Federal Democratic Republic of Ethiopia

OCCUPATIONAL STANDARD

POLYMER PROCESSING

NTQF Level III and IV

Ministry of Education
June 2013

Introduction

Ethiopia has embarked on a process of reforming its TVET-System. Within the policies and strategies of the Ethiopian Government, technology transformation – by using international standards and international best practices as the basis, and, adopting, adapting and verifying them in the Ethiopian context – is a pivotal element. TVET is given an important role with regard to technology transfer. The new paradigm in the outcome-based TVET system is the orientation at the current and anticipated future demand of the economy and the labor market.

The Ethiopian Occupational Standards (EOS) are - a core element of the Ethiopian National TVET-Strategy and an important factor within the context of the National TVET-Qualification Framework (NTQF).They are national Ethiopian standards, which define the occupational requirements and expected outcome related to a specific occupation without taking TVET delivery into account.

This document details the mandatory format, sequencing, wording and layout for the Ethiopian Occupational Standard comprised of Units of Competence.

A Unit of Competence describes a distinct work activity. It is documented in a standard format that comprises:

- Occupational title, NTQF level
- Unit code
- Unit title
- Unit descriptor
- Elements and Performance criteria
- Variables and Range statement
- Evidence guide

Together all the parts of a Unit of Competence guide the assessor in determining whether the candidate is competent.

The ensuing sections of this EOS document comprise a description of the respective occupation with all the key components of a Unit of Competence:

- chart with an overview of all Units of Competence for the respective level including the Unit Codes and the Unit Titles
- contents of each Unit of Competence (competence standard)
- occupational map providing the Technical and Vocational Education and Training (TVET) providers with information and important requirements to consider when designing training programs for this standards and for the individual, a career path

UNIT OF COMPETENCE CHART

Occupational Standard: Polymer Processing

Occupational Code: IND PLM

NTQF Level III

IND PMP3 01 0613 Perform Basic Tests	IND PMP3 02 0613 Modify Existing Compounds	IND PMP3 03 0613 Draw Wire
IND PMP3 04 0613 Bunch and Strand Wire	IND PMP3 05 0613 Change Extrusion Die and Setup	IND PMP3 06 0613 Produce Extruded Products
IND PMP3 07 0613 Produce Products Using Twin Screw Extruders	IND PMP3 08 0613 Produce Injection Moulded Products	IND PMP3 09 0613 Produce Blow Molded Products
IND PMP3 10 0613 Produce Continuous Thermoforming Products	IND PMP3 11 0613 Produce Compression Moulded Products	IND PMP3 12 0613 Produce Polyurethane Foam
IND PMP3 13 0613 Produce Foam Injected Mouldings	IND PMP3 14 0613 Produce Rotational Moulded Products	IND PMP3 15 0613 Produce Blown Film
IND PMP3 16 0613 Produce Composites Using Filament Winding	IND PMP3 17 0613 Set Up Polymer Fabric Production Machines for Product Change	IND PMP3 18 0613 Produce Liquid Surface Coated Products
IND PMP3 19 0613 Produce Printed And Decorated Film	IND PMP3 20 0613 Print and Decorate Rigid Products	IND PMP3 21 0613 Convert Plastic Film

IND PMP3 22 0613 Produce Polystirene Shape Moulded Products	IND PMP3 23 0613 Compound Materials Using an Internal Mill Blender	IND PMP3 24 0613 Compound Materials Using an Open Mill Blender
IND PMP3 25 0613 Produce Calendared Products	IND PMP3 26 0613 Build Green Tires	IND PMP3 27 0613 Vulcanize Products Using an Autoclave
IND PMP3 28 0613 Produce Finished Tires	IND PMP3 29 613 Inspect Tires	IND PMP3 30 0613 Monitor Implementation of Work Plan/Activities
IND PMP3 31 0613 Apply Quality Control	IND PMP3 32 0613 Lead Workplace Communication	IND PMP3 33 0613 Lead Small Team
IND PMP3 34 0613 Improve Business Practice	IND PMP3 35 0613 Prevent and Eliminate MUDA	

NTQF Level IV

IND PMP4 01 0613 Perform Chemical Tests and Procedures	IND PMP4 02 0613 Perform Physical - Mechanical Tests	IND PMP4 03 0613 Test Fibre-Composites Materials and Laminates
IND PMP4 04 0613 Predict Polymer Properties and Characteristics	IND PMP4 05 0613 Trial a New Die-Tool	IND PMP4 06 0613 Trial a New, Advanced or Complex Mould
IND PMP4 07 0613 Set Advanced or Complex Dies	IND PMP4 08 0613 Trial New Process or Product	IND PMP4 09 0613 Diagnose Production Equipment Problems
IND PMP4 10 0613 Identify Problems in Electronic Control Systems	IND PMP4 11 0613 Undertake Process Capability Improvements	IND PMP4 12 0613 Apply Statistics to Processes in Manufacturing
IND PMP4 13 0613 Optimize Process/Plant Area	IND PMP4 14 0613 Mistake Proof a Production Process	IND PMP4 15 0613 Determine Rheology and Output of Plastics Materials from Processing Equipment
IND PMP4 16 0613 Analyze Equipment Performance	IND PMP4 17 0613 Use Computer Aided Drafting Systems to Produce Basic Engineering Drawings	IND PMP4 18 0613 Choose Polymer Materials for an Application
IND PMP4 19 0613 Develop a New Compound	IND PMP4 20 0613 Determine Heat Transfer Loads For Processing Equipments	IND PMP4 21 0613 Analyze Failure in Polymeric Materials

IND PMP4 22 0613 Plan and Organize Work	IND PMP4 23 0613 Migrate to New Technology	IND PMP4 24 0613 Establish Quality Standards
IND PMP4 25 0613 Develop Individuals and Team	IND PMP4 26 0613 Utilize Specialized Communication Skills	IND PMP4 27 0613 Manage and Maintain Small/Medium Business Operations
IND PMP4 28 0613 Apply Problem Solving Techniques and Tools		

NTQF Level III

Occupational Standard: Polymer Processing Level III	
Unit Title	**Perform Basic Tests**
Unit Code	**IND PMP3 01 0613**
Unit Descriptor	This unit of competency covers the ability to perform tests using standard methods and with access to readily available advice. Personnel are required to demonstrate close attention to the accuracy and precision of measurements and the data obtained. In general, they do not calibrate equipment and make only limited adjustments to the controls. It does not cover interpretation or analysis of results or troubleshooting equipment problems.

Elements	Performance Criteria
1. Interpret test requirements	1.1 Test request is reviewed to identify samples to be tested, test method and equipment involved. 1.2 ***Hazards*** and ***enterprise controls*** are identified ***to address hazards*** associated with the sample, preparation methods, reagents and/or equipment.
2. Prepare sample	2.1 Sample description, compare with specification, record and report discrepancies are recorded. 2.2 ***Sample is prepared*** in accordance with appropriate standard methods.
3. Check equipment before use	3.1 Test for ***common measuring equipment*** in accordance with test method is set up. 3.2 Pre-use and safety checks are performed in accordance with enterprise procedures and manufacturer's instructions. 3.3 Faulty or unsafe equipment are identified and reported to appropriate personnel. 3.4 Calibration status of equipment is checked and any out of calibration items is reported to appropriate personnel
4. Perform tests on samples	4.1 Sample and standards to be tested are identified, prepared and weighted or measured. 4.2 ***Typical tests carried out by laboratory/field assistants*** are conducted in accordance with enterprise procedures. 4.3 Data is recorded in accordance with enterprise procedures. 4.4 Calculations on data is performed as required. 4.5 'Out of specification' or atypical results are identified and reported promptly to appropriate personnel.

	4.6 Equipment is shut down in accordance with operating procedures.
5. Maintain a safe work environment	5.1 Established safe work practices and personal protective equipment are used to ensure personal ***health, safety and environment.***
	5.2 ***Environmental impacts*** and the generation of wastes are minimized.
	5.3 Safe disposal of laboratory and hazardous wastes are ensured.
	5.4 Equipment and reagents are cleaned, cared for and stored as required.

Variable	**Range**
Hazards	May include: • electric shock • biohazards, such as microbiological organisms and agents associated with soil, air, water, blood and blood products, human or animal tissue and fluids • solar radiation, dust, noise • chemicals, such as sulphuric acid, fluorides, hydrocarbons, aerosols, sharps, broken glassware and hand tools • flammable liquids • dry ice and liquid nitrogen • fluids under pressure • sources of ignition • occupational overuse syndrome, slips, trips and falls • manual handling, working at heights and in confined spaces • Crushing, entanglement, cuts associated with moving machinery or falling objects.
Enterprise controls to address hazards	May include: • use of Material Safety Data Sheets (MSDS) • use of signage, barriers and service isolation tags • use of personal protective equipment, such as hard hats, hearing protection, sunscreen lotion, gloves, safety glasses, goggles, face guards, coveralls, gown, body suits, respirators and safety boots • use of appropriate equipment, such as biohazard containers and cabinets, laminar flow cabinets • recognising and observing hazard warnings and safety signs • labelling of samples, reagents, aliquoted samples and hazardous materials • handling and storage of all hazardous materials and equipment in accordance with labelling, materials safety

	data sheets and manufacturer's instructions, enterprise procedures and regulations • cleaning and decontaminating equipment and work areas regularly using recommended procedures • following established manual handling procedures for tasks involving manual handling.
Preparation of samples	May include: • sub-sampling or splitting using procedures, such as: riffling, coning and quartering, manual and mechanical splitters • diluting samples • physical treatments, such as ashing, dissolving, filtration, sieving, centrifugation and combination • Moulding, casting or cutting specimens.
Common measuring equipment	May include: • dimension apparatus • Dissolved Oxygen (DO), Electrical Conductivity (EC) • analogue and digital meters, charts/recorders • basic chemical and biological test kits • dipsticks and site test kits (for example, HACK) • timing devices • temperature measuring devices, such as thermometers, thermocouples.
Typical tests carried out by laboratory/field assistants	May include: • visual/optical tests of appearance, colour, texture, identity, turbidity, refractive index (alcohol content, Baume/Brix) physical tests, such as: ➢ density, specific gravity, compacted density ➢ moisture content, water activity ➢ particle size, particle shape, size distribution • chemical tests, such as: ➢ gravimetric ➢ colorimetric ➢ Electrical Conductivity (EC), pH ➢ specific ions using dipsticks and kits ➢ nutrients (for example nitrates, orthophosphates) using basic kits ➢ ashes, including Sulphated ashes • biological/environmental tests, such as: ➢ pH, Oxygen Reduction Potential (ORP), Dissolved Oxygen (DO), electrical conductivity ➢ E coli using test kits ➢ surface hygiene/presence of microbes • packaging tests, such as: ➢ tearing resistance, bursting strength, impact resistance ➢ permeability and/or leakage

	• mechanical tests, such as: ➢ Emerson class ➢ concrete slump ➢ Other measurements may include: ➢ simple ground surveys • meteorological parameters, such as: ➢ wind direction/strength, rainfall, max./min. temperature, humidity, solar radiation ➢ simple background radiation survey ➢ production/process parameters, such as temperature, flow, pressure ➢ gas levels in a confined space
Health, safety and environment	All operations to which this unit applies are subject to stringent health, safety and environmental (HSE) requirements, which may be imposed through State or Federal legislation and these, must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.
Minimizing environmental impacts	May include: • recycling of non-hazardous waste, such as chemicals, batteries, plastic, metals, glass • appropriate disposal of hazardous waste • correct disposal of excess sample/test material • correct storage and handling of hazardous chemicals.

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge competencies to: • interpret enterprise procedure or standard methods accurately • use safety information (for example, MSDSs) and perform procedures safely • check test equipment before use • complete all tests within required timeline without sacrificing safety, accuracy or quality • calculate, record and present results accurately and legibly • maintain security, integrity and traceability of all samples, data/results and documentation • clean and maintain equipment.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • purpose of test • principles of the standard method • pre-use equipment checks • relevant standards/specifications and their interpretation • sources of uncertainty in measurement and methods for control

	• enterprise and/or legal traceability requirements • interpretation and recording of test result, including simple calculations • procedures for recognition/reporting of unexpected or unusual results • Relevant health, safety and environment requirements.
Underpinning Skills	Demonstrate skills to: • apply principles of the standard method • perform pre-use equipment checks • apply relevant standards/specifications and their interpretation • identify sources of uncertainty in measurement and methods for control • enterprise and/or legal traceability requirements • interpret and record test result, including simple calculations • apply procedures for recognition/reporting of unexpected or unusual results • implement relevant health, safety and environment requirements.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Modify Existing Compounds**
Unit Code	**IND PMP3 02 0613**
Unit Descriptor	This competency covers the development of trial compounds in a laboratory or using pilot equipment and then monitoring initial factory trials. It would typically be done by an operator either working alone for a minor modification or with other relevant person(s) for a major modification. It covers minor modifications to existing compounds/formulae to develop an updated version of an existing compound or a 'new' compound which is strongly based on an existing compound.

Elements	Performance Criteria
1. Confirm requirements of modified formula	1.1 The specifications are checked for new compound are complete and unambiguous. 1.2 Items which are unclear or beyond the normal scope of work are clarified. 1.3 The type of changes/materials which are likely to meet these requirements are investigated. 1.4 Any possible issues if different, unusual or exotic materials are likely to be required are clarified. 1.5 Tests required on trial compound is identified.
2. Estimate starting formula	2.1 Existing compound(s) with similar specifications is identified. 2.2 Required changes to existing compound is estimated. 2.3 Practicality of proposed changes is checked. 2.4 HSE impacts of proposed changes is checked. 2.5 Proposed starting formulae is modified as appropriate.
3. Prepare trial compounds	3.1 All hazards for pilot mixing is identified and controlled. 3.2 All required plant and equipment are identified and checked. 3.3 All required materials are obtained and prepared. 3.4 Trial compound and obtain sample(s) are mixed. 3.5 Test results are interpreted. 3.6 Formula and repeat trials are modified as required.
4. Check initial factory trial	4.1 Availability of required sources and plant availability are checked. 4.2 Ensure ***sources of information*** are identified.

	4.3 Ensure all authorities and permissions have been obtained. 4.4 All hazard controls that have been implemented are checked. 4.5 Factory trial mixing of compound is monitored. 4.6 Sample(s) is obtained and test results are interpreted. 4.7 Formula and repeat factory trial are modified as required.
5. Complete trial	5.1 All required records and reports are completed. 5.2 Any changes to resources and ***procedures*** have been incorporated into standard procedures are checked. 5.3 A ***problem*** or a potential problem is recognized. 5.4 Any additional HSE or skill requirements have been included in future plans is ensured.

Variable	**Range**
Sources of information	May include: • yearly, monthly, weekly and daily production targets • business objectives and goals • control charts, run charts and graphs • enterprise manuals and procedures • equipment specifications.
Procedures	All operations are performed in accordance with appropriate procedures. mean all relevant workplace procedures, work instructions, temporary instructions, standard operating procedures and relevant industry and government codes and standards.
Problem	Typical process and product problems may include: • non-routine process and quality problems • equipment selection, availability and failure • teamwork and work allocation problems • safety and emergency situations and incidents.
Sources of process inefficiencies and wastage	May include: • equipment downtime • spillages • leaks • contamination • raw material quality • utilities usage • productivity issues • incorrect work allocation/priorities/planning • incorrect processes/procedures.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • understand the procedures and know the importance of critical operational systems • recognise potential situations requiring action and then implement appropriate action. • perform consistently to see that: ➢ production targets are identified and performance monitored against targets ➢ potential and actual issues/problems/hazards are recognised and clarified ➢ appropriate strategies are recommended to improve efficiency and productivity within team/department to achieve targets ➢ safety and environmental implications of recommendations are recognised and addressed ➢ Participation in implementing strategies to improve process efficiencies is demonstrated.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • components of relevant compounds and their impact on compound properties • tests which might be used and the applicability of the different tests for different compound properties • mixing methods and the impacts of different mixing on compound properties • existing compounds and their properties • requirements for factory trialling and scaling up from laboratory/pilot scale • suppliers of materials & sources of information about materials.
Underpinning Skills	• identify deviations from target and recommend improvement strategies. • apply organization procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. • manage risks using the hierarchy of controls applied to the process. • apply approved hazard control, safety procedures, use of PPE in relation to handling materials, equipment operation and clean up. • identify hazards of the materials and process • implement appropriate procedures for hazard control • use PPE, safely handle products and materials, read relevant safety information and apply safety precautions appropriate to the task.

	• read and interpret typical process documentation and charts. • write skills to the level of completing workplace forms and production reports.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Advanced Polymer Processing Operation Level III	
Unit Title	**Draw Wire**
Unit Code	**IND PMP3 03 0613**
Unit Descriptor	This competency covers the operation of wire drawing equipment and the solving of non-routine problems. It is typically performed by advanced operators demonstrating some relevant theoretical knowledge and using a range of well-developed skills requiring some discretion and judgment.

Elements	Performance Criteria
1. Plan own work requirements	1.1 ***Equipment*** and processes used for production process, upstream and downstream operations from production plan or request are identified. 1.2 Materials required including additives are identified. 1.3 ***Hazards are*** recognized and appropriate action is taken. 1.4 Emergency stops, guards and controls are identified and checked. 1.5 Requirements for materials, quality, production and equipment checks are identified. 1.6 Materials, waste management and housekeeping needs are identified.
2. Check wire drawing process set-up.	2.1 Equipment requirements are determined. 2.2 Equipment settings and adjustments are checked as required. 2.3 Appropriate dies (number and sizes) are selected and arranged in correct production sequence. 2.4 Dies, capstans, head, wire reel pack and gears, replacing or maintaining are identified and checked as required. 2.5 Wire drawing capstan with lubricant to procedures are coated. 2.6 Materials are checked if they are correct. 2.7 Material spool sizes for conformity with requirements are checked. 2.8 Adjustments are discarded or made to the process for non-conforming materials. 2.9 New materials checking free operation through dies are threaded and secured fixing to reels or spools. 2.10 Equipment and component checks are conducted to ensure safe and efficient operation to ***procedures***.

	2.11 Date, batch and materials markings are set up as required. 2.12 Other pre-start checks to procedures is completed.
3. Operate wire drawing process to procedures.	3.1 Wire drawing equipment, noting key variables are operated. 3.2 Controls/displays/terminals for production/process data are monitored. 3.3 Product/process quality is monitored. 3.4 Adjustments are made to remedy faults and nonconformity as required. 3.5 Continuity of process is maintained. 3.6 Other materials are collected and reprocessed/discarded scraped/trimmed. 3.7 Equipment is cleaned, adjusted and lubricated as required. 3.8 Required workplace documentation/records are completed. 3.9 Equipment is paused, or equipment is stopped in an emergency, as required.
4. Shut down equipment to procedures.	4.1 Equipment is shut down as required. 4.2 Equipment cleanup, adjustments and waste management are completed. 4.3 Suitable guards, locks and notices are placed to prevent inadvertent start-up.
5. Anticipate and solve problems.	5.1 A ***problem*** or a potential problem is recognized. 5.2 Problems needing priority action is determined. 5.3 Problems outside area of responsibility is referred to appropriate person, with possible causes. 5.4 Information and assistance as required is sought to solve problems. 5.5 Problems within area of responsibility are solved. 5.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • wire drawing equipment and components, including die box, payoff, capstan, internal cooling system, annealer, tinner, accumulator, spooler, main drive, control unit, wire drawing dies (diamond, tungsten, carbide, compax)’

	• associated equipment, including manual handling equipment, pointers, taggers, welders, lubrication system, packaging • measuring equipment • hand tools used in production process • Relevant personal protective equipment.
Hazards	May include: • temperature • hazardous materials • manual handling hazards • Equipment operations.
Procedures	All operations are performed in accordance with appropriate procedures. Procedures include all relevant workplace procedures, work instructions, temporary instructions, manufacturer operating instructions and relevant industry and government codes and standards.
Problems	Anticipate and solve problems means resolve a wide range of routine and non-routine problems, using product and process knowledge to develop solutions to problems which do not have a known solution/a solution recorded in the procedures. Typical process and product problems may include: • equipment malfunctions (e.g. wire breaks - raw material contamination, die wear, die build-up, faulty capstan bands, faulty wire welds) • materials problems (e.g. incorrect quantity of materials, raw material contamination) • processing problems (e.g. incorrect diameter, ovality, surface appearance, colour, inclusions, elongation, tensile strength, weight, wrap)

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • research information required, and intended use is taken into account • complete documentation accurately, concisely and in accordance with requirements • easily understand completed documentation by the recipient • communicate information in appropriate manner • distinguish communication between relevant and peripheral issues.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • products, materials and material characteristics • function of wire drawing equipment, equipment components and ancillary equipment

	• impact of die wear and build up, faulty capstan and wire welds on product quality and production output • wire drawing manufacturing processes • behaviour of materials in relation to speed, temperature and tension • waste management and importance of non-conforming materials • wire properties and their interactions with process conditions • relationships between wire properties and process conditions • changes to wire properties to better suit process requirements • product problems related to wire properties • product problems related to process conditions • Adjustments to process conditions to meet wire and product requirements.
Underpinning Skills	Demonstrate skills to: • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the wire drawing process • identify factors which may affect product quality or production output and appropriate remedies • identify when assistance is required to solve problems.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Bunch and Strand Wire**
Unit Code	**IND PMP3 04 0613**
Unit Descriptor	This competency covers the operation of wire bunching and stranding equipment and the solving of non-routine problems. It is typically performed by advanced operators demonstrating some relevant theoretical knowledge and using a range of well-developed skills requiring some discretion and judgement. It applies to advanced operators who are required to apply knowledge of materials, product purpose and processes to the operation of wire bunching and stranding equipment. The key factors are the production of material meeting quality standards and product requirements and the recognition and resolving of a range of routine and non-routine problems.

Elements	Performance Criteria
1. Plan own work requirements	1.1 ***Equipment*** and processes used for production process and upstream and downstream operations from production plan or requests are identified. 1.2 Materials required are identified. 1.3 ***Hazards*** are recognized and appropriate action is taken. 1.4 Emergency stops, guards and controls are identified and checked. 1.5 Requirements for materials, quality, and production and equipment checks are identified. 1.6 Materials, waste management and housekeeping needs are identified.
2. Check wire bunching and stranding process set-up	2.1 Equipment requirements are determined. 2.2 Process is set to specifications as required. 2.3 Appropriate dies (number and sizes) are selected and arranged in correct production sequence. 2.4 Wire bunching and stranding equipment settings and adjustments, including tension, die number, sizes and threading arrangements, are as required are checked. 2.5 Materials are checked if they are correct. 2.6 Adjustments to the process for non-conforming materials are discarded or made. 2.7 Date, batch and materials markings are set up to specifications, as required. 2.8 Other pre-start checks to ***procedures*** are completed.

	2.9 Close attention to the accuracy and precision of ***measurement*** is demonstrated.
3. Operate wire bunching and stranding process to procedures	3.1 Wire bunching and stranding equipment as required is set up. 3.2 Materials are loaded. 3.3 Equipment is started up and adjustments are made to reach required settings. 3.4 Controls/displays/terminals for production/process data are monitored. 3.5 Product/process quality is monitored. 3.6 Continuity of process is maintained. 3.7 Adjustments are made to remedy faults and nonconformities as required. 3.8 Other materials are collected and reprocessed/discarded scrapped/trimmed. 3.9 Required workplace documentation/ records are completed. 3.10 Equipment is cleaned, adjusted and lubricated as required. 3.11 Equipment is paused or stopped in an emergency, as required.
4. Shut down equipment to procedures	4.1 Equipment is shut down as required. 4.2 Equipment cleanup, adjustments and waste management is completed. 4.3 Suitable guards, locks and notices are placed to prevent inadvertent start-up. 4.4 Operate process equipment, noting key ***variables***
5. Anticipate and solve problems	5.1 A ***problem*** or a potential problem is recognized. 5.2 Problems needing priority action is determined. 5.3 Problems outside area of responsibility are referred to appropriate person, with possible causes. 5.4 ***Information*** and assistance as required are sought to solve problems. 5.5 Problems within area of responsibility are solved. 5.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	• wire bunching and stranding equipment and components, including dies, threading path, spools, gears • associated equipment, including manual handling equipment, welders, lubrication system, packaging, measuring equipment

	• hand tools used in production process • relevant personal protective equipment.
Hazards	• temperature • wire breakages • hazardous materials • manual handling hazards and equipment operations.
Procedures	All operations are performed in accordance with appropriate procedures. Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Measurements	May include measuring length, squareness, flatness, angle, roundness, clearances or any other measurements that can be read off analog, digital or other measuring device
Variables	May Include: • equipment operating speed • time • tension • wind off speed • Product integrity and general conformance to specification/sample.
Problems	Typical process and product problems may include: • processing problems (e.g. incorrect diameter, ovality, surface appearance, colour, inclusions, elongation, tensile strength, weight, wrap) • equipment malfunctions (eg wire breaks - raw material contamination, die wear, die build-up, faulty capstan bands, faulty wire welds) • materials problems (e.g. raw material contamination, incorrect quantity of materials).
Information	May include dimensions, instructions, base line or datum points

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge competencies of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out-of-specification production. • organization procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. • Application of the knowledge of managing risks using the hierarchy of controls applied to the wire bunching and stranding process. Application of approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup.

Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • products, materials and material characteristics • wire bunching and stranding manufacturing processes • function of wire bunching and stranding equipment, equipment components and ancillary equipment • why multiple strand wires are used and the purpose of armouring and annealing wires • the changes in materials in each stage of the production process • behaviour of materials in relation to speed, temperature and tension • changes to materials in wire bunching and stranding manufacturing process • waste management and importance of non-conforming materials • opportunities to re-use and recycle waste materials • wire properties and their interactions with process conditions • relationships between wire properties and process conditions • changes to wire properties to better suit process requirements. • product problems related to wire properties • product problems related to process conditions • adjustments to process conditions to meet wire and product requirements.
Underpinning Skills	Demonstrate skills to: • plan own work, including predicting consequences and identifying improvements • take measurements when required and identify product out of specification • identify and describe own role and role of others involved directly in the process • identify factors which may affect product quality or production output and appropriate remedies • identify when the operator is able to rectify faults and when assistance is required.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Change Extrusion Die and Setup**
Unit Code	**IND PMP3 05 0613**
Unit Descriptor	This competency covers the removal and refitting of dies, pins, sizing dies (calibrator), vacuum blocks and seals in preparation for production. It applies to extrusion, and similar, dies. It applies to advanced operators who are responsible for changing setups to meet the production schedule for an extrusion line process. Setup changes means the work involving the extrusion die and sizing equipment only. The key factors are the safe and precise removal and installation.

Elements	Performance Criteria
1. Prepare to change dies or cores	1.1 Process for closing down machinery is planned and relevant personnel are informed. 1.2 Last-off samples as required for die reports is taken. 1.3 Dies or cores are selected to match product/process specification. 1.4 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care.
2. Shut down extruder	2.1 Downstream ***equipment*** is stopped. 2.2 Feed is stopped, drop temperatures are dropped, vacuum pump is stopped and the extruder is purged. 2.3 Isolating locks is activated, power is disconnected to heaters.
3. Change setup	3.1 Die is removed, cleaned and stored according to workplace procedures. 3.2 Fit replacement die ensuring that locating devices and marks are matched and securing devices are installed and tightened to specification. 3.3 Calibrator sleeve and seals are removed and re-fitted as required. 3.4 Heats are set according to pre-start procedures.
4. Restart and test-run the new setup	4.1 Operation of die is checked against product quality. 4.2 Machine setting ranges against documented requirements are compared. 4.3 The first-off sample is checked for required standards. 4.4 Settings and other production ***variables is*** fine-tuned as required.

	4.5 Variances between standard operating procedures and actual production run is noted. 4.6 Workplace documentation is completed and reported to appropriate personnel.
5. Anticipate and solve problems	5.1 Actual and/or potential problem(s) is recognized. 5.2 Problems outside area of responsibility are referred to appropriate person, with possible causes. 5.3 Information and assistance as required is sought to solve problems. 5.4 Problems within area of responsibility are solved. 5.5 Items initiated is followed through until final resolution has occurred. 5.6 Problems needing priority action are determined.

Variable	**Range**
Hazards	May include: • hazardous materials • manual handling hazards and hot surfaces
Procedures	All operations are performed in accordance with appropriate procedures. Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Tools and equipment	May include: • hand carts and trolleys • hoists/lifting equipment not requiring any special permits or licences basic hand tools • hand tools • relevant personal protective equipment.
Variables	May include: • fitting and adjustments to die • adjustments to extruder settings • quality of the product against product specifications
Problems	• lack of cleaning leading to corrosion • inadequate fitting • fine adjustments to optimise production

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge competencies of: • Application of materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production.

	• organisation procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. • Application of managing risks using the hierarchy of controls applied to the extrusion process. Application of approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and clean up.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • impact of incorrect or faulty fitting • production work-flow sequences • correct selection and use of equipment and procedures • hazards of the removal and fitting process and appropriate hazard control procedures • the performance of die and cores • relevant information and workplace records • Safety precautions appropriate to the task.
Underpinning Skills	Demonstrate skills to: • plan own work, including predicting consequences and identifying improvements • start up equipment and make appropriate adjustments to bring process on line • take samples when required and identify product out of specification • safely shut down equipment in normal or abnormal circumstances • identify and describe own role and role of others involved directly in the process • identify factors which may affect product quality or production output and appropriate remedies • identify hazards of the materials and process • implement appropriate procedures for hazard control • use PPE • safely handle products and materials • read relevant safety information and apply safety precautions appropriate to the task.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Extruded Products**
Unit Code	**IND PMP3 06 0613**
Unit Descriptor	This competency covers the operation and adjustment of extrusion equipment and extrusion processes and the solving of non-routine problems. It applies to extrusion processes for pipe, sheet, profile, film, cable and rod and the extrusion of both plastics and rubber. It is typically performed by advanced operators applying knowledge of materials, product purpose and processes to the operation of extrusion equipment to produce product conforming to requirements. It also requires using a range of well-developed skills requiring some discretion and judgment to recognize and solve a range of problems.

Elements	Performance Criteria
1. Plan own work requirements.	1.1 The most appropriate equipment to be used for production process, upstream and downstream operations from production plan or request is identified. 1.2 ***Materials*** required, including additives and regrind and their amounts or percentages are identified and checked. 1.3 Measures to control identified ***hazards*** in line with ***procedures*** and duty of care are implemented. 1.4 Requirements for materials, quality, product and ***equipment*** checks are identified.
2. Start up extrusion process to procedures.	2.1 Process settings required for ***product*** is identified***.*** 2.2 Process is set to required settings. 2.3 Materials are checked it they are correct. 2.4 Appropriate action for non-conforming materials is taken. 2.5 Date, batch and materials markings are set up as required. 2.6 Pre-start checks is completed. 2.7 Extrusion process is started up.
3. Operate and make adjustments to the extrusion process to procedures.	3.1 Extrusion process, noting key ***variables*** is operated***.*** 3.2 Controls/displays/terminals for production and process data are monitored. 3.3 Samples as required are taken and product out of specification is identified. 3.4 Product/process quality is monitored. 3.5 Adjustments are made to remedy faults and nonconformity as required.

	3.6 A stable extrusion process is established. 3.7 Process is adjusted to minimize scrap and trim. 3.8 Equipment is cleaned, adjusted and lubricated as required.
4. Shut down extruder to procedures.	4.1 Type of shut down is determined. 4.2 Appropriate purging method is selected. 4.3 Efficiently and adequately purged as required. 4.4 Machine is left in appropriate condition and with appropriate locks, tags or notices. 4.5 Relevant documentation is completed. 4.6 Area is clean and clear after the shutdown in readiness for the next start up is ensured.
5. Anticipate and solve problems	5.1 A ***problem*** or a potential problem is recognized. 5.2 Problems needing priority action is determined. 5.3 Problems outside area of responsibility is referred to appropriate person, with possible causes. 5.4 Information and assistance as required is sought to solve problems. 5.5 Problems within area of responsibility are solved. 5.6 Items initiated us followed through until final resolution has occurred.

Variable	**Range**
Materials	May include: • This unit applies to most plastic and rubber materials, including compounded PVC fed to the extruder as pellets. It does not apply to dry blended PVC powder (refer to PMBPROD334A).
Hazards	May include: • spills • dusts/vapours • slip and fall (eg due to spilt granules) • temperature (eg due to heated barrel, head and die) • hazardous materials (including decomposing polymer during start up and shut down) • moving equipment (e.g. moving moulds, robots and ancillary equipment) • manual handling hazards • Equipment operations
Procedures	• All operations are performed in accordance with procedures.

	• Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Tools and equipment	May include: • extruder equipment and components (e.g. main drive, gear box, thrust assembly, adapter, gate, breaker plate, screen pack, doser, screw/s, barrel, heaters, thermocouples) • extrusion dies (e.g. rod, sheet, pipe, profile and cable) • extruders, either single or twin screw • auxiliary equipment (e.g. water pump, feeders, hopper loader, pelletiser, dehumidifiers) • tools for taking samples • relevant personal protective equipment.
Products	May include: • rod • sheet • film • profile • tread profile • Cable
Variables	May include: • differences between actual and set temperatures • speeds (including screw speed and haul-off) • colour and uniformity • surface finish and appearance • product finished thickness • output rate • Product integrity and general conformance to specification/sample.
Problems	May include: • 'Anticipate and solve problems' means resolve a wide range of routine and non-routine problems, using product and process knowledge to develop solutions to problems which do not have a known solution/a solution recorded in the procedures. • burn marks • flow marks • poor surface finish • poor colour dispersion • blistering • colour contamination • Black spots • Non-routine faults, which may have multiple causes include: ➢ product distortion ➢ residual stresses

	➢ Intermittent faults. • Typical process and product problems may include: ➢ die/tooling problems such as damage or build-up ➢ equipment malfunction ➢ variations in temperatures, pressures, speeds and times ➢ variations in material properties and/or contamination of materials ➢ variation in material flow rates ➢ Processing problems. • Appropriate action for problems outside of area of responsibility may be reporting to an appropriate person. • Appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources.

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge competencies of: • extrusion production quality and output standards are met consistently the process runs consistently and smoothly, with the minimum need for human intervention • All safety procedures are adhered to • identification of critical materials properties and extrusion process characteristics in relation to the process requirements and the end product • making adjustments to the process as required • Identifying and taking appropriate action on problems and potential problems.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. For example foreign material in the polymer feed leading to black spots in the product. • organizations procedures, quality requirements at each production stage and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. • application of managing risks using the hierarchy of controls applied to the extrusion process. Application of approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup. • characteristics of materials and behaviour in relation to heat, pressure, flow rate and time • function and operating principles of extruder equipment, machine components and ancillary equipment (e.g. stackers, haul off, saw/cutter, printing, embossing, coil winder, packaging)

	• impact of extruder machine speed, temperature, pressure, time, haul-off speed, on product quality and production output • the relationship between the type of extruder and the materials being extruded • nature of mechanical, hydraulic, pneumatic, electrical and electronic principles which affect machine operation and product development • processing behaviours of the materials extruded in the workplace • impact of variations in raw materials and equipment operation in relation to final product • changes to materials at various stages of production • waste management and importance of non-conforming materials • polymer properties and their interactions with process conditions • relationships between polymer properties and process conditions • changes to polymer properties to better suit process requirements • product problems related to polymer properties • product problems related to process conditions • Adjustments to process conditions to meet polymer and product requirements.
Underpinning Skills	Demonstrate skills to: • Apply approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup. • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the extrusion process • identify factors which may affect product quality or production output and appropriate remedies • identify when assistance is required to solve problems. • distinguish between causes of faults such as: • routine product extrusion faults - burn marks, flow marks, poor surface finish, poor colour dispersion, blistering, colour contamination, black spots • incorrect quantity of materials • contaminated materials/additives • equipment faults

	• read and interpret typical product specifications, job sheets and material labels as provided to operators. • the level of completing workplace forms and production reports. • basic numeracy, e.g. to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Products Using Twin Screw Extruders**
Unit Code	**IND PMP3 07 0613**
Unit Descriptor	This competence covers the operation and adjustment of twin screw extrusion equipment and extrusion processes and the solving of non-routine problems. It applies to extrusion processes for pipe, sheet, profile, film, cable and rod. It usually applies to products extruded from dry blend PVC powder/resin and other materials. It includes the operation of all relevant ancillary equipment where that equipment is integral to the extrusion process. It is typically performed by technicians applying knowledge of materials, product purpose and processes to the operation of twin screw extrusion equipment to produce product conforming to requirements. It also requires using a range of well-developed skills requiring some discretion and judgment to recognize and solve a range of problems.

Elements	Performance Criteria
1. Plan own work requirements.	1.1 The most appropriate ***equipment*** to be used for production process, upstream and downstream operations from production plan or request is identified. 1.2 Materials required, including additives and regrind and their amounts or percentages is identified and checked. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care. 1.4 Requirements for ***materials***, quality, production and equipment checks is identified.
2. Start up twin screw extrusion process to procedures.	2.1 Process settings required for product is identified. 2.2 Process is set to required settings. 2.3 Materials are checked if it is correct. 2.4 Appropriate action for non-conforming materials is taken. 2.5 Date, batch and materials markings are set up as required. 2.6 Pre-start checks is completed. 2.7 Ancillary equipment is started up as required. 2.8 Extrusion process is started up. 2.9 System components are synchronized/balanced as required.

3. Operate and make adjustments to the twin screw extrusion process to procedures.	3.1 Extrusion process, noting key ***variables*** are operated***.*** 3.2 Controls/displays/terminals for production and process data are monitored. 3.3 Samples are taken as required and product out of specification is identified. 3.4 Product/process quality is monitored. 3.5 Adjustments are made to remedy faults and nonconformity as required. 3.6 A stable compounding and extrusion process are established. 3.7 Process is adjusted to minimize scrap and trim. 3.8 Equipment is cleaned, adjusted and lubricated as required.
4. Shut down twin screw extruder to procedures.	4.1 Type of shut down is determined. 4.2 Appropriate purging method is selected. 4.3 Efficiently and adequately purged as required. 4.4 Machine is left in appropriate condition and with appropriate locks, tags or notices. 4.5 Relevant documentation is completed. 4.6 Area is ensured clean and clear after the shutdown in readiness for the next start up.
5. Anticipate and solve problems.	5.1 A ***problem*** or a potential problem is recognized. 5.2 Problems needing priority action is determined. 5.3 Problems outside area of responsibility is referred to appropriate person, with possible causes. 5.4 Information and assistance as required are sought to solve problems. 5.5 Problems within area of responsibility is solved. 5.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • twin screw extruder equipment and components (such as main drive, gear box, thrust assembly, adapter, gate, breaker plate, screen pack, doser, screw/s, barrel, heaters, thermocouples) • vacuum pump, vacuum system

	• extrusion dies (e.g. rod, sheet, pipe, profile and cable) • twin screw extruders, including those with parallel, tapered or other screw configurations • auxiliary equipment (e.g. water pump, feeders, hopper loader, pelletiser, dehumidifiers) • tools for taking samples • relevant personal protective equipment
Hazards	May include: • spills • dusts/vapours • slip and fall (e.g. due to spilt granules) • temperature (e.g. due to heated barrel, head and die) • volatiles vented from the extruder • hazardous materials, including decomposing polymer during start up and shut down • moving equipment (e.g. moving moulds, robots and ancillary equipment) • manual handling hazards • equipment operations
Procedures	All operations are performed in accordance with appropriate procedures. Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards. All operations are performed in accordance with procedures.
Materials	May include: • dry blended PVC powder, where the materials are 'compounded' within the extruder.
Variables	May include: • differences between actual and set temperatures • speeds, including screw speed and haul-off • colour and uniformity • surface finish and appearance • product finished thickness • output rate • product integrity and general conformance to specification/sample
Problems	• Typical routine faults may include: ➢ burn marks ➢ flow marks ➢ poor surface finish ➢ poor colour dispersion ➢ blistering ➢ colour contamination ➢ black spots

	➢ dimensional changes ➢ high reversion ➢ ovality ➢ Bowing. • Non-routine faults, which may have multiple causes may include: ➢ product distortion ➢ plate out ➢ residual stresses and intermittent faults. • Typical process and product problems may include: ➢ die/tooling problems such as damage or build-up ➢ equipment malfunction ➢ variations in temperatures, pressures, torque, speeds and times ➢ vacuum performance and volatile venting rates ➢ variations in material properties and/or contamination of materials ➢ variation in material flow rates ➢ Processing problems. • Appropriate action for problems outside of area of responsibility may be reporting to an appropriate person. • Appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and extrusion process characteristics in relation to the process requirements and the end product • make adjustments to the process as required • Identify and take appropriate action on problems and potential problems. • perform consistently to see that: • extrusion production quality and output standards are met consistently the process runs consistently and smoothly, with the minimum need for human intervention • all safety procedures are adhered to.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • materials, equipment and process sufficient to recognize material and equipment conditions which may lead to out of specification production. • organizations procedures, quality requirements at each production stage and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards.

	• managing risks using the hierarchy of controls applied to the extrusion process. • approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup. • basis for solving processing and material problems, including: • characteristics of materials and behaviour in relation to heat, pressure, flow rate and time • function and operating principles of twin screw extruder equipment, machine components and ancillary equipment (e.g. stackers, haul off, saw/cutter, printing, embossing, coil winder, packaging) • requirements for compounding within the extruder • critical process variables such as temperature, torque, power • impact of extruder machine speed, torque, temperature, pressure, time, haul-off speed, on product quality and production output • operation and adjustment of vacuum system and the venting of volatiles • the relationship between the type of extruder and the materials being extruded • nature of mechanical, hydraulic, pneumatic, electrical and electronic principles which affect machine operation and product development • processing behaviours of the materials extruded in the workplace • impact of variations in raw materials and equipment operation in relation to final product • changes to materials at various stages of production • Waste management and importance of non-conforming materials. • Reading and interpreting typical product specifications, job sheets and material labels as provided to operators. • Writing is required to the level of completing workplace forms and production reports.
Underpinning Skills	Demonstrates skills to: • Apply knowledge of the materials, equipment and process sufficient to recognize material and equipment conditions which may lead to out of specification production. For example foreign material in the polymer feed leading to black spots in the product. • Apply organization procedures, quality requirements at each production stage and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards.

	• Apply the knowledge of managing risks using the hierarchy of controls applied to the extrusion process. • Apply approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup. • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the extrusion process • identify factors which may affect product quality or production output and appropriate remedies • Identify when assistance is required to solve problems. • Read and interpret typical product specifications, job sheets and material labels as provided to operators. • complete workplace forms and production reports • Distinguish between causes of faults such as: ➢ routine product extrusion faults - burn marks, flow marks, poor surface finish, poor colour dispersion, blistering, colour contamination, black spots ➢ incorrect quantity of materials ➢ contaminated materials/additives ➢ equipment faults
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Injection Moulded Products**
Unit Code	**IND PMP3 08 0613**
Unit Descriptor	This competence covers the operation and adjustment of injection moulding processes and the solving of routine problems. It is typically performed by advanced operators applying knowledge of materials, product purpose and processes to the operation of injection moulding equipment to produce product conforming to requirements. It also requires using a range of well-developed skills requiring some discretion and judgement to recognize and resolve a range of problems.

Elements	Performance Criteria
1. Plan own work requirements	1.1 The most appropriate ***equipment*** to be used for production and upstream and downstream operations from production plan or request is identified. 1.2 Materials required, including additives and regrind and their amounts or percentages are identified and checked. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care. 1.4 Requirements for materials, quality, production and equipment checks are identified.
2. Startup injection moulding process to procedures	2.1 Process settings required for product is identified. 2.2 Process is set to required settings. 2.3 Materials are checked if they are correct. 2.4 Appropriate action for non-conforming materials is taken. 2.5 Date, batch and materials markings to specifications, as required is set up. 2.6 Pre-start checks is completed. 2.7 Injection moulding process is started up.
3. Operate and make adjustments to the injection moulding process to procedures	3.1 Injection moulding process, noting key ***variables*** is operated***.*** 3.2 Controls/displays/terminals are monitored for production and process data. 3.3 Samples are taken as required and product out of specification is identified. 3.4 Product/process quality is monitored. 3.5 Adjustments are made to remedy faults and nonconformity as required.

	3.6 A stable injection moulding process is established. 3.7 Process is adjusted to minimize scrap and trim. 3.8 Equipment is cleaned, adjusted and lubricated as required.
4. Shut down machine to procedures	4.1 Type of shut down is determined. 4.2 Appropriate purging method is selected. 4.3 Efficiently and adequately purged as required. 4.4 Machine is left in appropriate condition and with appropriate locks, tags or notices. 4.5 Relevant documentation is completed. 4.6 Area is ensured clean and clear after the shutdown, in readiness for the next start up.
5. Anticipate and solve problems	5.1 A ***problem*** or a potential problem is recognized. 5.2 Problems needing priority action is determined. 5.3 Problems outside area of responsibility is referred to appropriate person, with possible causes. 5.4 Information and assistance as required are sought to solve problems. 5.5 Problems within area of responsibility is solved. 5.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment may include:	• injection moulding machines (e.g. electrical, pneumatic, mechanical, electromechanical and hydraulic) • components of injection moulding machines (e.g. base, frame, feed hoppers and material supply mechanisms, barrel and screw plastification unit, injection units) • die/tool (e.g. pneumatic, or hydraulic actuation of cores, slides ejector systems) • additional equipment (e.g. chillers, die heating equipment, hopper driers, mixing hoppers, dehumidifying driers, air compressors, dosing machines, colour blending equipment and conveyors where they are integral to the operation of the injection moulder) • hand tools used in the injection moulding process • material loading equipment used for loading of raw materials • Relevant personal protective equipment.
Hazards	May include: • spills

	• dusts/vapours • slip and fall (such as due to spilt granules) • temperature (e.g. due to heated barrel, nozzle and hot runner moulds) • hazardous materials (including decomposing polymer during start up and shut down) • moving equipment (e.g. moving moulds, robots and ancillary equipment) • Manual handling hazards and equipment operations
Procedures	All operations are performed in accordance with appropriate procedures. All relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Variables	May include: • differences between actual and set temperatures • speeds (including injection speed, mould opening and closing speed and ejection speed) • hunt or sprue break positions • colour and uniformity • surface finish/appearance • tolerance for cushion position • times (including injection times and cycle time) • product weight and output rate • product integrity and general conformance to specification and quality sample
Problems	May include: • short mouldings • flash • sink marks • voids • burn marks • splay/splash marks/silver streaking • blistering • flow marks • poor surface finish • weld lines • poor colour dispersion • colour contamination • black spots • Ejection damage. • Non-routine faults, which may have multiple causes include: • release problems • distortion of product upon ejection

	• warping or cracking after moulding • residual stresses • Intermittent faults. • Typical process and product problems may include: • die/tooling problems, e.g. damage • equipment malfunction • variations in temperatures, pressures, speeds, times, and cushion position • variations in material properties and/or contamination of materials • variation in material flow rates • Processing problems. • Appropriate action for problems outside of area of responsibility may be reporting to an appropriate person. • Appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge competencies to: • identify critical materials properties and injection moulding process variables in relation to the process requirements and the end product • make adjustments to the process as required • identify and take appropriate action on problems and potential problems • perform consistently. For example, look to see that run consistently and smoothly, with the minimum need for human intervention • always follow all safety procedures
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. For example, PVC easily shear heats and degrades when left too long at normal processing temperatures. Therefore particular care is needed when processing and purging PVC • organizations procedures, quality requirements at each production stage and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards • managing risks using the hierarchy of controls applied to the injection moulding process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup.

	• knowledge as a basis for solving processing and material problems, including: ➢ characteristics of materials and behaviour in relation to heat, pressure, flow rate and time ➢ function and operating principles of injection moulding equipment, machine components and ancillary equipment, including the mechanical, hydraulic, pneumatic, electrical and electronic principles which effect machine operation ➢ impact of machine speed, temperature, pressure, time during cycles on product quality and production output ➢ phases of the injection moulding cycle and the effect of the key variables on product quality, in order to make appropriate adjustments to machine settings. For example, the packing phase is needed to compensate for the polymer shrinkage, inadequate packing pressure may cause voids, but excessive packing pressure may cause excessive residual stresses and or flash. ➢ processing behaviour of those polymers which are moulded at the workplace ➢ changes to materials at various stages of production ➢ waste management and importance of non-conforming materials ➢ impact of variations in raw materials and equipment operation in relation to final product ➢ polymer properties and their interactions with process conditions ➢ relationships between polymer properties and process conditions ➢ changes to polymer properties to better suit process requirements ➢ product problems related to polymer properties ➢ product problems related to process conditions ➢ adjustments to process conditions to meet polymer and product requirements
Underpinning Skills	Demonstrates skills to: • application of materials, equipment and process sufficient to recognize material and equipment conditions which may lead to out of specification production. • application of the knowledge of managing risks using the hierarchy of controls applied to the injection moulding process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup. • plan own work, including predicting consequences and identifying improvements

	• maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the injection moulding process • identify factors which may affect product quality or production output and appropriate remedies • identify when the when assistance is required to solve problems • read and interpret typical product specifications, job sheets and complex machine control panels such as those displaying SPC information • Write skills to the level of completing workplace forms, quality assurance records and production reports
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Blow Moulded Products**
Unit Code	**IND PMP3 09 0613**
Unit Descriptor	This competency covers the operation and adjustment of blow moulding processes and the solving of non-routine problems. It is typically performed by advanced operators demonstrating some relevant theoretical knowledge and using a range of well-developed skills requiring some discretion and judgement. It applies to operators who are required to apply knowledge of materials, product purpose and processes to the operation of blow moulding equipment. The key factors are the production of material meeting quality standards and product requirements and the recognition and resolving of a range of routine and non-routine problems.

Elements	Performance Criteria
1. Plan own work requirements	1.1 The most appropriate ***equipment*** to be used for production process, upstream and downstream operations from production plan or request is identified. 1.2 Materials required, including additives and regrind and their amounts or percentages are identified and checked. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care. 1.4 Requirements for materials, quality, production and equipment checks are identified.
2. Start up blow moulding equipment to procedures	2.1 Process settings required for product is identified. 2.2 Blow moulding equipment for shot size, parison control, die gap, temperature, screw speed, cycle speed, slow close setting (or cushion) and timing are set up and adjusted. 2.3 Safety gates are checked and guards are located in their correct working positions and emergency stops are identified and checked as required. 2.4 Equipment, raw material and mould all match job requirement are verified. 2.5 Date, batch and materials markings are set up. 2.6 Other pre-start checks are completed. 2.7 Equipment safely and 'dry run' to warm hydraulics and components to operating temperature before production, as required is started up.

3. Operate and make adjustments to the blow moulding process to procedures	3.1 Condition of equipment is checked and raw materials are introduced as required. 3.2 Blow moulding equipment, noting key ***variables*** are operated. 3.3 Controls/displays/terminals are monitored for production and process data. 3.4 Product/process quality is monitored. 3.5 Adjustments are made to remedy faults and nonconformity as required. 3.6 A stable blow moulding process is established. 3.7 Other materials are collected and reprocessed/discarded scrapped/trimmed. 3.8 Equipment is cleaned, adjusted and lubricated as required. 3.9 Logs and records are completed as required. 3.10 Equipment is paused or stopped in an emergency, as required.
4. Anticipate and solve problems	4.1 A ***problem*** or a potential problem is recognized. 4.2 Problems needing priority action is determined. 4.3 Problems outside area of responsibility are referred to appropriate person, with possible causes. 4.4 Information and assistance as required are sought to solve problems. 4.4 Problems within area of responsibility are solved. 4.5 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • bottom blow, top blow, needle blow, tail to tail blow, prison pre-blow and pre-squeeze, prison stretching and prison orientation type machines • additional equipment, including chillers/cooling towers, die heating equipment, hopper driers, mixing hoppers, dehumidifying driers, air compressors, dosing machines, colour blending equipment and conveyors • hand tools as required • material loading equipment for raw materials • Relevant personal protective equipment.

Hazards	May include: • spills • dusts/vapours • slip and fall, particularly due to spilt granules • temperature • hazardous materials • manual handling hazards • equipment operations.
Procedures	May include: • all operations are performed in accordance with appropriate procedures. • procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Variables	May include: • operating temperatures • speed • cycle time • output rate • concentration or dispersion of colour • product weight • product wall thickness • product integrity and general conformance to specification/sample.
Problems	May include: • equipment malfunction • variations in temperature, pressure, speed, inflation • variations in materials or contamination of materials • mould damage • routine blow moulding faults - wall thinning, holes, poor surface finish, warping, poor colour dispersion, ejection damage, colour contamination, black spots and other defects • machine malfunction • mould/tooling problems

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge competencies to: • identify critical materials properties and blow moulding process characteristics in relation to the process requirements and the end product • plan own work process within workplace procedures and explain the reasons for the steps in the process • take appropriate action to observe equipment, materials and products for out of specification results, make adjustments and identify problems to be reported.

	• Consistent performance should be demonstrated. For example, look to see that: • production quality and output standards are met consistently • problems are anticipated from process observations • problems are efficiently resolved • the process runs consistently and smoothly. • the level of completing workplace forms and production reports • basic numeracy, e.g. to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. For example foreign material in the polymer feed leading to black spots in the product. • organizations procedures, quality requirements at each production stage and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. • application of managing risks using the hierarchy of controls applied to the blow moulding process. Application of approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup. • characteristics of materials and behaviour in relation to heat, pressure, flow rate and time • function and operating principles of blow moulding equipment, machine components and ancillary equipment • purpose and requirements of 'dry running' before process materials are introduced • impact of blow moulding machine speed, temperature, blow pressure, sequence time, parison control, on product quality and production output • nature of mechanical, hydraulic, pneumatic, electrical and electronic principles which affect machine operation and product development • processing behaviours of the materials blow moulded in the workplace • impact of variations in raw materials and equipment operation in relation to final product • changes to materials at various stages of production • waste management and importance of non-conforming materials • polymer properties and their interactions with process conditions

	• relationships between polymer properties and process conditions • changes to polymer properties to better suit process requirements • product problems related to polymer properties • product problems related to process conditions • adjustments to process conditions to meet polymer and product requirements.
Underpinning Skills	Demonstrates skills to: • Apply of approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup. • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the extrusion process • identify factors which may affect product quality or production output and appropriate remedies • identify when assistance is required to solve problems. • distinguish between causes of faults such as: • routine blow moulding faults - burn marks, flow marks, poor surface finish, poor colour dispersion, blistering, colour contamination, black spots • incorrect quantity of materials • contaminated materials/additives • equipment faults. • read and interpret typical product specifications, job sheets and material labels as provided to operators. • the level of completing workplace forms and production reports. • basic numeracy, e.g. to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Continuous Thermoforming Products**
Unit Code	**IND3 PMP3 10 0613**
Unit Descriptor	This competency covers production of continuous thermoforming products using thermoforming equipment and the solving of problems. It is typically performed by advanced operators applying knowledge of materials, product purpose and processes to the operation thermoforming equipment to produce product conforming to requirements. It also requires using a range of well-developed skills requiring some discretion and judgment to recognize and resolve a range of problems.

Elements	Performance Criteria
1. Plan own work requirements.	1.1 The most appropriate ***equipment*** to be used for production and upstream and downstream operations from production plan or request is identified. 1.2 Materials required, including additives and regrind and their amounts or percentages is identified and checked. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care. 1.4 Requirements for materials, quality, production and equipment checks are identified.
2. Start up continuous thermoforming process to procedures.	2.1 Process settings required for product is identified. 2.2 Process is set to required settings. 2.3 Materials are checked if they are correct. 2.4 Appropriate action for non-conforming materials is taken. 2.5 Date, batch and materials markings are set up to specifications, as required. 2.6 Pre-start checks are completed. 2.7 Thermoforming process is started up.
3. Operate and make adjustments to the continuous thermoforming process to procedures.	3.1 Thermoforming process, noting key ***variables*** are operated. 3.2 Controls/ displays/terminals for production and process data are monitored. 3.3 Samples are taken as required and identify product out of specification. 3.4 Product/process quality is monitored.

	3.5 Adjustments are made to remedy faults and nonconformity as required. 3.6 A stable thermoforming process is established. 3.7 Process is adjusted to minimize scrap and trim. 3.8 Equipment is cleaned, adjusted and lubricated as required.
4. Shut down machine to procedures.	4.1 Type of shut down is determined. 4.2 Machine is left t in appropriate condition and with appropriate locks, tags or notices. 4.3 Relevant documentation is completed. 4.4 Area is ensured clean and clear after the shutdown, in readiness for the next start up.
5. Anticipate and solve problems	5.1 A ***problem*** or a potential problem is recognized. 5.2 Problems needing priority action are determined. 5.3 Problems outside area of responsibility are referred to designated person, with possible causes. 5.4 Information and assistance as required are sought to solve problems. 5.5 Problems within area of responsibility are solved. 5.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • heaters • moulds • stacker • winder • granulator • conveyors and chutes • relevant personal protective equipment. • hand tools as required • additional equipment (including programmable limit controllers) • relevant personal protective equipment
Hazards	Typical hazards include: • spills • dust/vapours • slip and fall (e.g. due to leaks) • temperature (e.g. from ovens)

	• hazardous substances • moving equipment (e.g. changing heater rods) • manual handling hazards. • stationary and moving machinery, parts and components.
Procedures	May include: • all operations are performed in accordance with appropriate procedures. • procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Variables	May include: • temperature • speeds (e.g. rollers, mould opening and closing) • times (including cycle times) • surface finish/appearance • product weight and output rate • product integrity and general conformance to specification and quality sample.
Problems	May include: • sheet sag • non-uniform pre-stretching • non-uniform wall thickness • sheet pulling out • bubbles, blisters or pits • scorching • whitening of formed part • blushing • loss of embossing detail • chill marks, drag-off lines • pinholes/pimples • shiny streaks • shrink marks • plug sticking • sheet tearing during forming. • Non-routine faults, which may have multiple causes include: ➢ warpage or shrinkage after moulding ➢ cracking ➢ surface marks ➢ webbing or wrinkling and mould sticking. • Typical process and product problems may include: ➢ equipment malfunction ➢ variations in temperature (e.g. uneven oven temperatures) ➢ pressure ➢ speed (e.g. cycle times) ➢ variations in sheet or contamination of sheet

	➢ product tool damage ➢ machine malfunction ➢ mould/tooling problems ➢ variations in materials and/or contamination of materials

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge competencies to: • identify critical materials properties and continuous thermoforming process characteristics in relation to the process requirements and the end product • make adjustments and identify problems to be reported • identify and take appropriate action on problems and potential problems • perform consistently. For example, look to see that: ➢ the process runs consistently and smoothly, with the minimum need for human intervention ➢ all safety procedures are always followed
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. For example, static electricity can increase the potential for contamination of materials by dust and dirt. This can be minimised by vacuuming or blowing air sheet surfaces immediately before forming, and also maintaining a clean plant to prevent dust and dirt from entering the thermoforming area. • organization procedures, quality requirements at each production stage and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. • application of managing risks using the hierarchy of controls applied to the thermoforming process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup. • basis for solving processing and material problems including: • characteristics of materials and behaviour in relation to heat pressure, and time • function and operating principles of continuous thermoforming equipment, machine components and ancillary equipment, including the mechanical, hydraulic, pneumatic, electrical and electronic principles which effect machine operation • impact of machine speed, temperature, pressure, time during cycles on product quality and production output • phases of the thermoforming cycle and the effect of the key variables on product quality, in order to make appropriate

	adjustments to machine settings. For example. Pre-stretching a heated sheet in the air before it makes contact with the mould improves material distribution by increasing the sheet surface area so it more closely matches that of the mould. • changes to materials at various stages of production • waste management and importance of non-conforming materials • impact of variations in raw materials and equipment operation in relation to final product • polymer properties and their interactions with process conditions • relationships between polymer properties and process conditions • changes to polymer properties to better suit process requirements • product problems related to polymer properties • product problems related to process conditions • adjustments to process conditions to meet polymer and product requirements.
Underpinning Skills	• apply approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup. • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the thermoforming process • identify factors which may affect product quality or production output and appropriate remedies • identify when assistance is required to solve problems. • read and interpret typical product specifications, job sheets and material labels as provided to operators. • the level of completing workplace forms and production reports. • basic numeracy, e.g., to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Compression Moulded Products**
Unit Code	**IND PMP3 11 0613**
Unit Descriptor	This competency covers the operation and adjustment of compression moulding processes and the solving of non-routine problems. It is typically performed by advanced operators applying knowledge of materials, product purpose and processes to the operation of compression moulding equipment to produce product conforming to requirements. It also requires using a range of well-developed skills requiring some discretion and judgment to recognize and resolve a range of problems.

Elements	Performance Criteria
1. Plan own work requirements	1.1 ***Equipment*** and processes used for production process and upstream and downstream operations from production plan or request is identified. 1.2 Materials required are identified and checked. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care. 1.4 Requirements for materials, quality, production and equipment checks are identified.
2. Check compression moulding process set-up to procedures	2.1 Process settings required for product is identified. 2.2 Process is set to required settings. 2.3 materials are checked if they are correct. 2.4 Appropriate action for non-conforming materials is taken. 2.5 Date, batch and materials markings to specifications, as required are set up. 2.6 Pre-start checks is checked. 2.7 Press/compression moulding process is started up.
3. Operate and make adjustments as required to the compression moulding process	3.1 Compression moulding process, noting key ***variables*** are operated***.*** 3.2 Controls/displays/terminals for production and process data are monitored. 3.3 Samples are taken as required and product out of specification is identified. 3.4 Product/process quality is monitored. 3.5 adjustments are made to remedy faults and non-conformity as required.

	3.6 A stable compression moulding process is established. 3.7 Processes are adjusted to minimize scrap and trim. 3.8 Equipment is cleaned, adjusted and lubricated as required. 3.9 Process is shut down as required. 3.10 Machine is left in appropriate condition and ready for the next start up.
4. Anticipate and solve problems	4.1 A ***problem*** or a potential problem is recognized. 4.2 Problems needing priority action is determined. 4.3 Problems outside area of responsibility are referred to appropriate person, with possible ***causes.*** 4.4 Information and assistance as required is sought to solve problems. 4.5 Problems within area of responsibility are solved. 4.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • knives/scissors • scoops, measures, scales, fixed gauges • levers and other mould handling devices • mould release sprays or other means of application • relevant personal protective equipment
Hazards	May include: • fumes/vapours • crushing hazards • temperature • hazardous materials • manual handling hazards and equipment operations
Procedures	May include: • All operations are performed in accordance with appropriate procedures. • Procedures mean all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards. These may include: • original manufacturer instructions and guidelines for the use of the moulding equipment • relevant procedures relating to safe working practices prescribed for the equipment • local OHS legislation and/or Regulations • Site-specific instructions based on production requirements

Variables	May include: • operating temperatures • colour • cycle time • output rate • product weight • product integrity and general conformance to specification/sample
Problems	May include: • variations in materials/scorchy rubber • contamination of materials • blank/charge/shot size • mould temperature/temperature • profile demoulding • dirty moulds, damaged moulds.
Causes of faults	May include: • wrong raw materials • incorrect quantity of materials • contaminated materials • dirty mould; damaged mould • mould open too long • mould/product temperature/temperature profile • pressure

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and compression moulding process characteristics in relation to the process requirements and the end product • perform consistently. For example, look to see that: ➢ production quality and output standards are met consistently ➢ the process runs consistently and smoothly
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • materials, equipment and process sufficient to recognize material and equipment conditions which may lead to out of specification production. For example changes in press/temperature, pre-scorching of rubber or changes in pressure can all lead to faulty mouldings, but with different properties • organizations procedures, quality requirements at each production stage and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards

	• Application of managing risks using the hierarchy of controls applied to the injection moulding process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup • characteristics of materials and behaviour in relation to heat, pressure and time • function and operating principles of compression moulding equipment, machine components and ancillary equipment • impact of machine speed, temperature, pressure, time during cycles on product quality and production output • compression moulding cycle and the importance of machine set-up and warm-up for effective processing of materials • impact of variations in raw materials and equipment operation in relation to final product • changes to materials at various stages of production • quality requirements at each production stage • identifying and read transducers for hydraulic position and clamping force • distinguishing between causes of faults • polymer properties and their interactions with process conditions • relationships between polymer properties and process conditions • changes to polymer properties to better suit process requirements • product problems related to polymer properties • product problems related to process conditions • adjustments to process conditions to meet polymer and product requirements
Underpinning Skills	Demonstrates skills to: • Apply the knowledge of managing risks using the hierarchy of controls applied to the injection moulding process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup • identifying the range of possible causes of product faults. • planning own work sequence, including identification of key checkpoints for equipment monitoring, product quality checks and monitoring of supplies and downstream operations • maintaining output and product quality using appropriate instruments, controls, test information and readings • identifying and describe own role and role of others involved directly in the compression moulding process

	• identifying factors which may affect product quality or production output and appropriate remedies • identifying when the operator is able to rectify faults and when assistance is required • completing workplace forms and production reports. • basic numeracy, e.g., to determine the size/weight of blanks and how many moulded products can be obtained from a batch/tray of green rubber • reading and interpreting typical product specifications, job sheets and material labels as provided to operators
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Polyurethane Foam**
Unit Code	**IND PMP3 12 0613**
Unit Descriptor	This competency covers the application of knowledge of materials, product purpose and processes to the production of polyurethane foam. It applies to advanced operators producing polyurethane foam. The key factors are the adequate planning of the process stages, preparation of the equipment, checking on performance of the equipment and making approved adjustments and equipment corrections. It is typically performed by all operators working either independently or as part of a work team.

Elements	Performance Criteria
1. Plan process stages for polyurethane foam production.	1.1 The stages in the polyurethane foaming process are planned and ensured that these comply with the quality requirements for production. 1.2 For changes in materials at each stage of the polyurethane foaming process are identified and allowed. 1.3 The availability of the ***equipment*** and components for each production stage is planned. 1.4 The impact of the process on product characteristics and product quality and useability are anticipated. 1.5 Work requirements based on ***procedures*** are planned.
2. Identify work requirements for polyurethane foaming operations	2.1 Materials, including base raw materials and additives are prepared. 2.2 Hazards are recognized and appropriate ***hazard*** control/minimization methods are followed. 2.3 Materials, ancillary supplies and equipment are checked if they are correct. 2.4 Equipment and processes used for materials preparation, production process and for the downstream operations are available are checked. 2.5 Product quality requirements for the relevant process stage(s) are checked. 2.6 Emergency stops, gauges, guards and controls are identified and checked. 2.7 The task sequences, including times and locations for product quality checks, equipment operation and required production outputs are planned. 2.8 For ongoing materials input, waste management and work area housekeeping requirements are provided.

	2.9 Any required supplementary equipment for product quality testing or routine equipment maintenance and/or adjustments are arranged.
3. Check polyurethane foaming process set-up	3.1 With equipment information, required quality specifications and set-up procedures are complied. 3.2 Equipment is set in accordance with required quality specifications and standard operating procedures. 3.3 Polyurethane foaming equipment settings and adjustments and conformity to documented procedures are checked. 3.4 Materials are inspected for conformity with requirements including surface condition and materials thickness. 3.5 Non-conforming materials or adjustments are discarded and made to processing operations in accordance with procedures.
4. Operate and make adjustments as required to the foam process	4.1 Polyurethane foam process, noting key ***variables*** are operated***.*** 4.2 Foam equipment is started up, operated and shut down as required by procedures. 4.3 Polyurethane foaming operations noting product quality, production outputs, equipment operating temperature, amperage, pressures, colour, thickness and product integrity are monitored. 4.4 Adjustments are made to remedy faults and non-conformity to production standards where applicable. 4.5 Material is collected which is able to be reprocessed and reused, and dispose of waste and scrap in accordance with workplace procedures. 4.6 Equipment is cleaned up, lubricated, and adjusted in accordance with procedures.
5. Anticipate and solve problems	5.1 A ***problem*** or a potential problem is recognized. 5.2 Problems needing priority action are determined. 5.3 Problems outside area of responsibility are referred to appropriate person, with possible causes. 5.4 Information and assistance as required are sought to solve problems. 5.5 Problems within area of responsibility are solved. 5.6 Items initiated are followed through until final resolution has occurred.

Variable	Range
Tools and equipment	May include: • manual handling aids - hand carts and trolleys • knives and other bag opening equipment • hoists/lifting equipment not requiring any special permits or licences • basic hand tools required for opening of material packaging • relevant personal protective equipment • material loading equipment used for loading of raw materials.
Procedures	May include: • All operations are performed in accordance with appropriate procedures. • procedures mean all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Hazards	May include: • spills • dusts/vapours • slip and fall, particularly due to spilt granules • temperature • hazardous materials • manual handling hazards and equipment operations.
Variables	May include: • operating temperatures • speed • colour • cushion specification • cycle time • output rate • product weight • product integrity and general conformance to specification/sample.
Problems	May include: • machine malfunction • out of specification equipment operation • contamination of materials • variations in materials and/or contamination of materials • processing problems.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and polyurethane foaming process characteristics in relation to the process requirements and the end product.

	• perform consistently. For example, to see that: ➢ production quality and output standards are met consistently ➢ the process runs consistently and smoothly.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. • organizations procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards • products, materials and material characteristics • behaviour of materials in relation to heat, pressure and time • impact of machine speed, temperature, pressure, time during cycles on product quality and production output • impact of variations in raw materials and equipment operation in relation to final product • changes to materials at various stages of production • waste management and importance of non-conforming materials • production workflow sequences and materials demand • focus of operation, work systems and equipment • correct selection and use of equipment, materials, processes and procedures • hazards of the materials and process and appropriate hazard control procedures • polymer properties and their interactions with process conditions • relationships between polymer properties and process conditions • changes to polymer properties to better suit process requirements. • product problems related to polymer properties • product problems related to process conditions • adjustments to process conditions to meet polymer and product requirements.
Underpinning Skills	Demonstrate skills to: • implement relevant regulatory requirements within appropriate time constraints and work standards. • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • make adjustments to equipment operation to rectify variations in equipment operation or product quality

	• identify and describe own role and role of others involved directly in the foam process • identify factors which may affect product quality or production output and appropriate remedies • identify when the operator is able to rectify faults and when assistance is required. • read and interpret typical product specifications, job sheets and material labels as provided to operators. • the level of completing workplace forms. • basic numeracy, e.g., to determine that 16 units and 46 units are equal to a total of 62 units.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Foam Injected Moldings**
Unit Code	**IND PMP3 13 0613**
Unit Descriptor	This competency covers the application of knowledge of materials, product purpose and processes to the production of foam injected mouldings. It applies to operators of foam injection moulding equipment. The key factors are the adequate planning of the process stages, preparation of the equipment, checking on performance of the equipment and making approved adjustments and equipment corrections. It is typically performed by operators working either independently or as part of a work team.

Elements	Performance Criteria
1. Plan own work requirements	1.1 ***Equipment*** and processes used for production process and upstream and downstream operations from production plan or request is identified. 1.2 Materials required including additives are identified. 1.3 Hazards are recognized and appropriate ***hazard*** control/minimization methods are followed. 1.4 Emergency stops, guards and controls are identified and checked. 1.5 Requirements for materials, quality, production and equipment checks are identified. 1.6 Materials, waste management and housekeeping needs are identified.
2. Check foam injection moulding process set-up	2.1 Equipment requirements is determined. 2.2 Process is set to specifications as required. 2.3 Foam injection moulding equipment settings and adjustments are checked as required. 2.4 Materials are checked if they are correct. 2.5 Adjustments to the process for, non-conforming materials are discarded or made. 2.6 Date, batch and materials markings to specifications, as required are set up. 2.7 Other pre-start checks is completed in accordance with procedures.
3. Operate and make adjustments as required to the foam injection moulding process	3.1 Foam injection moulding equipment, noting key ***variables*** are operated***.*** 3.2 Controls/displays/terminals for production/process data are monitored.

	3.3 Product/process quality in accordance with procedures are monitored. 3.4 Adjustments are made to remedy faults and nonconformity to standard as required. 3.5 Continuity of process is monitored. 3.6 Other materials are collected and reprocessed/discarded scrapped/trimmed in accordance with procedures. 3.7 Equipment is cleaned, adjusted and lubricated as required. 3.8 Equipment is paused, or equipment is stopped in an emergency, following workplace and emergency procedures.
4. Anticipate and solve problems	4.1 A ***problem*** or a potential problem is recognized. 4.2 Problems needing priority action are determined. 4.3 Problems outside area of responsibility are referred to appropriate person, with possible causes. 4.4 Information and assistance as required are sought to solve problems. 4.5 Problems within area of responsibility are solved. 4.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • hand carts and trolleys • knives and other bag opening equipment • hoists/lifting equipment not requiring any special permits or licences • basic hand tools required for opening of material packaging • relevant personal protective equipment • hand tools used in the foam injected product moulding process • material loading equipment used for loading of raw materials
Hazards .	May include: • spills • dusts/vapours • hazardous materials • manual handling hazards • knife hazards
Problems	May include: • variations in materials • contamination of materials • out-of-specification machine operation • machine malfunction

	• mould/tooling problems • processing problems
Variables	May include: • operating temperatures • speed • colour • cycle time • output rate • product integrity and general conformance to specification/sample

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and foam injection moulding process characteristics in relation to the process requirements and the end product • plan own work process within workplace procedures and explain the reasons for the steps in the process • take appropriate action to observe equipment, materials and products for out of specification results, make adjustments and identify problems to be reported. • perform consistently. For example, to see that: ➢ production quality and output standards are met consistently ➢ problems are anticipated from process observations ➢ problems are efficiently resolved ➢ the process runs consistently and smoothly
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. • organizations procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. • impact of incorrect or faulty materials • production workflow sequences and materials demand • focus of operation of work systems and equipment • correct selection and use of equipment, materials, processes and procedures • hazards of the materials and process and appropriate hazard control procedures • quality requirements at each production stage • nature of mechanical, hydraulic, pneumatic, electrical and electronic principles which affect machine operation and product development

	• foam injection moulding cycle and the importance of machine set-up and warm-up for effective processing of materials • the hierarchy of control including engineering controls • impact of variations in raw materials and equipment operation in relation to final product • changes to materials at various stages of production • waste management and importance of non-conforming materials • polymer properties and their interactions with process conditions • relationships between polymer properties and process conditions • changes to polymer properties to better suit process requirements • product problems related to polymer properties • product problems related to process conditions • adjustments to process conditions to meet polymer and product requirements
Underpinning Skills	Demonstrates skills to: • implement relevant regulatory requirements within appropriate time constraints and work standards. • plan own work, including predicting consequences and identifying improvements • distinguish between causes of faults • maintain output and product quality using appropriate instruments, controls, test information and readings • identify when the operator is able to rectify faults and when assistance is required • the level of completing workplace forms. • basic numeracy, e.g. to determine that 16 units and 46 units are equal to a total of 62 units • ability to read and interpret typical product specifications, job sheets and material labels as provided to operators
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Rotational Moulded Products**
Unit Code	**IND PMP3 14 0613**
Unit Descriptor	This competency covers the operation and adjustment of rotational moulding processes and the solving of non-routine problems. This does not cover open flame equipment. It is typically performed by operators demonstrating some relevant theoretical knowledge and using a range of well-developed skills requiring some discretion and judgement. It applies to operators who are required to apply knowledge of materials, product purpose and processes to the operation of rotational moulding equipment. The key factors are the production of material meeting quality standards and product requirements and the recognition and resolving of a range of routine and non-routine problems.

Elements	Performance Criteria
1. Plan own work requirements.	1.1 ***Equipment*** and processes used for production process and upstream and downstream operations from production plan or request is identified. 1.2 Materials required, including additives are identified. 1.3 ***Hazards are*** recognized and appropriate hazard control/minimization methods are followed. 1.4 Emergency stops, safety gates, guards and controls are identified and checked. 1.5 Requirements for materials, quality, production and equipment checks are identified. 1.6 Materials, waste management and housekeeping needs are identified.
2. Start up rotational moulding process.	2.1 Equipment requirements is determined. 2.2 Process is set to specifications as required. 2.3 Rotational moulding equipment settings and adjustments are checked as required. 2.4 Materials are checked if they are correct. 2.5 Adjustments are discarded or made to the process for, non-conforming materials. 2.6 Date, batch and materials markings are set up to specifications, as required. 2.7 Other pre-start checks are completed in accordance with procedures. 2.8 Rotational moulding process is started up.

3. Operate and make adjustments as required to the rotational moulding process.	3.1 Rotational moulding equipment, noting key ***variables*** are operated. 3.2 Controls/displays/terminals for production/process data are monitored. 3.3 Product/process quality in accordance with ***procedures*** are monitored. 3.4 Adjustments are made to remedy faults and nonconformity to standard as required. 3.5 Continuity of process is maintained. 3.6 Other materials are collected and reprocessed/discarded scrapped/trimmed in accordance with procedures. 3.7 Equipment is cleaned, adjusted and lubricated as required. 3.8 Equipment is paused, or equipment is stopped in an emergency, following workplace and emergency procedures.
4. Anticipate and solve problems	4.1 A ***problem*** or a potential problem is recognized. 4.2 Problems needing priority action is determined. 4.3 Problems outside area of responsibility are referred to appropriate person, with possible ***causes.*** 4.4 Information and assistance as required are sought to solve problems. 4.5 Problems are solved within area of responsibility. 4.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • hand tools used in the rotational moulding process • material loading equipment used for loading of raw materials • relevant personal protective equipment.
Hazards	May include: • noise, light, energy sources • manual handling • humidity, air temperatures, radiant heat, hot moulds • stationary and moving machinery, parts and components
Variables	May include: • operating temperatures • type of heating used • cooling time • speed of rotation/movement • pattern of movement

	• colour of product • product integrity and general conformance to specification/sample • cycle time according to external temperatures and humidity
Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Problems	May include: • routine and non-routine product rotational moulding faults • machine malfunction • mould/tooling problems • variations in materials and/or contamination of materials • processing problems
Causes of faults	May include: • short mouldings • sink marks • voids • burn marks • mica • splash marks • warping • silver streaking • blistering • flow marks • poor surface finish • windows • erratic cycles • poor colour dispersion • rotation damage • colour contamination • black spots • incorrect quantity of materials and contaminated materials

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and rotational moulding process characteristics in relation to the process requirements and the end product • perform consistently. For example, look to see that: ➢ production quality and output standards are met consistently ➢ the process runs consistently and smoothly

Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. • organizations procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards • products, materials and material characteristics • behaviour of materials in relation to heat, rotation and time • quality requirements at each production stage • function and operating principles of rotational moulding equipment, machine components and ancillary equipment • impact of machine speed, temperature, time during heating and cooling cycles on product quality and production output • nature of mechanical, hydraulic, pneumatic, electrical and electronic principles which affect machine operation and product development • rotational moulding cycle and the importance of machine set-up and warm-up for effective processing of materials • safety procedures and the use of PPE in relation to handling materials, equipment operation and clean up • the hierarchy of control including engineering controls • impact of variations in raw materials and equipment operation in relation to final product changes to materials at various stages of production • waste management and importance of non-conforming materials • polymer properties and their interactions with process conditions • relationships between polymer properties and process conditions • changes to polymer properties to better suit process requirements • product problems related to polymer properties • product problems related to process conditions • adjustments to process conditions to meet polymer and product requirements
Underpinning Skills	Demonstrates skills to: • implement relevant regulatory requirements within appropriate time constraints and work standards • plan own work, including predicting consequences and identifying improvements • interpret from production requests the correct selection and use of equipment, materials, processes and procedures

	• maintain output and product quality using appropriate instruments, controls, test information and readings • identify factors which may affect product quality or production output and appropriate remedies • identify when the operator is able to rectify faults and when assistance is required • distinguish between causes of faults • read and interpret typical product specifications, job sheets and material labels as provided to operators • the level of completing workplace forms and production reports • basic numeracy, e.g. to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Blown Film**
Unit Code	**IND PMP3 15 0613**
Unit Descriptor	This competency covers the operation and adjustment of blown film lines and the solving of non-routine problems. It is typically performed by advanced operators demonstrating some relevant theoretical knowledge and using a range of well-developed skills requiring some discretion and judgement. It applies to operators who are required to apply knowledge of materials, product purpose and processes to the operation of blown film lines. The key factors are the production of material meeting quality standards and product requirements and the recognition and resolving of a range of routine and non-routine problems.

Elements	Performance Criteria
1. Plan own work requirements.	1.1 ***Equipment*** and processes used for production process and upstream and downstream operations from production plan or request Identify materials required including additives is identified. 1.2 ***Hazards*** are recognized and appropriate hazard control/minimization methods are followed. 1.3 Emergency stops, guards and controls Identify requirements for materials, quality, production and equipment checks are identified and checked. 1.4 Identify materials, waste management and housekeeping needs are identified.
2. Check blown film process set-up.	2.1 Equipment requirements are determined. 2.2 Process is set to specifications as required. 2.3 Blown film line for extruder temperature, back pressures and currents, nip and winding speeds, nip roller settings, corona treatment settings, winder settings, slitters, trimmers and die gap adjustments are set up and adjusted according to specifications. 2.4 Materials are checked if they are correct. 2.5 Adjustments are discarded or made to the process for, non-conforming materials. 2.6 Date, batch and materials markings are set up to specifications, as required. 2.7 Other pre-start checks to ***procedures*** is completed***.***

3. Operate and make adjustments as required to the blown film process.	3.1 Blown film line is started up as required. 3.2 Blown film line, noting key ***variables*** is operated***.*** 3.3 Controls/displays/terminals for production/process data are monitored. 3.4 Product thickness and quality to procedures are monitored. 3.5 Adjustments are made to remedy faults and non-conformity to standard as required. 3.6 Continuity of process is maintained. 3.7 Other materials are collected and reprocessed/discarded scrapped/trimmed in accordance with procedures . 3.8 Equipment is cleaned, adjusted and lubricated as required. 3.9 Equipment is paused or equipment is stopped in an emergency, following workplace and emergency procedures.
4. Anticipate and solve problems.	4.1 A ***problem*** or a potential problem is recognized. 4.2 Problems needing priority action is determined. 4.3 Problems outside area of responsibility are referred to appropriate person, with possible causes. 4.4 Information and assistance as required are sought to solve problems. 4.5 Problems within area of responsibility are solved. 4.6 Items initiated are followed though until final resolution has occurred.

Variable	**Range**
Procedures	May include: • All operations are performed in accordance with appropriate procedures. • Procedures mean all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Tools and equipment	May include: • extruder • die, air ring and blower • bubble guides and rollers • film rollers, slitting, trimming and winding gear • coolers, heaters and ancillary equipment • hand tools, knives, adjustment tools • relevant personal protective equipment.

Hazards	May include: • high air velocities • high voltage corona treatment systems sharp knives • high towers manual handling • fumes, humidity, air temperatures, radiant heat, hot dies stationary and moving machinery, parts and components.
Problems	May include: • extruder control, temperature, pressures, screw speed contamination • bubble control, size, stability • blemishes, voids, gels, die and weld lines, burn marks, poor surface finish, poor colour dispersion, partially decomposed products, uneven colour, contamination of colour • alignment and control of trimming and winding gear • materials variations • worn/damaged dies and extruder adjustments • raw material contamination, wrong grade, variations of polymer properties • hydraulic pressure variations, temperature variations, loss of power or drives • process sequencing problems • variations in component speeds.
Variables	May include: • extruder operating temperatures, melt temperatures, back pressures and current (amps) • nip and winding speeds, nip roller settings • corona treatment settings • winder settings, slitters, trimmers and die gap adjustments • colour • output rate • product thickness • product integrity and general conformance to specification/sample.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and blown film process characteristics in relation to the process requirements and the end product. • perform consistently. For example, to see that: ➢ production quality and output standards are met consistently ➢ the process runs consistently and smoothly.

Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. • organizations procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards
Underpinning Skills	Demonstrate skills to: • apply products, materials and material characteristics • apply behaviour of materials in relation to heat, pressure and time • apply quality requirements at each production stage • function and operating principles of blown film equipment, machine components and ancillary equipment • identify impact of extruder speed, temperature, pressure on product quality and production output • identify impact of changes and adjustments to the winding gear on film properties • identify nature of mechanical, hydraulic, pneumatic, electrical and electronic principles which effect machine operation and product development • apply safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup • identify the hierarchy of control including engineering controls • identify impact of variations in raw materials and equipment operation in relation to final product • identify changes to materials at various stages of production • waste management and importance of non-conforming materials • plan own work, including predicting consequences and identifying improvements • interpret from production requests the correct selection and use of equipment, materials, processes and procedures • maintain output and product quality using appropriate instruments, controls, test information and readings • make adjustments to equipment operation to rectify variations in equipment operation or product quality • check blown film line for correct setup to job specifications and implement adjustments or report deviations immediately • start up equipment and make appropriate adjustments to bring process on line • make measurements when required and identify product out of specification • safely shut down equipment in normal or abnormal circumstances

	• identify and describe own role and role of others involved directly in the film process • identify factors which may affect product quality or production output and appropriate remedies • identify when the operator is able to rectify faults and when assistance is required • identify hazards of the materials and process • implement appropriate procedures for hazard control • use PPE, safely handle products and materials, read relevant safety information and apply safety precautions appropriate to the task • distinguish between causes of faults such as materials, contaminants, equipment - adjustments/set-up, equipment - maintenance requirements. • the level of completing workplace forms and production reports. • basic numeracy, e.g. to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg. • read and interpret typical product specifications, job sheets and material labels as provided to operators
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Composites Using Filament Winding**
Unit Code	**IND PMP3 16 0613**
Unit Descriptor	This competency covers preparation and operations for forming composite products using filament winding processes and the solving of problems. It is typically performed by advanced operators applying knowledge of materials, product purpose and processes to the operation of filament winding equipment to produce product conforming to requirements. It also requires using a range of well-developed skills requiring some discretion and judgment to recognize and resolve a range of problems.

Elements	Performance Criteria
1. Plan own work requirements.	1.1 The most appropriate ***equipment*** to be used for production and upstream and downstream operations from production plan or request is identified. 1.2 Materials required including additives and their amounts and percentages are identified and checked. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care. 1.4 Requirements for materials, quality, production, and equipment checks are identified.
2. Startup filament winding process to procedures.	2.1 Process settings required for product is identified. 2.2 Process is set to required settings. 2.3 Materials are checked if they are correct. 2.4 Appropriate action for non-conforming materials is taken. 2.5 Date, batch and materials markings are set up to specifications, as required. 2.6 Other pre-start checks is completed. 2.7 Filament winding moulding process is started up.
3. Operate and make adjustments to the filament winding process to procedures.	3.1 Filament winding process, noting key ***variables*** are operated. 3.2 Controls/displays/terminals for production and process data are monitored. 3.3 Samples are taken as required and identify product out of specification. 3.4 Product/process quality is monitored. 3.5 Adjustments are made to remedy faults and nonconformity as required.

	3.6A stable filament winding process is established. 3.7Process is adjusted to minimize scrap and waste. 3.8Equipment is cleaned, adjusted and lubricated as required.
4. Shut down machine to procedures.	4.1Type of shut down is determined. 4.2Appropriate mandrel stripping method is selected. 4.3Mandrel is stripped efficiently and adequately as required. 4.4Machine is left in appropriate condition and with appropriate locks, tags or notices. 4.5Relevant documentation is completed. 4.6Area is ensured clean and clear after the shutdown, in readiness for the next start up.
5. Respond to problems.	5.1A ***problem*** or a potential problem is recognized. 5.2Problems needing priority action is determined. 5.3Problems outside area of responsibility are referred to appropriate person. 5.4Information and assistance as required are sought to solve problems. 5.5Problems within area of responsibility are solved. 5.6Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • filament winding machines - electrical, pneumatic, mechanical, electromechanical and hydraulic • dies, moulds, mandrels, formers • hand tools, e.g. knives, cutters • equipment for filament winding equipment and curing • relevant personal protective equipment.
Hazards	May include: • hazardous vapours • hazardous materials • slip and fall • manual handling hazards • moving machinery hazards • temperature and equipment operations
Procedures	May include: • All operations are performed in accordance with appropriate procedures.

	• Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Variables	May include: • operating temperatures • speeds, including the rotating speed of the mandrel • spool tension • colour • cycle time • output rate • product weight • product integrity and general conformance to specification/sample.
Problems	May include: • voids • poor surface finish • colour contamination • curing damage • distorted winding angle pattern. • Typical non-routine faults may include: • damage from mandrel stripping • warping or cracking after moulding • inconsistent fibre spread • filament breakage and fuzz generation. • Typical process and product problems may include: • cracks, dents or imperfections of the mandrel, former, die • variations in materials, colour, consistency or mix • adjustment and settings of the equipment (such as creel-to-head transfer problems) • contamination of materials • curing conditions • variations in materials and/or contamination of materials • processing problems. • appropriate action for problems outside of area of responsibility may be reporting to an appropriate person. • appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and filament winding composites process variables in relation to the process requirements and the end product

	• make adjustments to the process as required • identify and take appropriate action on problems and potential problems. • perform consistently. For example, to see that: ➢ the process runs consistently and smoothly with minimum need for operator intervention ➢ all safety procedures are followed.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. For example, amount of applied tension is dependent on the fibre material, the diameter, and the pattern being wound and, if not correct, can affect the void content and fibre volume. Therefore, as the spools unwind the fibre the signals received from the tension bars need to be monitored • organizations procedures, quality requirements at each production stage and relevant regulatory requirements, and the ability to implement them within appropriate time constraints and work standards. • identifying the range of possible causes of product faults • Application of managing risks using the hierarchy of controls applied to the filament winding process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup. • characteristics of materials in relation to temperature, tension and time for a required strength and surface finish of composite structure • function and operating principles of filament winding equipment, machine components and ancillary equipment including the mechanical, hydraulic, pneumatic, electrical and electronic principles which effect machine operation • impact of machine speed, temperature, pressure, time during cycles on product quality and production output • phases of the filament winding cycle and the effect of the key variables on product quality, in order to make appropriate adjustments to machine settings. For example. the resin wiping phase is needed to remove excess resin from the impregnated fibre, too much resin will affect curing time and strength of composite. • changes to materials at various stages of production • waste management and importance of non-conforming materials • impact of variations in raw materials and equipment operation in relation to final product

	• material properties and their interactions with process conditions • relationships between material properties and process conditions • changes to material properties to better suit process requirements • product problems related to material properties • product problems related to process conditions • adjustments to process conditions to meet material and product requirements.
Underpinning Skills	Demonstrates skills to: • apply approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup. • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the process • identify factors which may affect product quality or production output and appropriate remedies • identify when assistance is required to solve problems. • read and interpret typical product specifications, job sheets and material labels as provided to operators • to the level of completing workplace forms and production reports. • numeracy to the level of determining required weights/volumes of materials in a resin mix for different circumstances (say using a data sheet), number of layers of impregnated matrix required to yield the required product laminate thickness, and similar activities.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Set up Polymer Fabric Production Machines for Product Change**
Unit Code	**IND PMP3 17 0613**
Unit Descriptor	This unit covers the skills and knowledge to perform or coordinate the setting up of machines for production changes.

Element	Performance Criteria
1. Set or organize setting of machine	1.1 Product specifications are interpreted for correct ***machine setting*** requirements. 1.2 Specifications are conveyed to appropriate personnel, where required. 1.3 Machine is set according to product specifications and manufacturer instructions. 1.4 operational maintenance of machinery is performed
2. Conduct sample or trial runs	2.1 ***Materials or products*** to be used for sampling or trialing are obtained or arranged. 2.2 Machine is operated according to manufacturer requirements and ***OHS practices*** 2.3 Specified sample is produced.
3. Check sample and organize quality testing	3.1 Sample is checked to ensure quality standards are met. 3.2 Quality testing is determined and organized as required.
4. Re-adjust or confirm machine settings to meet requirements	4.1 Test results are interpreted to determine adjustment requirements. 4.2 Adjustment changes are completed according to product and machine specifications.

Variable	Range
Machine setting	May include: • unwinding creel • tape in feed • tape guide elements • compensator • controls • shading • reed ring • shuttle • weaving ring • expander

	• fabric take up • fabric winding
Materials or products	May include: • fiber(tape) • steam • water • bobbin packages
OHS practices	include hazard identification and control, risk assessment and implementation of risk reduction measures specific to the tasks described by this unit, and may relate to: • manual handling techniques • standard operating procedures • personal protective equipment • safe materials handling • taking of rest breaks • ergonomic arrangement of workplaces • following marked walkways • safe storage of equipment • housekeeping • reporting accidents and incidents • environmental practices
Machines	May include: • winding • warping and looms
Legislative/ regulatory requirements	All work must comply with relevant Federal and State or Territory legislative or regulatory requirements.

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge competencies to: • interpret specifications for machine settings • arrange or conduct quality testing of samples • operate and adjust machines correctly • analyze samples or test results • maintain accurate records • apply OHS practices in work operations
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • machine and equipment operation • setting and adjustment requirements • technical specifications manuals • maintenance planning and workplace practices • quality standards and practices • OHS practices, including hazard identification and control measures

	• workplace practices • recording and reporting practices
Underpinning Skills	Demonstrates skills to: • interpret technical data • set and operate machines • test and analyze samples • use and dispose of a range of chemical cleaning agents, sealants and lubricants • document, assess and transfer information • read, interpret and follow information on work specifications, standard operating procedures and work instructions, and other reference material • maintain accurate records • communicate within the workplace • sequence operations • meet specifications • clarify and check task-related information • carry out work according to OHS practices
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be accessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Liquid Surface Coated Products**
Unit Code	**IND PMP3 18 0613**
Unit Descriptor	This competence covers the operation of liquid surface coating processes and the solving of problems. It is typically performed by advanced operators applying knowledge of materials, product purpose and processes to the application of surface coatings by hand, spray gun or immersion. It also requires using a range of well-developed skills requiring some discretion and judgment to recognize and resolve a range of problems.

Elements	Performance Criteria
1. Plan own work requirements	1.1 Most appropriate ***equipment*** or tool/s and processes to be used for production process and upstream and downstream operations from production plan or request is identified. 1.2 Materials required, including additives are identified and checked. 1.3 Measures are implemented to control identified ***hazards*** and appropriate hazard control/ minimization methods are followed. 1.4 Requirements for materials, quality, production and equipment or tool/s checks are identified. 1.5 The sequence of work maximizing potential of the applied finish for the production operation is established.
2. Start up surface coating process to procedures	2.1 Process settings required for the product is identified is identified. 2.2 Process is set to specifications as required. 2.3 Surface coating equipment or tool/s settings and adjustments are checked as required. 2.4 Materials are checked if they are correct. 2.5 Appropriate action for non-conforming materials is taken. 2.6 Date, batch and materials markings to specifications, are set up as required. 2.7 Pre-start checks is completed. 2.8 Surface coating process is started up.
3. Operate and make adjustments as required to the surface coating process to procedures	3.1 Liquid surface coating process, noting key ***variables*** is operated***.*** 3.2 Trial applications of surface materials is made to check equipment operation. 3.3 Controls/displays/terminals for production/process data are monitored.

	3.4 Product/process quality in accordance with ***procedures*** is monitored***.*** 3.5 Samples are taken as required and identify product out of specification. 3.6 Adjustments are made to remedy faults and nonconformity to standard as required. 3.7 A stable surface coating process is established. 3.7 Process is adjusted to minimize scrap and overspray. 3.8 Equipment or tool/s is cleaned, adjusted and lubricated as required.
4. Shut down machine to procedures	4.1 Type of shutdown is determined. 4.2 Appropriate cleaning methods are selected. 4.3 Machine is cleaned efficiently and adequately as required. 4.4 Machine is left in appropriate condition and with appropriate locks, tags or notices. 4.5 Relevant documentation is completed. 4.6 Area is ensured clean and clear after the shutdown, in readiness for the next start up.
5. Anticipate and solve problems	5.1 ***Problem*** or anticipated potential problems is recognized. 5.2 Problems needing priority action is determined. 5.3 Possible fault causes is determined. 5.4 Problems outside area of responsibility are referred to appropriate person, with possible causes. 5.5 Information and assistance as required are sought to solve problems. 5.6 Problems within area of responsibility are solved. 5.7 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • coating equipment such as brushes, spray guns and/or immersion equipment • additional equipment such as ventilation and other fume/vapor removal equipment • manual handling aid such as hand carts and trolleys hoists/lifting equipment not requiring any special permits or licenses • Relevant personal protective equipment

Hazards	May include: • spills and splashes • toxic fumes or vapors • hazardous materials • manual handling hazards • flammable vapors
Variables	May include: • spray patterns • materials consistency • finished color • surface finish • product integrity and general conformance to specification • coating viscosity • coating drying rate • coating application rate
Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Problems	May include: • Anticipate and solve problems means resolve a wide range of routine and non-routine problems, using product and process knowledge to develop solutions to problems which do not have known solution/s recorded in procedures. • Typical process and product problems may include: ➢ incorrect selection of materials ➢ variations in materials ➢ contamination of materials or product surface ➢ inappropriate application of coatings ➢ drying rates ➢ uniformity of film thickness & appropriate film thickness. • Appropriate action for problems outside area of responsibility may be reporting to an appropriate person. • Appropriate action for problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/ sources.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and liquid surface coating process characteristics in relation to the process requirements and the end product • make adjustments to the process, materials, and equipment as required

	• Identify and take appropriate action on current and potential problems • perform consistently. For example to see that: ➢ the process runs smoothly with the minimum need for intervention ➢ all safety procedures are always followed
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • materials, equipment and process sufficient to recognize material and equipment conditions which may lead to out of specification production • organizations procedures, quality and safety requirements at each production stage and relevant regulatory requirements; and the ability to implement them within appropriate time constraints and work standards • application managing risks using the hierarchy of controls applied to the liquid surface coating process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup • identifying problem solving process and material problems, • function and operating principles of liquid surface coating equipment or tool/s • identifying characteristics of materials and behaviour in relation to temperature, application rate, ventilation rate, thinning liquid, viscosity • identifying impact of equipment/process variables (eg speed, temperature, pressure) on product quality and production output • identifying phases of the coating cycle and the effect of key variables on product quality, in order to make appropriate adjustments to machine settings • identifying impact of variations in raw materials and equipment or tool/s operation in relation to final product • identifying changes to materials at various stages of production • waste management and significance of non-conforming materials • basic pre-blending of materials • application of coatings • identifying coating properties and their interactions with process conditions • identifying relationships between coating properties and process conditions • identifying changes to coating properties to better suit process requirements

	• identifying product problems related to coating properties • identifying product problems related to process conditions • adjustments to process conditions to meet coating and product requirements • planning own work, including predicting consequences and identifying improvements • completing workplace forms, quality assurance records and production reports. • determining how much diluents needs to be added to reduce a coating to a given concentration, apply viscosity data to coating application and read simple graphs/charts
Underpinning Skills	• apply of knowledge of the materials, equipment and process sufficient to recognize material and equipment conditions which may lead to out of specification production • apply and explain organization procedures, quality and safety requirements at each production stage and relevant regulatory requirements; and the ability to implement them within appropriate time constraints and work standards • manage risks using the hierarchy of controls applied to the liquid surface coating process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the coating process • identify when assistance is required to solve problems • read and interpret typical product specifications, job sheets and material labels as provided to operators. • complete workplace forms, quality assurance records and production reports • determine how much diluents need to be added to reduce a coating to a given concentration, apply viscosity data to coating application and read simple graphs/charts
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Printed and Decorated Film**
Unit Code	**IND PMP3 19 0613**
Unit Descriptor	This competence covers the production of product from film printing and decorating equipment. It applies to operators of film printing and decorating equipment. The key factors are the adequate planning of the process stages, preparation of the equipment, checking on performance of the equipment and making approved adjustments and equipment corrections.

Elements	Performance Criteria
1. Plan the process stages for printing and decorating on flexible films.	1.1 The stages in the printing process are planned and these complied with the quality requirements for product printing are ensured. 1.2 For changes in materials at each stage of the printing and decorating process are identified and allowed. 1.3 The availability of the ***equipment*** and components for each production stage are planned. 1.4 The impact of the process on product characteristics and product quality and usability are anticipated. 1.5 Work requirements based on workplace approved operating ***procedures*** are planned***.*** 1.6 Equipment and processes to be used for materials preparation, production process and for downstream operations are identified.
2. Prepare for flexible printing and decorating operations.	2.1 Materials, including base raw materials and additives are prepared. 2.2 ***Hazards*** connected with both production materials and process are identified and addressed. 2.3 Base materials inputs and outputs, dyes and print chemical colours, ancillary supplies and equipment are checked. 2.4 Product quality requirements for the relevant process stage(s) is checked. 2.5 Equipment emergency stops, gauges, guards and controls are identified and located. 2.6 The task sequences including times and locations for product quality checks, equipment operation and required production outputs are planned. 2.7 Ongoing materials input, waste management and work area housekeeping requirements are provided for.

	2.8 Any required supplementary equipment for product quality testing or routine equipment maintenance and/or adjustments are arranged.
3. Set up and check printing and decorating equipment.	3.1 Equipment is set up in accordance with required quality specifications and standard operating procedures. 3.2 Printing and decorating settings and equipment adjustments for conformity to documented procedures are checked. 3.3 Materials for conformity with workplace operational requirements including surface condition and materials thickness are inspected. 3.4 Non-conforming materials are discarded or adjustments are made to processing operations in accordance with workplace procedures.
4. Monitor printing and decorating operation.	4.1 Operate and shut down operation are started up as required by procedures. 4.2 Printing and decorating operations noting product quality, ink adherence, production outputs, equipment operating pressures, colour, thickness and product integrity are monitored. 4.3 Adjustments are made to remedy faults and non-conformity to production standards where applicable. 4.4 Material which is able to be reprocessed and reused, and dispose of waste and scrap in accordance with workplace procedures are collected. 4.5 Equipment is cleaned up , lubricated and adjusted in accordance with workplace procedures.
5. Anticipate and solve problems.	5.1 A ***problem*** or a potential problem is recognized. 5.2 Problems needing priority action is determined. 5.3 Problems outside area of responsibility are referred to appropriate person, with possible causes. 5.4 Information and assistance as required are sought to solve problems. 5.5 Problems within area of responsibility are solved. 5.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • hand carts and trolleys

	• knives and other package opening equipment • hoists/lifting equipment not requiring any special permits or licenses • relevant personal protective equipment • hand tools used in the printing and decorating process • material loading equipment used for loading of raw materials • relevant personal protective equipment.
Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Hazards	May include: • dusts/vapours/fumes • hazardous materials • manual handling hazards • knife hazards.
Problems	May include: • 'Anticipate and solve problems' means resolve a wide range of routine and non-routine problems, using product and process knowledge to develop solutions to problems which do not have a known solution/a solution recorded in the procedures. • Typical process and product problems may include: ➢ variations in materials ➢ contamination of materials ➢ equipment operation problems ➢ machine malfunction ➢ product anomalies such as sticking, 'veining', misprints
Variables	May include: • speed • colour • production time • output rate • product integrity and general conformance to specification/sample

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge competencies to: • identify critical materials properties and printed and decorated film process characteristics in relation to the process requirements and the end product • take appropriate action to observe equipment, materials and products for out of specification results, make adjustments and identify problems to be reported.

	• perform consistently. For example, to see that: ➢ production quality and output standards are met consistently ➢ The process runs consistently and smoothly.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • The materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. • Organization procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. • Competence includes the ability for the practical completion of the job to apply and/or explain: ➢ impact of incorrect or faulty materials ➢ production workflow sequences and materials demand ➢ focus of operation of work systems and equipment ➢ correct selection and use of equipment, materials, processes and procedures ➢ hazards of the materials and process and appropriate hazard control procedures ➢ distinguish between causes of faults such as wrong raw materials, incorrect quantity of materials, contaminated materials ➢ function and operating principles of film printing and decorating equipment ➢ impact of variations in raw materials and equipment operation in relation to final product ➢ material properties and their interactions with process conditions ➢ relationships between material properties and process conditions ➢ changes to material properties to better suit process requirements. ➢ product problems related to material properties ➢ product problems related to process conditions ➢ Adjustments to process conditions to meet material and product requirements.
Underpinning Skills	Demonstrates skills to: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. • organizations procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. • identify impact of incorrect or faulty materials • identify production workflow sequences and materials demand

	• focus of operation of work systems and equipment • correct selection and use of equipment, materials, processes and procedures • identify hazards of the materials and process and appropriate hazard control procedures • distinguish between causes of faults such as wrong raw materials, incorrect quantity of materials, contaminated materials • function and operating principles of film printing and decorating equipment • identify impact of variations in raw materials and equipment operation in relation to final product • identify material properties and their interactions with process conditions • identify relationships between material properties and process conditions • identify changes to material properties to better suit process requirements. • identify product problems related to material properties • identify product problems related to process conditions • identify adjustments to process conditions to meet material and product requirements. Competence also includes the ability to: • plan own work, including predicting consequences and identifying improvements • identify factors which may affect product quality or production output and appropriate remedies • identify when the operator is able to rectify faults and when assistance is required. • read and interpret typical product specifications, job sheets and material labels as provided to operators. • complete workplace forms.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Print and Decorate Rigid Products**
Unit Code	**IND PMP3 20 0613**
Unit Descriptor	This competency covers the application of knowledge of materials, product purpose and processes to the printing and decoration of rigid products. It is typically performed by all advanced operators working either independently or as part of a work team. It applies to operators of printing and decorating equipment for rigid products. The key factors are the adequate planning of the process stages, preparation of the equipment, checking on performance of the equipment and making adjustments and equipment corrections.

Elements	Performance Criteria
1. Plan process stages for printing and decorating.	1.1 The stages in the printing and decorating process are planned and these complied with the quality requirements for production is ensured. 1.2 For changes in materials at each stage of the printing and decorating process is identified and allowed. 1.3 The availability of the ***equipment*** and components for each production stage are planned. 1.4 The impact of the process on product characteristics and product quality and usability is anticipated. 1.5 Work requirements based on ***procedures*** are planned***.***
2. Identify work requirements for printing and decorating operations.	2.1 Materials, including base raw materials and additives are prepared. 2.2 ***Hazards*** connected with both production materials and process are identified and addressed. 2.3 Materials inputs and outputs, dyes and print chemical colours, ancillary supplies and equipment are within specifications are checked. 2.4 Product quality requirements for the relevant process stage(s) are checked. 2.5 Equipment emergency stops, gauges, guards and controls are identified and checked. 2.6 The task sequences, including times and locations for product quality checks, equipment operation and required production outputs are planned. 2.7 For ongoing materials input, waste management and work area housekeeping requirements are provided.

	2.8 Any required supplementary equipment for product quality testing or routine equipment maintenance and/or adjustments are arranged.
3. Set up and check printing and decorating equipment.	3.1 Equipment information, required quality specifications and set-up procedures are complied with. 3.2 Equipment is set up in accordance with required specifications and procedures. 3.3 Printing and decorating equipment settings and adjustments and conformity to procedures are checked. 3.4 A ***problem*** or a potential problem is recognized. 3.5 Materials are checked if they are correct. 3.6 Surface preparation operations provide for an even and consistent surface for printing is checked. 3.7 Non-conforming materials are discarded or adjustments are made to processing operations in accordance with workplace procedures. 3.8 Process equipment, noting key ***variables*** is operated.
4. Monitor printing and decorating operation	4.1 Equipment is stated up, operated and shut down as required by procedures. 4.2 Printing and decorating operations are monitored. 4.3 Adjustments are made to remedy faults and non-conformity to production standards where applicable. 4.4 Material is collected which is able to be reprocessed and reused, and dispose of waste and scrap in accordance with procedures. 4.5 Equipment is cleaned up, lubricated, and adjusted in accordance with workplace procedures.

Variable	**Range**
Tools and equipment may include:	• hand carts and trolleys • knives and other bag opening equipment • hoists/lifting equipment not requiring any special permits or licences • basic hand tools required for opening of material packaging • relevant personal protective equipment.
Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures means all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards

Hazards	May include: • spills • dusts/vapours • hazardous materials • manual handling and knife hazards.
Problems .	May include: • variations in materials • contamination of materials in product to be decorated • out of specification equipment operation • variations in materials and/or contamination of materials • processing problems
Variables .	May include: • equipment operating conditions • condition of graphics and lettering film • colour • output rate • product integrity and general conformance to specification/sample • product quality • ink adherence • production outputs • equipment operating pressures • colour • thickness and product integrity

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and printing and decoration process characteristics in relation to the process requirements and the end product • plan own work process within workplace procedures and explain the reasons for the steps in the process • take appropriate action to observe equipment, materials and products for out of specification results, make adjustments and identify problems to be reported. • perform consistently. For example, to see that: ➢ production quality and output standards are met consistently ➢ problems are anticipated from process observations ➢ problems are efficiently resolved ➢ the process runs consistently and smoothly
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production.

	• organizations procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. • planning own work, including predicting consequences and identifying improvements • interpreting from production requests the correct selection and use of equipment, materials, processes and procedures • identifying factors which may affect product quality or production output and appropriate remedies.
Underpinning Skills	Demonstrate skills to: • identify impact of incorrect or faulty materials • identify production workflow sequences and materials demand • focus of operation of work systems and equipment • correct selection and use of equipment, materials, processes and procedures • identify hazards of the materials and process and appropriate hazard control procedures • distinguish between causes of faults • identify material properties and their interactions with process conditions • identify relationships between material properties and process conditions • identify changes to material properties to better suit process requirements. • identify product problems related to material properties • identify product problems related to process conditions • make adjustments to process conditions to meet material and product requirements. • numeracy, e.g. to determine that 16 units and 46 units are equal to a total of 62 units. • read and interpret typical product specifications, job sheets and material labels as provided to operators. • Write is required to the level of completing workplace forms.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Convert Plastic Film**
Unit Code	**IND PMP3 21 0613**
Unit Descriptor	This competence covers the operation and adjustment of film converting processes and the solving of non-routine problems. It does not cover film printing or decorating. It applies to operators who are required to apply knowledge of materials, product purpose and processes to the operation of film converting equipment. The key factors are the production of material meeting quality standards and product requirements and the recognition and resolving of a range of routine and non-routine problems.

Elements	Performance Criteria
1. Plan own work requirements.	1.1 ***Equipment*** and processes used for production process and upstream and downstream operations from production plan or request is identified. 1.2 Materials required, including additives if appropriate are identified. 1.3 ***Hazards*** are recognized and appropriate hazard control/minimization methods are followed. 1.4 Emergency stops, guards and controls are identified and checked. 1.5 Requirements for materials, quality, production and equipment checks are identified. 1.6 Materials, waste management and housekeeping needs are identified.
2. Check film conversion process set-up.	2.1 Equipment requirements are determined. 2.2 Process is set to specifications as required. 2.3 Film conversion equipment settings and adjustments are checked as required. 2.4 Materials are checked if they are correct. 2.5 Adjustments are discarded or made to the process for, non-conforming materials. 2.6 Date, batch and materials markings are set up to specifications, as required. 2.7 Other pre-start checks are completed in accordance with procedures.
3. Operate and make adjustments as required to the film conversion process.	3.1 Film conversion equipment, noting key ***variables*** are operated. 3.2 Controls/displays/terminals for production/process data are monitored.

	3.3 Product/process quality is monitored in accordance with ***procedures***. 3.4 Adjustments are made to remedy faults and non-conformity to standard as required. 3.5 Continuity of process is maintained. 3.6 Other materials are collected and reprocessed/discarded scrapped/trimmed in accordance with procedures. 3.7 Equipment is cleaned, adjusted and lubricated as required. 3.8 Equipment is paused or stopped in an emergency, following workplace and emergency procedures.
4. Anticipate and solve problems	4.1 A ***problem*** or a potential problem is recognized. 4.2 Problems needing priority action is determined. 4.3 Problems outside area of responsibility is referred to appropriate person, with possible ***causes.*** 4.4 Information and assistance as required are sought to solve problems. 4.5 Problems are solved within area of responsibility. 4.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • hand tools used in the film conversion process • material loading equipment used for loading of raw materials • relevant personal protective equipment.
Hazards	May include: • cut hazards • nip hazards • compressed air • vapours • slip and fall • temperature • hazardous substances • moving equipment • manual handling hazards.
Variables	May include: • operating temperatures • cooling • speed • time/timing

	• seal head condition • cutter condition • cycle time • output rate • product weight • product integrity and general conformance to specification/sample.
Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Problems	May include: • equipment malfunction registration • blocking • seal bar temperature or wear/damage • contamination • seal appearance • seal strength • bag dimensions • variations in materials and/or contamination of materials.
Fault causes	May include: • incorrect materials • contaminated materials • equipment faults • seal bar damage • machine failure • incorrect quantity of materials • contaminated materials • temperature/time pressure faults.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and film conversion process characteristics in relation to the process requirements and the end product. • perform consistently. For example, to see that: ➢ production quality and output standards are met consistently ➢ the process runs consistently and smoothly.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production

	• organizations procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards • products, materials and material characteristics • behaviour of materials in relation to heat, pressure and time • quality requirements at each production stage • function and operating principles of film conversion equipment, machine components and ancillary equipment • impact of machine speed, temperature, pressure, time during cycles on product quality and production output • nature of mechanical, hydraulic, pneumatic, electrical and electronic principles which affect machine operation and product development • film conversion cycle and the importance of machine set-up and temperature/time/pressure interaction for effective processing of materials • safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup • the hierarchy of control including engineering controls • impact of variations in raw materials and equipment operation in relation to final product • changes to materials at various stages of production • waste management and importance of non-conforming materials • polymer properties and their interactions with process conditions • relationships between polymer properties and process conditions • changes to polymer properties to better suit process requirements • product problems related to polymer properties • product problems related to process conditions • adjustments to process conditions to meet polymer and product requirements
Underpinning Skills	• apply knowledge of the materials, equipment and process sufficient to recognize material and equipment conditions which may lead to out of specification production. • implement Knowledge of organization procedures and relevant regulatory requirements along with them within appropriate time constraints and work standards • identify products, materials and material characteristics • apply quality requirements at each production stage • apply nature of mechanical, hydraulic, pneumatic, electrical and electronic principles which affect machine operation and product development

	• apply safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup • explain waste management and importance of non-conforming materials • explain product problems related to polymer properties • explain product problems related to process conditions • explain adjustments to process conditions to meet polymer and product requirements. • plan own work, including predicting consequences and identifying improvements • interpret from production requests the correct selection and use of equipment, materials, processes and procedures • identify and describe own role and role of others involved directly in the film conversion process • identify factors which may affect product quality or production output and appropriate remedies • identify when the operator is able to rectify faults and when assistance is required • distinguish between causes of faults. • read and interpret typical product specifications, job sheets and material labels as provided to operators. • Write skills to the level of completing workplace forms and production reports.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Polystirene Shape Moulded Products**
Unit Code	**IND PMP3 22 0613**
Unit Descriptor	This competency covers the operation and adjustment of polystirene shape moulding processes and the solving of routine and non-routine problems. It is typically performed by advanced operators applying knowledge of materials, product purpose and processes to the production of polystirene foam shape moulded products. It also requires using a range of well-developed skills requiring some discretion and judgment to recognise and resolve a range of problems.

Elements	Performance Criteria
1. Plan own work requirements	1.1 ***Equipment*** to be used for production and upstream and downstream operations from production plan or request is identified. 1.2 Materials required are identified and checked. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care. 1.4 Requirements for materials, quality, production and equipment checks are identified.
2. Startup polystirene shape moulding process to procedures	2.1 Process settings required for product is identified. 2.2 Process is set to required settings. 2.3 Materials are checked if they are correct. 2.4 Appropriate action for non-conforming materials is taken. 2.5 Date, batch and materials markings are set up to specifications, as required. 2.6 Pre-start checks is completed. 2.7 Polystirene shape moulding process is started up.
3. Operate and make adjustments to the polystirene shape moulding process to procedures	3.1 Polystirene shape moulding process, noting key ***variables*** is operated***.*** 3.2 Controls displays/terminals for production and process data are monitored. 3.3 Samples are taken as required and identify product out of specification. 3.4 Product/process quality is monitored. 3.5 Adjustments are made to remedy faults and non-conformity as required.

	3.6 A stable shape moulding process is established. 3.7 Process is adjusted to minimize scrap and trim. 3.8 Equipment is cleaned, adjusted and lubricated as required.
4. Shut down machine to procedures	4.1 Type of shutdown is determined. 4.2 Appropriate purging method is selected. 4.3 Machine is purged efficiently and adequately as required. 4.4 Machine is left in appropriate condition and with appropriate locks, tags or notices. 4.5 Relevant documentation is completed. 4.6 Area is ensured clean and clear after the shutdown, in readiness for the next start up.
5. Anticipate and solve problems	5.1 A ***problem*** or a potential problem is recognized. 5.2 Problems needing priority action is determined. 5.3 Problems outside area of responsibility are referred to appropriate person, with possible causes. 5.4 Information and assistance as required are sought to solve problems. 5.5 Problems within area of responsibility are solved. 5.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • polystirene shape moulding machine • components of shape moulding machine (such as prefoamer, storage hopper, moulding tool) • additional equipment (eg vacuum system) • manual handling aids such as hand carts and trolleys • basic hand tools and other bag opening equipment (e.g. knives) • hoists/lifting equipment not requiring any special permits or licences • relevant personal protective equipment.
Hazards	May include: • spills • dusts/fumes • hazardous materials • manual handling hazards • knife hazards.

Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Variables	May include: • operating temperatures • compression • pressure • speed • colour • output rate • product weight • polystirene density • product integrity and general conformance to specification/sample.
Problems	May include: • 'Anticipate and solve problems' means resolve a wide range of routine and non-routine problems, using product and process knowledge to develop solutions to problems which do not have a known solution /s recorded in the procedures. • Typical process and product problems may include: ➢ variations in materials ➢ contamination of materials ➢ machine failure ➢ mould damage. ➢ appropriate action for problems outside area of responsibility may be reporting to an appropriate person. ➢ appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate person/sources

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and polystirene shape moulding process variables in relation to the process requirements and the end product • make adjustments to the process as required • identify and take appropriate action on problems and potential problems. • perform consistent. For example, to see that: ➢ the process runs consistently and smoothly, with minimum need for intervention ➢ all safety procedures are always followed.

Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. • organizations procedures, quality requirements at each production stage and relevant regulatory requirements; within appropriate time constraints and work standards. • application of managing risks using the hierarchy of controls applied to the resin transfer moulding process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup. • characteristics of materials and behaviour in relation to heat, pressure, flow rate and time • identifying function and operating principles of polystirene shape moulding equipment, machine components and ancillary equipment, including the mechanical, hydraulic, pneumatic, electrical and electronic principles which affect machine operation • identifying impact of machine speed, temperature, pressure, time during cycles on product quality and production output • identifying phases of the polystirene shape moulding cycle and the effect of key variables on product quality • changes to materials at various stages of production • identifying impact of variations in raw materials and equipment operation in relation to final product • waste management and importance of non-conforming material • processing behaviour of those polymers which are moulded at the workplace • identifying polymer properties and their interactions with process conditions • identifying relationships between polymer properties and process conditions • identifying changes to polymer properties to better suit process requirements. • identifying product problems related to polymer properties • identifying product problems related to process conditions • make adjustments to process conditions to meet polymer and product requirements. • identifying and taking appropriate action on the range of possible causes of product faults.
Underpinning Skills	• Apply approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup.

	• plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the process • identify factors which may affect product quality or production output and appropriate remedies • identify when assistance is required to solve problems. • the level of completing workplace forms and production reports. • basic numeracy, e.g. to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg. • read and interpret typical product specifications, job sheets, material labels and complex machine control panels such as those displaying SPC information.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Compound Materials Using an Internal Mill Blender**
Unit Code	**IND PMP3 23 0613**
Unit Descriptor	This competency covers the operation and adjustment of compounding processes and blending equipment and the solving of non-routine problems. It is typically performed by advanced operators apply knowledge of materials, product purpose and processes to the operation of internal blenders. It also requires using a range of well-developed skills required some discretion and judgment to recognize and resolve of a range of problems.

Elements	Performance Criteria
1. Plan own work requirements.	1.1 Most appropriate ***equipment*** to be used for production and upstream and downstream operations from production plan or request is identified. 1.2 Materials required, including additives are identified and checked. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care. 1.4 Requirements for materials, quality, production and equipment checks are identified.
2. Start up internal mill blender process to procedures.	2.1 Machine/equipment requirements are determined. 2.2 Process is set to required settings. 2.3 Materials are checked if they are correct. 2.4 Appropriate action is taken for non-conforming materials. 2.5 Date, batch and materials markings are set up to specifications, as required. 2.6 Pre-start checks is completed. 2.7 Internal mill blender is started up.
3. Operate and make adjustments to the internal mill blender process to procedures.	3.1 Internal mill blender process, noting key ***variables*** are operated***.*** 3.2 Controls/displays/terminals for production/process data are monitored. 3.3 Samples are taken as required and identify product out of specification. 3.4 Product quality is monitored. 3.5 Adjustments are made to remedy faults and nonconformity to standard as required.

	3.6 A stable internal mill blending process is established. 3.7 Process is adjusted to minimize scrap and trim. 3.8 Machine/equipment is cleaned, adjusted and lubricated as required.
4. Shut down machine to procedures.	4.1 Type of shutdown is determined. 4.2 Appropriate purging method is selected. 4.3 Machine is purged efficiently and adequately as required. 4.4 Machine is left in appropriate condition and with appropriate locks, tags or notices. 4.5 Relevant documentation is completed. 4.6 Area is ensured clean and clear after the shutdown, in readiness for the next start-up.
5. Anticipate and solve problems.	5.1 A ***problem*** or a potential problem is recognized. 5.2 Problems needing priority action is determined. 5.3 Problems outside area of responsibility are referred to appropriate person, with possible causes. 5.4 Information and assistance as required are sought to solve problems. 5.5 Problems are solved within area of responsibility. 5.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • process electrical/mechanical machine and its major components, e.g. skid shifter/ wigwags, bale loader, overhead rubber feed • hand tools, e.g. knives • material loading equipment used for loading of raw materials, e.g. forklift, lift, hook, takeaway belt • monitoring equipment and tools, e.g. scales for weighing powders and rubber • digital sensors, computer control settings and displays • recipe cards • 2C plates • tickets of unused material • wheel marker • relevant Personal Protective Equipment (PPE) .

Hazards	May include: • chemical spills • dusts/vapours/rubbish • slip and fall • temperature • hazardous materials • manual handling hazards • equipment operations.
Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Variables	May include: • temperatures • speed • pressures • colour • mixing differences/mixing steps/plasticity • cycle steps/cycle time/process timing • output rate/machine inactivity • product weight • product integrity and general conformance to specification/sample, e.g. rubber batch differences, batch dump indicators.
Problems	May include: • Anticipate and solve problems means resolve a wide range of routine and non-routine problems, using product and process knowledge to develop solutions to problems which do not have a known solution / a solution recorded in the procedures. • Typical process and product problems may include: • machine malfunction, e.g. caused by incorrect dip solution/rubber levels • variations in materials, e.g. allowable tolerances of cut-up materials contamination of compounds and/or materials • processing problems • dust stop leakage • incorrect quantity of materials • contaminated materials. • appropriate action for problems outside of area of responsibility may be reporting to an appropriate person. • appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and process characteristics in relation to the process requirements and the end product • make adjustments to the process as required • identify and take appropriate action on problems and potential problems. • perform consistently. For example, to see that: ➢ the process runs consistently and smoothly, with minimum need for human intervention ➢ all safety procedures are always followed.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • all compounds, materials, equipment and process sufficient to recognise compound, material and equipment conditions which may lead to out of specification production. For example, • organizations procedures, quality requirements at each production stage, relevant regulatory requirements (eg quality system and standards, current operating standards) and the ability to implement them within appropriate time constraints and work standards. • managing risks using the hierarchy of controls applied to compound materials using an internal mill blender. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup. • Identifying characteristics of materials and behaviour in relation to heat, pressure, flow rates and time • function and operating principles of internal mill blending equipment, machine components and ancillary equipment, including the mechanical, hydraulic, pneumatic, electrical and electronic principles which affect machine operation • Identifying impact of machine speed, temperature, pressure, time during cycles on product quality and production output • Identifying changes to materials at various stages of production • waste management and importance of re-using non-conforming materials • Identifying impact of variations in raw materials and equipment operation in relation to final product • Identifying polymer properties and their interactions with process conditions • Identifying relationships between polymer properties and process conditions

	• changes to polymer properties to better suit process requirements • Identifying product problems related to polymer properties • Identifying product problems related to process conditions • make adjustments to process conditions to meet polymer and product requirements
Underpinning Skills	Demonstrate skills to: • apply requirements at each production stage, relevant regulatory requirements (e.g. quality system and standards, current operating standards) and the ability to implement them within appropriate time constraints and work standards. • identify the range of possible causes of product faults. • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the internal mill blending process • identify factors which may affect product quality or production output and appropriate remedies • identify when assistance is required to solve problems. • read and interpret typical product specifications, job sheets and complex machine control panels such as those displaying SPC information. • write is required to the level of completing workplace forms and production reports. • basic numeracy is required, e.g. to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg. Basic statistical knowledge is required to construct histograms and control charts as well as to interpret results and recommend actions.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Compound Materials Using an Open Mill Blender**
Unit Code	**IND PMP3 24 0613**
Unit Descriptor	This competency covers the operation and adjustment of open mill blenders to compound materials and the solving of non-routine problems. It is typically performed by advanced operators applying knowledge of materials, product purpose and processes to the operation of open mill blenders to produce product conforming to requirements. It also requires using a range of well-developed skills requiring some discretion and judgment to recognize and resolve a range of problems. It is typically performed by operators working either independently or as part of a work team.

Elements	Performance Criteria
1. Plan own work requirements	1.1 ***Equipment*** and processes used for production process and upstream and downstream operations from production plan or request is identified. 1.2 Materials required including additives are identified and checked. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care. 1.4 Emergency stops, guards and controls are identified and checked. 1.5 Requirements for materials, quality, production and equipment checks are identified. 1.6 Materials, waste management and housekeeping needs are identified.
2. Startup mill	2.1 Process settings required for product is identified. 2.2 Process is set to required settings. 2.3 Materials are checked if they are correct. 2.4 Appropriate action is taken for non-conforming materials. 2.5 Date, batch and materials markings are set up to specifications, as required. 2.6 Pre-start checks is completed. 2.7 Mill is started up.
3. Operate and make minor adjustments to the process to procedures	3.1 Process equipment, noting key ***variables*** are operated***.*** 3.2 Controls/displays/terminals for production/process data are monitored.

	3.3 Samples are taken as required and identify product out of specification. 3.4 Product/process quality are monitored. 3.5 Adjustments are made to remedy faults and non-conformity required. 3.6 A stable process is established. 3.6 Process is adjusted to minimize scrap. 3.8 Mill is shut down as required. 3.9 Equipment is cleaned, adjusted and lubricated as required.
4. Anticipate and solve problems	4.1 ***Problems*** or potential problems are recognized. 4.2 Problems needing priority action are determined. 4.3 Problems outside area of responsibility are referred to appropriate person, with possible causes. 4.4 Information and assistance as required are sought to solve problems. 4.5 Problems are solved within area of responsibility. 4.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • open mill and its major components • hand tools used in the process, eg mill knives • material loading equipment used for loading of raw materials, e.g. stock loaders and conveyors, overhead crane arms and hooks • relevant personal protective equipment
Hazards	May include: • nip hazards • cut hazards • dusts/vapours • slip and fall (such as caused by scrap of spilled materials) • temperature(such as hot rubber) • hazardous materials (including curatives and accelerators, plasticizers, fillers) and manual handling hazards
Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards

Variables	May include: • temperatures • speed (including difference in speed between rolls) • nip pressures • colour • cycle time/process timing • product/stock/material flow and quality • product weight and output rate • product integrity and general conformance to specification and quality sample
Problems	• power failures • incorrect machine adjustments • incorrect quantities of materials • incorrect blending times • equipment breakdowns • worn rolls • short scorch products • forming the initial band • adjusting bank size for efficient mixing. • Typical product problems many include: ➢ variations in materials ➢ contamination of materials ➢ lack of a homogeneous product. • Appropriate action for problems outside of area of responsibility may be reporting to an appropriate person. • Appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and process characteristics in relation to the process requirements and the end product • make adjustments to the process as required • identify and take appropriate action on problems and potential problems • perform consistently. For example, look to see that: ➢ the process runs consistently and smoothly, with the minimum need for human intervention. ➢ all safety procedures are always followed
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production.

	• organizations procedures, quality requirements at each stage of production and relevant regulatory requirements (eg quality system and standards, current operating standards) and the ability to implement them within appropriate time constraints and work standards. • Application of managing risks using the hierarchy of controls applied to compound materials using an open mill blender. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup • products, materials and material characteristics • behaviour of materials in relation to key process variables • quality requirements at each production stage • function and operating principles of equipment, machine components and ancillary equipment, including mechanical, hydraulic, pneumatic, electrical and electronic principles which affect machine operation • identifying impact of key process variables such as speed/speed difference, temperature, nip, bank size, and time on product quality and production output • identifying impact of material properties, such as rubber nerve, filler volume and dryness, resin tack and accelerator scorch on mixing • identifying phases of the mixing process such as ban forming, nerve breaking, additive incorporation and homogenisation • identifying importance of machine set-up and start-up procedure for effective processing of materials • identifying impact of variations in raw materials and equipment operation in relation to final product • identifying changes to materials at various stages of production • waste management and importance of re-using non-conforming materials • identifying polymer properties and their interactions with process conditions • identifying relationships between polymer properties and process conditions • identifying changes to polymer properties to better suit process requirements • identifying product problems related to polymer properties • identifying product problems related to process conditions • make adjustments to process conditions to meet polymer and product requirements

Underpinning Skills	Demonstrates skills to: • apply of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup • apply requirements at each stage of production and relevant regulatory requirements (e.g. quality system and standards, current operating standards) and the ability to implement them within appropriate time constraints and work standards. • identify the range of possible causes of product faults including: ➢ low/high plasticity ➢ scorch ➢ strength ➢ hardness • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the process • identify factors which may affect product quality or production output and appropriate remedies • identify when assistance is required to solve problems. • the level of completing workplace forms and production reports. • basic numeracy is required, e.g. to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg. • read and interpret typical product specifications, job sheets and material labels as provided to operators
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Calendared Products**
Unit Code	**IND PMP3 25 0613**
Unit Descriptor	This competency covers the operation and adjustment of calendaring processes and the solving of routine and non-routine problems. It is typically performed by advanced operators applying knowledge of materials, product purpose and processes to the operation of calendaring equipment to convert plastic or rubber compound into intermediate or final film/sheet products. It also requires using a range of well-developed skills requiring some discretion and judgment to recognize and resolve problems.

Elements	Performance Criteria
1. Plan own work requirements	1.1 ***Equipment*** and processes used for production process and upstream and downstream operations from production plan or request identified. 1.2 Materials are identified and checked required including additives. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care. 1.4 Requirements for materials, quality, production and equipment checks are identified.
2. Startup calendering process to procedures	2.1 Process settings required for product is identified. 2.2 Process is set to required settings. 2.3 Materials are checked is they are correct. 2.4 Appropriate action is taken for non-conforming materials. 2.5 Date, batch and materials markings are set up to specification as required. 2.6 Pre-start checks is completed. 2.7 Calendering process is started up.
3. Operate and make adjustments to the calendering process to procedures	3.1 Calendering process, noting key ***variables*** are operated. 3.2 Controls/displays/terminals for production/process data are monitored. 3.3 Product/process quality are monitored. 3.4 Samples are taken as required and identify product out of specification. 3.5 Adjustments are made to remedy faults and non-conformity to standard as required.

	3.6 A stable calendering process is established. 3.7 Process is adjusted to minimize scrap and trim. 3.8 Equipment is cleaned, adjusted and lubricated as required.
4. Shut down machine to procedures	4.1 Type of shutdown is determined. 4.2 Appropriate cleaning method is selected. 4.3 Machine is cleaned efficiently and adequately as required. 4.4 Machine is left in appropriate condition and with appropriate locks, tags, or notices. 4.5 Relevant documentation is completed. 4.6 Area is ensured clean and clear after the shutdown, in readiness for the next start-up.
5. Anticipate and solve problems	5.1 A problem or a potential problem is recognized. 5.2 ***Problems*** needing priority action are determined. 5.3 Possible fault causes are determined. 5.4 Problem outside area of responsibility are referred to appropriate person, with possible causes. 5.5 Information and assistance as required are sought to solve problems. 5.6 Problems are solved within area of responsibility. 5.7 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • calendars • additional equipment (such as mill knives, thickness gauges, profiling gauges/tools/jigs, nip adjusting bars, strainers and metal detector) • manual handling equipment • product take up equipment • material feeding equipment • hoists/lifting equipment not requiring any special permits or licences • basic hand tools • relevant personal protective equipment.
Hazards	May include: • restricted spaces • heat • hazardous chemicals

	• dust/fumes • manual handling hazards • knife hazards • nip hazards • creel and spooling hazards.
Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Variables	May include: • operating temperatures • speed • nip settings • materials consistency • surface finish • product integrity and general conformance to specifications.
Problems	May include: • contamination of materials • incorrect machine set-up, especially the nip setting tensions • temperatures • uniformity of product • Appropriate action for problems outside area of responsibility may be reporting to an appropriate person. • Appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/ sources.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and calendaring process variables in relation to the process requirements and the end product • make adjustments to the process as required • identify and take appropriate action on problems and potential problems. • perform consistently. For example, to see that: ➢ the process runs consistently and smoothly, with the minimum need for intervention ➢ all safety procedures are followed.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • characteristics of materials and behaviour in relation to heat, pressure, flow rate and time

	• function and operating principles of calendaring equipment, machine components and ancillary equipment, including the mechanical , hydraulic, pneumatic, electrical and electronic principles which affect machine operation • identifying impact of machine settings such as nip setting, speed, temperature, tension etc. on product quality and production output • processing behaviour of those polymers which are moulded at the workplace • identifying characteristics of different types of coated materials • identifying impact of variations in raw materials and equipment operation in relation to final product • identifying changes to materials at various stages of production • waste management and importance of non-conforming materials • identifying polymer properties and their interactions with process conditions • relationships between polymer properties and process conditions • changes to polymer properties to better suit process requirements. • product problems related to polymer properties • product problems related to process conditions • make adjustments to process conditions to meet polymer and product requirements. • application of materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. • implementing organisations procedures, quality requirements at each production stage and relevant regulatory requirements; within appropriate time constraints and work standards. • Application of managing risks using the hierarchy of controls applied in the calendaring process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup. • identifying and take appropriate action on the range of possible causes of product faults
Underpinning Skills	Demonstrates skills to: • Apply approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup.

	• implement organizations procedures, quality requirements at each production stage and relevant regulatory requirements; within appropriate time constraints and work standards. • plan own work including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the calendaring process • identify factors which may affect product quality or production output and appropriate remedies • identify when assistance is required to solve problems. • determine time required to produce product at a given production rate, amount of compound required to produce the required amount of product. • read and interpret typical product specifications, job sheets, machine control panels, and material labels as provided to operators. • Write to the level of completing workplace forms and production reports.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Build Green Tires**
Unit Code	**IND PMP3 26 0613**
Unit Descriptor	This competency covers the production of 'green' tires through the operation and adjustment of the respective tire building machines and the solving of routine and non-routine problems. It also requires using a range of well-developed skills requiring some discretion and judgment to recognize and resolve a range of problems. It is performed by advanced operators applying knowledge of materials, product purpose, and processes to the operation green tire building equipment to produce green tire. It is typically performed by advanced operators who are involved in the assembly of basic tire components from intermediate production stages into a completed green tire ready for curing.

Elements	Performance Criteria
1. Plan own work requirements	1.1 Job requirements of tire to be built are identified. 1.2 Requirements for materials, quality, product and ***tools and equipment*** checks are identified. 1.3 Materials required including additives and regrind and their amounts or percentages are identified and checked. 1.4 Measures are implemented to control identified ***hazards***, in line with ***procedures*** and duty of care. 1.5 Requirements for materials, quality, and production and equipment checks are identified.
2. Startup green tire building machine to procedures	2.1 Process settings required for product is identified. 2.2 Process is set to required settings. 2.3 Materials are checked if they are correct. 2.4 Appropriate action is taken for non-conforming materials. 2.5 Date, batch and materials markings are set up to specifications, as required. 2.6 Pre-start checks are completed. 2.7 Green tire building machine is started up.
3. Operate and make minor adjustments to the green tire building process to procedures	3.1 Green tire building process, noting key ***variables*** are operated. 3.2 Controls/displays/terminals for production and process data are monitored. 3.3 Samples are taken as required and identify product out of specification.

	3.4 Product/process quality is monitored. 3.5 Supply of material(s) as required is maintained. 3.6 Adjustments are made to remedy faults and nonconformity as required. 3.7 Process is adjusted to minimize scrap and trim. 3.8 A stable tire building process is established. 3.9 Equipment is cleaned, adjusted and lubricated as required.
4. Shut down machine to procedures	4.1 Type of shutdown is determined. 4.2 Machine is cleaned as required. 4.3 Machine is left in appropriate condition and with appropriate locks, tags or notices. 4.4 Relevant documentation is completed. 4.5 Area is ensured clean and clear after the shutdown, in readiness for the next start up. 4.6 Machine is purged efficiently and adequately as required.
5. Anticipate and solve problems	5.1 A problem or potential problems is recognized. 5.2 ***Problems*** needing priority action are determined. 5.3 Problems outside area of responsibility are referred to appropriate person, with possible causes. 5.4 Information and assistance as required are sought to solve problems. 5.5 problems are solved within area of responsibility. 5.6 Items initiated are followed though until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • Green tire building machine • components green tire building machine (e.g. drum, stitchers) • hand tools as required • knives for bias cutting different component layers • Relevant personal protective equipment.
Hazards	• manual handling • cuts • noise, light, energy sources • humidity, air temperatures, radiant heat • stationary and moving machinery, parts and components • fumes/vapours

Procedures	• All operations are performed in accordance with appropriate procedures. • all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards
Variables	May include: • speed • temperature • output rate • product integrity and general conformance to specification
Problems	May include: • equipment malfunction • poorly aligned guides • mould incorrectly placed on machine • materials variations • contaminated materials • poor adhesion • process variations • variations in rotation speed • variations in temperature • Product distortion/damage. • distorted/misshaped components • protecting from damage and contamination • air pockets • ply, tread centering • splicing • appropriate action for problems outside of area of responsibility may be reporting to an appropriate person. • appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies of: • critical materials properties and green tire building process variables in relation to the process requirements and the end product • making adjustments to the process as required • Identifying and take appropriate action on problems and potential problems. • performing consistently. For example, to see that: ➢ the process runs consistently and smoothly, with the minimum need for human intervention ➢ All safety procedures are followed.

Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • Materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production, process problems and faults. • organizations procedures, quality requirements of products and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards. • managing risks using the hierarchy of controls applied to the resin transfer moulding process and compound materials using and open mill blender. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup. • Identifying the range of possible causes of product faults and take appropriate action. • function and operating principles of the tire building equipment and machine components • Identifying different components used in the tire building process (e.g. tubeless liner, first and second [or third] ply, beadwire), the function of different components and the reasons for differences in types and number of components used in different products • Identifying impact of machine speed, temperature, pressure, time during cycles on product quality and production output • Identifying effect of unauthorized or emergency shutdown in relation to safety and production requirements • waste management and importance of non-conforming materials • Identifying material properties and their interactions with process conditions • Identifying relationships between material properties and process conditions • Identifying changes to material properties to better suit process requirements. • Identifying product problems related to material properties • Identifying product problems related to process conditions • making adjustments to process conditions to meet material and product requirements. • Identifying the terms radial force, inflation pressure, lateral force, internal force harmonics and concentricity • Identifying different components used in the building process, Eg steel belts, treads • the function of different components, especially different tread compounds • Identifying range of products made using this method

	• Identifying reasons for differences in types and number of components used in different products • monitoring equipment operation and product quality
Underpinning Skills	Demonstrate skills to: • Identify the range of possible causes of product faults and take appropriate action. • Apply approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and • Implement organization procedures, quality requirements of production and relevant regulatory, within appropriate time constraints and work standards. • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the green tire building process • identify factors which may affect product quality or production output and appropriate remedies • Identify when assistance is required to solve problems. • identify when the operator is able to rectify faults, when assistance is required and who is the appropriate source for assistance • the level of completing workplace forms and production reports. • basic numeracy, eg to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg. • read and interpret typical product specifications, job sheets, procedures, material labels, machine control panels and safety information as provided to operators. • pause or shut down equipment in abnormal circumstances • explain the effect of unauthorized or emergency shutdown in relation to safety and production requirements.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Vulcanize Products Using an Autoclave**
Unit Code	**IND PMP3 27 0613**
Unit Descriptor	This unit applies to the application of knowledge of materials, product purpose and processes to the autoclave production of vulcanized rubber products. It typically applies to advanced operators who load green rubber products into an autoclave for curing/vulcanizing. The key factors are ensuring compatible loads and the right curing time, temperatures and pressures. It also requires using a range of well-developed skills, requiring some discretion and judgment to recognize and resolve a range of problems.

Elements	Performance Criteria
1. Plan own work requirements	1.1 Work requirements from workplace procedures are identified. 1.2 Equipment and processes used for materials preparation, vulcanizing and any related production process and for the downstream operations are identified. 1.3 Operating principles and components of vulcanizing ***equipment*** are identified***.*** 1.4 ***Hazards*** connected with materials and process from workplace reference materials including materials safety data sheets and equipment instructions are identified. 1.5 Measures are implemented to control identified hazards in line with procedures and duty of care. 1.6 Requirements for materials, quality, production and equipment checks are identified.
2. Set up autoclave vulcanizing process	2.1 Read equipment information, quality specifications and standard operating ***procedures*** are identified***.*** 2.2 Heat and pressure settings and process adjustments are checked for conformity to procedures. 2.3 Equipment and material condition to known optimum condition are compared and appropriate action is taken in accordance with procedures (including, where authorized, making adjustments within overall specifications to process settings to ensure product output quality is appropriate). 2.4 All gauges are checked operating, safety features are activated or fitted; locks and guards are in place.
3. Operate and make adjustments to the autoclave process to procedures	3.1 Autoclave is loaded and closed and brought on line. 3.2 Production outputs, equipment operating temperatures and pressures are monitored. 3.3 Adjustments are made to remedy faults and non-conformity as required.

	3.4 Autoclave is shut down, vented and unloaded. 3.5 Samples are taken as required and identify product out of specification. 3.6 Non-conformity are noted and reported to required workplace specifications, following workplace procedures. 3.7 Equipment is cleaned, adjusted and lubricated as required. 3.8 Equipment is paused or stopped in an emergency, following procedures. 3.9 Vulcanizing process, noting key ***variables*** are operated.
4. Respond to product quality improvement requests	4.1 Vulcanizing process is monitored and conditions are noted which may affect product quality standards. 4.2 Process variations are reported. 4.3 Changes are noted and implemented in standard operating procedures and specifications.
5. Anticipate and solve problems	6.1 A problem or a potential problem is recognized. 5.2 ***Problems*** needing priority action are determined. 5.3 Problems outside area of responsibility are referred to appropriate person, with possible causes. 5.4 Information and assistance as required are sought to solve problems. 5.5 Problems are solved within area of responsibility. 5.6 Items initiated are followed through until final resolution has occurred.

Variable	**Range**
Tools and equipment	May include: • hand carts and trolleys • knives and other trimming equipment • hoists/lifting equipment not requiring any special permits or licences • basic hand tools • relevant personal protective equipment.
Hazards	May include: • heat • confined spaces • manual handling hazards • knife hazards. • heat • confined spaces • manual handling hazards • knife hazards.

Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Variables	May include: • operating temperatures • stacking and loading off product for autoclaving • material composition • operating pressure • cycle time • output rate • product integrity and general conformance to specification and quality sample.
Problems	May include: • air/water blinding of steam equipment • faulty/unreliable gauges • matching loads requiring the same cure conditions • adjusting temperature/pressure profile to match load and product • wrong cure cycle • changed product cure systems/section • steam problems. • Appropriate action for problems outside of area of responsibility may be reporting to an appropriate person. • Appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical materials properties and rubber vulcanising process characteristics in relation to the process requirements and the end product • make adjustment to the process as required. • identify and take appropriate action on problems and potential problems. • perform consistently. For example, to see that: ➢ the process runs consistently and smoothly, with the minimum need for human intervention ➢ all safety procedures are always followed.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • materials, equipment and process sufficient to recognize material and equipment conditions which may lead to out of specification production

	• organizations procedures, quality requirements at each stage of production stage and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards • application of managing risks using the hierarchy of controls applied to the vulcanizing process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup. • identifying characteristics of materials and behavior in relation to heat, thickness and cure rates • identifying the function of vulcanizing equipment, components and the materials used • identifying changes to materials at various stages of production • identifying relationship between steam pressure and temperatures and the effects this and time will have on product quality and production output • identifying impact of heat and pressure in relation to providing strength, stiffness, resistance to deformation, fatigue and abrasion • monitoring equipment operation and product quality • identifying impact of product section/thickness on cure requirements • identifying impact of compound cure system on cure requirements • identifying impact of heating too quickly/slowly on final product properties • identifying compound properties and their interactions with process conditions • identifying relationships between compound properties and process conditions • identifying changes to compound properties to better suit process requirements • identifying product problems related to compound properties • identifying product problems related to process conditions • make adjustments to process conditions to meet compound and product requirements.
Underpinning Skills	Demonstrates skills to: • apply approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup. • identify the range of possible causes of product faults • apply requirements at each stage of production stage and relevant regulatory requirements along with the ability to

	implement them within appropriate time constraints and work standards. • plan own work, including predicting consequences identifying improvements • maintain output and product quality using appropriate instruments, controls checks, test information and readings • identify and describe own role and the roles of others involved directly in the vulcanizing process • identify when assistance is required to solve problems • identify factors which may affect product quality and production output and appropriate remedies. • the level of completing workplace forms, quality assurance records and production reports. • Basic numeracy is also required, e.g. to determine required steam pressure to give necessary time/temperature cycle. • read and interpret typical product specifications, job sheets and material labels as provided to operators.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Produce Finished Tires**
Unit Code	**IND PMP3 28 0613**
Unit Descriptor	This competence covers tire finishing operations and the solving of routine and non-routine problems. It applies to advanced operators who are required to apply knowledge of materials, product purpose and processes to produce finished tires that meet quality standards and requirements, It also requires using a range of well-developed skills requiring some discretion and judgment to recognize and resolve problems.

Elements	Performance Criteria
1. Plan own work requirements.	1.1 The appropriate ***equipment*** and processes to be used from production plan or request is identified. 1.2 Quality requirements for tire type is identified. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care.
2. Startup finishing process to procedures.	2.1 Equipment settings and adjustments are checked as required. 2.2 Date, batch and materials markings are set up to specifications, as required. 2.3 Other pre-start checks is completed in accordance with procedures.
3. Finish tires to specification.	3.1 Process equipment, noting key ***variables*** are operated. 3.2 Controls/displays/terminals for production/process data are monitored. 3.3 Product quality in accordance with procedures are monitored. 3.4 Adjustments are made to remedy faults and non-conformity to standard as required. 3.5 Other materials as well as disposing of reject tires are collected and reprocessed/discarded scrapped/trimmed in accordance with procedures. 3.6 Equipment is cleaned, adjusted and lubricated as required. 3.7 Equipment to procedures, in normal or emergency situations is shut down.
4. Anticipate and solve problems.	4.1 A problem or a potential problem is recognized. 4.2 ***Problems*** needing priority action is determined. 4.3 Problems outside area of responsibility are referred to appropriate person, with possible fault causes.

	4.4 Information and assistance as required are sought to solve problems. 4.5 Problems are solved within area of responsibility. 4.6 Items initiated until final resolution has occurred.

Variable	Range
Tools and equipment	May include: • process electrical/mechanical machine and its major components, e.g. radial run out machine, x-ray console (manual/auto), vulcanizer, spreader, force variation machine, camera throw out unit, radial run out and lateral run out peak unit, grinders, high point tape, harmonic balance • process equipment and its major components, e.g. digital measuring equipment, visual display unit, printer, labelling equipment, inflation panel, inspection station, trimming tools, power tools for tire repair, repair table, foot pedal, marking chalk and table • hand tools used in the process, e.g. hand held trimmers • mechanical crane, chucks, push trolleys, stillages, conveyors, etc. • relevant personal protective equipment, e.g. radiation discs for x-ray inspection • relevant protective clothing which may include gloves, safety glasses and appropriate footwear.
Hazards	May include: • Typical hazards include: ➢ dusts/vapours ➢ slip and fall ➢ temperature ➢ hazardous materials • manual handling hazards, e.g. loading and unloading tires from machines/equipment • machine/equipment operations, e.g. hand held trimmers, x-ray machines, inflating panels.
Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards. All operations are performed in accordance with procedures.
Variables	May include: • temperatures • speed

	• pressures • colour • tire components • repair standards • limits for repair • tire construction/integrity and general conformance to specification/sample, e.g. bumps/dips on tires.
Problems	May include: • routine and non-routine product faults, e.g. excess flash • machine malfunction • mould/tooling/die problems • variations in materials and/or contamination of materials processing problems, e.g. flow-through of tires. • Appropriate action for problems outside of area of responsibility may be reporting to an appropriate person. • Appropriate action for problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify tire properties and quality requirements in relation to the process requirements and the end product • make adjustments to the process as required • identify and take appropriate action on problems and potential problems. • perform consistent. For example, to see that: ➢ production quality and output standards are met consistently ➢ all safety procedures are always followed.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • materials, equipment and process sufficient to recognize material and equipment conditions which may lead to out of specification production • organizations procedures, quality requirements at each production stage and relevant regulatory requirements, within appropriate time constraints and work standards. • managing risks using the hierarchy of controls applied to tire finishing operations. • approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup, (e.g. maximum number of tires to be stacked per stillage). • basis for solving finishing problems, including different tire types, their construction and material content

	• quality requirements for the different types of tires • function and operating principles of equipment, machine components and ancillary equipment • correct selection and use of equipment, materials, processes and procedures • identifying characteristics of materials and behaviour in relation to heat, pressure, flow rate and time • identifying impact of key process variables on product quality and production output • waste management and importance of re-using non-conforming materials and products wherever possible • reading and interpreting typical product specifications, job sheets, material labels and machine control panels such as those displaying SPC information. • completing workplace forms and production reports. • operating force variation machine, basic statistical knowledge is required to understand concepts of variance and process control as well as to recognize and interpret process control charts.
Underpinning Skills	• apply materials, equipment and process sufficient to recognize material and equipment conditions which may lead to out of specification production. • Implement organization procedures, quality requirements at each production stage and relevant regulatory requirements, within appropriate time constraints and work standards • Apply the knowledge of managing risks using the hierarchy of controls applied to tire finishing operations. • Apply of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup, (e.g. maximum number of tires to be stacked per stillage). • plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the process • Identify when assistance is required to solve problems. • read and interpret typical product specifications, job sheets, material labels and machine control panels such as those displaying SPC information. • Complete workplace forms and production reports. • Computing, basic statistical knowledge is required to understand concepts of variance and process control as well as to recognize and interpret process control charts.

Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Inspect Tires**
Unit Code	**IND PMP3 30 0613**
Unit Descriptor	This competency covers the testing and inspection of tires and the solving of routine and non-routine problems. It is typically performed by advanced operators applying knowledge of materials, product purpose and processes in tire inspection and testing to ensure quality, in both performance and safety, of finished tires. It also requires using a range of well-developed skills requiring some discretion and judgment to recognize and resolve a range of problems.

Elements	Performance Criteria
1. Plan own work requirements.	1.1 The most appropriate ***equipment*** and processes to be used for tire inspection and testing is identified. 1.2 Different tire types, identification coding and quality standards required are identified. 1.3 Measures are implemented to control identified ***hazards*** in line with ***procedures*** and duty of care. 1.4 Repair, scrap tire and housekeeping needs are identified.
2. Startup testing process to procedures.	2.1 Visual inspections of tires is conducted to spot obvious defects. 2.2 Bumps or dips are manually located. 2.3 Inspection equipment settings is checked and adjustments are made as required. 2.4 Other pre-start checks in accordance with procedures is completed.
3. Operate tire testing machines to procedures.	3.1 Machine is operated to rotate and test tires, following standard operating procedures and State OHS requirements. 3.2 Product quality is monitored in accordance with procedures. 3.3 Equipment is cleaned, adjusted and lubricated as required. 3.4 Equipment to procedures, in normal or emergency situations is shut down. 3.5 Relevant documentation is completed.
4. Respond to faults.	4.1 Possible routine and non-routine faults in the tire is identified. 4.2 Tires needing action is determined. 4.3 Possible fault causes is determined. 4.4 Faults outside area of responsibility are reported to designated person.

	4.5 Appropriate records and log books are maintained to meet procedures/work instructions. 4.6 ***Problems*** are solved within area of responsibility
5. Stamp, label and sort tires.	5.1 Identification number on each tire is stamped. 5.2 Tires are labeled with weekly code. 5.3 Passed tires are sorted by coding. 5.4 Tires are sorted for repair or scrap. 5.5 Inspecting equipment, noting key ***variables*** are operated.

Variable	**Range**
Tools and equipment	May include: • tire testing machines such as x-ray, uniformity, bulge test, and tire balance test machines • hand tools used in the inspection/testing process • material loading equipment used for loading of tires • relevant personal protective equipment.
Hazards	May include: • manual handling hazards • equipment operations • dust/ vapours.
Procedures	• All operations are performed in accordance with appropriate procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Variables	May include: • colour • product weight • product integrity
Problems	May include: • Typical routine faults include: ➢ bulges in sidewalls ➢ deformation ➢ damaged carcass ➢ offset ➢ snaking and cuts. • Typical inspection/testing problems may include: ➢ equipment malfunction ➢ incorrect set-up of testing machine to tire type ➢ detecting hidden damage. • Appropriate action for problems outside area of responsibility may be reporting to an appropriate person.

	• Appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify critical tire properties and inspection criteria in relation to the end product • make adjustments to inspections/testing process and equipment as required • identify and take appropriate action on problems and potential problems. • perform consistently. For example, to see that: ➢ tire inspection and testing standards are met consistently ➢ all safety procedures are always followed.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • materials, equipment and testing process sufficient to recognise material and equipment conditions which may lead to out of specification production • implement organizations procedures, the quality requirements at each production stage and relevant regulatory requirements, within appropriate time constraints and work standards. • Application of managing risks using the hierarchy of controls applied to the tire inspection/testing processes. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials. equipment operation and cleanup. • tire inspection and testing equipment, including: ➢ different tire types and their construction and material content ➢ quality requirements for the different types of tires ➢ function and operating principles of tire testing equipment, machine components and ancillary equipment ➢ correct selection and use of equipment and inspection/testing procedures ➢ waste management and importance of repairing non-conforming products.
Underpinning Skills	Demonstrates skills to: • apply of approved hazard control and safety procedures and the use of PPE in relation to handling materials. equipment operation and cleanup. • apply quality requirements at each production stage and relevant regulatory requirements, within appropriate time constraints and work standards.

	• plan own work, including predicting consequences and identifying improvements • maintain output and product quality using appropriate instruments, controls, test information and readings • identify and describe own role and role of others involved directly in the inspection/testing process • identify what faults the operator is able to recognise manually and when assistance by equipment is required. • read and interpret typical product specifications, job sheets and machine control panels such as those displaying SPC information.. • write is required to the level of completing workplace forms and production reports. • basic numeracy, e.g. to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Monitor Implementation of Work Plan/Activities**
Unit Code	**IND PMP3 30 0613**
Unit Descriptor	This unit covers competence required to oversee and monitor the quality of work operations within an enterprise. It may be carried out by team leaders or supervisors.

Elements	Performance Criteria
1. Monitor and improve workplace operations	1.1 Efficiency and service levels are monitored on an ongoing basis. 1.2 Operations in the workplace support overall enterprise goals and quality assurance initiatives. 1.3 Quality ***problems*** and issues are promptly identified and adjustments are made accordingly. 1.4 Procedures and systems are changed in consultation with colleagues to improve efficiency and effectiveness. 1.5 Colleagues are consulted about ways to improve efficiency and service levels.
2. Plan and organise workflow	2.1 Current workload of colleagues is accurately assessed. 2.2 Work is scheduled in a manner which enhances efficiency and customer service quality. 2.3 Work is delegated to appropriate people in accordance with principles of delegation. 2.4 Workflow is assessed against agreed objectives and timelines and colleagues are assisted in prioritisation of workload. 2.5 Input is provided to appropriate management regarding staffing needs.
3. Maintain workplace records	3.1 ***Workplace records*** are accurately completed and submitted within required timeframes. 3.2 Where appropriate completion of records is delegated and monitored prior to submission.
4. Solve problems and make decisions	4.1 Workplace problems are promptly identified and considered from an operational and customer service perspective. 4.2 Short term action is initiated to resolve the immediate problem where appropriate. 4.3 Problems are analysed for any long term impact and potential solutions are assessed and actioned in consultation with relevant colleagues.

	4.4 Where problem is raised by a team member, they are encouraged to participate in solving the problem. 4.5 Follow up action is taken to monitor the effectiveness of solutions in the workplace.

Variables	**Range**
Problems	May include but not limited to: • difficult customer service situations • equipment breakdown/technical failure • delays and time difficulties • competence
Workplace records	May include but is not limited to: • staff records and regular performance reports

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge in: • ability to effectively monitor and respond to a range of common operational and service issues in the workplace • understanding of the role of staff involved in workplace monitoring • knowledge of quality assurance, principles of workflow planning, delegation and problem solving
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • roles and responsibilities in monitoring work operations • overview of leadership and management responsibilities • principles of work planning and principles of delegation • typical work organization methods appropriate to the sector • quality assurance principles and time management • problem solving and decision making processes • industrial and/or legislative issues which affect short term work organization as appropriate to industry sector
Underpinning Skills	Demonstrate skills to: • monitor and improve workplace operations • plan and organize workflow • maintain workplace records
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Apply Quality Control**
Unit Code	**IND PMP3 32 0613**
Unit Descriptor	This unit covers the knowledge, attitudes and skills required in applying quality control in the workplace.

Elements	Performance Criteria
1. Implement quality standards	1.1 Agreed quality standard and procedures are acquired and confirmed. 1.2 Standard procedures are introduced to organizational staff/personnel. 1.3 Quality standard and procedures documents are provided to employees in accordance with the organization policy. 1.4 Standard procedures are revised / updated when necessary.
2. Assess quality of service delivered	2.1 Services delivered are ***quality checked*** against organization ***quality standards*** and specifications. 2.2 Service delivered are evaluated using the appropriate evaluation ***quality parameters*** and in accordance with organization standards. 2.3 Causes of any identified faults are identified and corrective actions are taken in accordance with organization policies and procedures.
3. Record information	3.1 Basic information on the quality performance is recorded in accordance with organization procedures. 3.2 Records of work quality are maintained according to the requirements of the organization.
4. Study causes of quality deviations	4.1 Causes of deviations from final outputs or services are investigated and reported in accordance with organization procedures. 4.2 Suitable preventive action is recommended based on organization quality standards and identified causes of deviation from specified quality standards of final service or output.
5. Complete documentation	5.1 Information on quality and other indicators of service performance is recorded. 5.2 All service processes and outcomes are recorded.

Variable	Range
Quality check	May include but not limited to: • Check against design / specifications • Visual inspection and Physical inspection

Quality standards	May include but not limited to: • materials • components • process • procedures
Quality parameters	May include but not limited to: • standard Design / Specifications • material Specification

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge to: • Check completed work continuously against organization standard • Identify and isolate faulty or poor service • Check service delivered against organization standards • Identify and apply corrective actions on the causes of identified faults or error • Record basic information regarding quality performance • Investigate causes of deviations of services against standard • Recommend suitable preventive actions
Underpinning Knowledge	Demonstrates knowledge of: • Relevant quality standards, policies and procedures • Characteristics of services • Safety environment aspects of service processes • Evaluation techniques and quality checking procedures • Workplace procedures and reporting procedures
Underpinning Skills	Demonstrates skills to: • interpret work instructions, specifications and standards appropriate to the required work or service • carry out relevant performance evaluation • maintain accurate work records • meet work specifications and requirements • communicate effectively within defined workplace procedures
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Lead Workplace Communication**
Unit Code	**IND PMP3 32 0613**
Unit Descriptor	This unit covers the knowledge, attitudes and skills needed to lead in the dissemination and discussion of information and issues in the workplace.

Elements	Performance Criteria
1. Communicate information about workplace processes	1.1 Appropriate ***communication method*** is selected. 1.2 Multiple operations involving several topics areas are communicated accordingly. 1.3 Questions are used to gain extra information. 1.4 Correct sources of information are identified. 1.5 Information is selected and organized correctly. 1.6 Verbal and written reporting is undertaken when required. 1.7 Communication skills are maintained in all situations.
2. Lead workplace discussion	2.1 Response to workplace issues is sought. 2.2 Response to workplace issues are provided immediately. 2.3 Constructive contributions are made to workplace discussions on such issues as production, quality and safety. 2.4 Goals/objectives and action plan undertaken in the workplace are communicated.
3. Identify and communicate issues arising in the workplace	3.1 Issues and problems are identified as they arise. 3.2 Information regarding problems and issues are organized coherently to ensure clear and effective communication. 3.3 Dialogue is initiated with appropriate staff/personnel. 3.4 Communication problems and issues are raised as they arise.

Variable	Range
Methods of communication	May include: • Non-verbal gestures • Verbal • Face to face • Two-way radio • Speaking to groups • Using telephone

	• Written • Using Internet • Cell phone

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge to: • Deal with a range of communication/information at one time • Make constructive contributions in workplace issues • Seek workplace issues effectively • Respond to workplace issues promptly • Present information clearly and effectively written form • Use appropriate sources of information • Ask appropriate questions • Provide accurate information
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Organization requirements for written and electronic communication methods • Effective verbal communication methods
Underpinning Skills	Demonstrates skills to: • Organize information • Understand and convey intended meaning • Participate in variety of workplace discussions • Comply with organization requirements for the use of written and electronic communication methods
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Lead Small Teams**
Unit Code	**IND PMP3 33 0613**
Unit Descriptor	This unit covers the skills, knowledge and attitudes required to determine individual and team development needs and facilitate the development of the work group.

Elements	Performance Criteria
1. Provide team leadership	1.1 ***Learning and development needs*** are systematically identified and implemented in line with ***organizational requirements***. 1.2 Learning plan to meet individual and group training and developmental needs is collaboratively developed and implemented. 1.3 Individuals are encouraged to self-evaluate performance and identify areas for improvement. 1.4 ***Feedback on performance*** of team members is collected from relevant sources and compared with established team learning process.
2. Foster individual and organizational growth	2.1 Learning and development program goals and objectives are identified to match the specific knowledge and skills requirements of competence standards. 2.2 ***Learning delivery methods*** are appropriate to the learning goals, the learning style of participants and availability of equipment and resources. 2.3 Workplace learning opportunities and coaching/ mentoring assistance are provided to facilitate individual and team achievement of competencies. 2.4 Resources and timelines required for learning activities are identified and approved in accordance with organizational requirements.
3. Monitor and evaluate workplace learning	3.1 Feedback from individuals or teams is used to identify and implement improvements in future learning arrangements. 3.2 Outcomes and performance of individuals/teams are assessed and recorded to determine the effectiveness of development programs and the extent of additional support. 3.3 Modifications to learning plans are negotiated to improve the efficiency and effectiveness of learning. 3.4 Records and reports of competence are maintained within organizational requirement.

4. Develop team commitment and cooperation	4.1 Open communication processes to obtain and share information is used by team. 4.2 Decisions are reached by the team in accordance with its agreed roles and responsibilities. 4.3 Mutual concern and camaraderie are developed in the team.
5. Facilitate accomplishment of organizational goals	5.1 Team members actively participated in team activities and communication processes. 5.2 Teams' members developed individual and joint responsibility for their actions. 5.3 Collaborative efforts are sustained to attain organizational goals.

Variable	**Range**
Learning and development needs	May include but not limited to: • Coaching, mentoring and/or supervision • Formal/informal learning program • Internal/external training provision • Work experience/exchange/opportunities • Personal study • Career planning/development • Performance appraisals • Workplace skills assessment & Recognition of prior learning
Organizational requirements	May include but not limited to: • Quality assurance and/or procedures manuals • Goals, objectives, plans, systems and processes • Legal and organizational policy/guidelines and requirements • Safety policies, procedures and programs • Confidentiality and security requirements • Business and performance plans • Ethical standards • Quality and continuous improvement processes and standards
Feedback on performance	May include but not limited to: • Formal/informal performance appraisals • Obtaining feedback from supervisors and colleagues • Obtaining feedback from clients • Personal and reflective behavior strategies • Routine and organizational methods for monitoring service delivery
Learning delivery methods	• On the job coaching or mentoring • Problem solving • Presentation/demonstration

	• Formal course participation • Work experience and Involvement in professional networks • Conference/seminar attendance and induction

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge in: • identify and implement learning opportunities for others • give and receive feedback constructively • facilitate participation of individuals in the work of the team • negotiate learning plans to improve the effectiveness of learning • prepare learning plans to match skill needs • access and designate learning opportunities
Underpinning Knowledge and Attitude	Demonstrates knowledge of: • coaching and mentoring principles • how to work effectively with team members who have diverse work styles, aspirations, cultures and perspective • how to facilitate team development and improvement • methods and techniques for eliciting and interpreting feedback • methods for identifying and prioritizing personal development opportunities and options • career paths and competence standards in the industry
Underpinning Skills	Demonstrates skills to: • read and understand a variety of texts, prepare general information and documents according to target audience; spell with accuracy; use grammar and punctuation effective relationships and conflict management • receive feedback and report, maintain effective relationships and conflict management • organize required resources and equipment to meet learning needs • provide support to colleagues • organize information; assess information for relevance and accuracy; identify and elaborate on learning outcomes • facilitation skills to conduct small group training sessions • relate to people from a range of social, cultural, physical and mental backgrounds
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Improve Business Practice**
Unit Code	**IND PMP3 34 0613**
Unit Descriptor	This unit covers the skills, knowledge and attitudes required in promoting, improving and growing business operations.

Elements	Performance Criteria
1. Diagnose the business	1.1 ***Data required*** for diagnosis is determined and acquired. 1.2 ***Competitive advantage*** of the business is determined from the data. 1.3 ***SWOT analysis*** of the data is undertaken.
2. Benchmark the business	2.1 Sources of relevant benchmarking data are identified. 2.2 ***Key indicators*** for benchmarking are selected in consultation with key stakeholders. 2.3 Like indicators of own practice are compared with benchmark indicators. 2.4 Areas for improvement are identified.
3. Develop plans to improve business performance	3.1 A consolidated list of required improvements is developed. 3.2 Cost-benefit ratios for required improvements are determined. 3.3 Work flow changes resulting from proposed improvements are determined. 3.4 Proposed improvements are ranked according to agreed criteria. 3.5 An action plan is developed and agreed to implement the top ranked improvements. 3.6 ***Organizational structures*** are checked to ensure they are suitable.
4. Develop marketing and promotional plans	4.1 The practice vision statement is reviewed. 4.2 Practice ***objectives*** are developed/reviewed. 4.3 Target markets are identified/refined. 4.4 ***Market research data*** is obtained. 4.5 ***Competitor analysis*** is obtained. 4.6 ***Market position*** is developed/reviewed. 4.7 ***Practice brand*** is developed. 4.8 ***Benefits*** of practice/practice products/services are identified. 4.9 ***Promotion tools*** are selected/developed.

5. Develop business growth plans	5.1 Plans are developed to increase ***yield per existing client***. 5.2 Plans are developed to add new clients. 5.3 Proposed plans are ranked according to agreed criteria. 5.4 An action plan is developed and agreed to implement the top ranked plans. 5.5 Practice work practices are reviewed to ensure they support growth plans.
6. Implement and monitor plans	6.1 Implementation plan is developed in consultation with all relevant stakeholders. 6.2 Indicators of success of the plan are agreed. 6.3 Implementation is monitored against agreed indicators. 6.4 Implementation is adjusted as required.

Variable	**Range**
Data required	May include but not limited to: • organization capability • appropriate business structure • level of client service which can be provided • internal policies, procedures and practices • staff levels, capabilities and structure • market, market definition • market changes/market segmentation • market consolidation/fragmentation • revenue • level of commercial activity • expected revenue levels, short and long term • revenue growth rate • break even data • pricing policy • revenue assumptions • business environment • economic conditions • social factors • demographic factors • technological impacts • political/legislative/regulative impacts • competitors, competitor pricing and response to pricing • competitor marketing/branding • competitor products
Competitive advantage	May include but not limited to: • services/products • fees

	• location • timeframe
SWOT analysis	May include but not limited to: • internal strengths such as staff capability, recognized • quality • internal weaknesses such as poor morale, • under-capitalization, poor technology • external opportunities such as changing market and • economic conditions • external threats such as industry fee structures, strategic • alliances, competitor marketing
Key indicators	May include but not limited to: • salary cost and staffing • personnel productivity (particularly of principals) • profitability • fee structure • client base • size staff/principal • overhead/overhead control
Organizational structures	May include but not limited to: • Legal structure (partnership, Limited Liability Company, etc.) • organizational structure/hierarchy • reward schemes
Objectives should be 'SMART' , that:	May include but not limited to: • S: Specific • M: Measurable • A: Achievable • R: Realistic • T: Time defined
Market research data	May include but not limited to: • data about existing clients • data about possible new clients • data from internal sources • data from external sources such as: ➢ trade associations/journals ➢ Yellow Pages small business surveys ➢ libraries ➢ Internet ➢ Chamber of Commerce ➢ client surveys ➢ industry reports ➢ secondary market research • primary market research such as: ➢ telephone surveys

	➢ personal interviews ➢ mail surveys
Competitor analysis	May include but not limited to: • competitor offerings • competitor promotion strategies and activities • competitor profile in the market place
Market position	May include but not limited to: • product • the good or service provided • product mix • the core product - what is bought • the tangible product - what is perceived • the augmented product - total package of consumer • features/benefits • product differentiation from competitive products • new/changed products • Price and pricing strategies (cost plus, supply/demand, ability to pay, etc.) • Pricing objectives (profit, market penetration, etc.) • cost components • market position • distribution strategies • marketing channels • promotion • promotional strategies • target audience • communication • promotion budget
Practice brand	May include but not limited to: • data on practice image • practice logo/letter head/signage • phone answering protocol • facility decor • slogans • templates for communication/invoicing • style guide • writing style • AIDA (attention, interest, desire, action)
Benefits	May include but not limited to: • features as perceived by the client • benefits as perceived by the client
Promotion tools	May include but not limited to: • networking and referrals • seminars

	• advertising • press releases • publicity and sponsorship • brochures • newsletters (print and/or electronic) • websites • direct mail • telemarketing/cold calling
Yield per existing client may be increased by:	May include but not limited to: • raising charge out rates/fees • packaging fees • reduce discounts • sell more services to existing clients

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge in: • ability to identify the key indicators of business performance • ability to identify the key market data for the business • knowledge of a wide range of available information sources • ability to acquire information not readily available within a business • ability to analyze data and determine areas of improvement • ability to negotiate required improvements to ensure implementation • ability to evaluate systems against practice requirements and form recommendations and/or make recommendations • ability to assess the accuracy and relevance of information
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • data analysis • communication skills • computer skills to manipulate data and present information • negotiation skills • problem solving • planning skills • marketing principles • ability to acquire and interpret relevant data
Underpinning Skills	Demonstrates skill in: • data analysis and manipulation • ability to acquire and interpret required data, current practice systems and structures and sources of relevant benchmarking data • applying methods of selecting relevant key benchmarking indicators • communication skills

	• working and consulting with others when developing plans for the business • planning skills, negotiation skills and problem solving • using computers to manipulate, present and distribute information
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level III	
Unit Title	**Prevent and Eliminate MUDA**
Unit Code	**IND PMP3 35 0613**
Unit Descriptor	This unit of competence covers the knowledge, skills and attitude required by a worker to prevent and eliminate MUDA/wastes in his/her their workplace. It covers responsibility for the day-to-day operation of the work and ensures Kaizen elements are continuously improved and institutionalized.

Elements	Performance Criteria
1. Prepare for work.	1.1 Work instructions are used to determine job requirements, including method, material and equipment. 1.2 Job specifications are read and interpreted following working manual. 1.3 ***OHS requirements***, including dust and fume collection, breathing apparatus and eye and ear personal protection needs are observed throughout the work. 1.4 Appropriate material is selected for work. 1.5 ***Safety equipment and tools*** are identified and checked for safe and effective operation.
2. Identify MUDA.	2.1 Plan of MUDA identification is prepared and implemented. 2.2 Causes and effects of MUDA are discussed. 2.3 ***Tools and techniques*** are used to draw and analyze current situation of the work place. 2.4 Wastes/MUDA are identified and measured based on ***relevant procedures***. 2.5 Identified and measured wastes are reported to relevant personnel.
3. Eliminate wastes/MUDA.	3. 1. Plan of MUDA elimination is prepared and implemented. 3. 2. Necessary attitude and ***the ten basic principles for improvement*** are adopted to eliminate waste/MUDA. 3. 3. Tools and techniques are used to eliminate wastes/MUDA based on the procedures and OHS. 3. 4. Wastes/MUDA are reduced and eliminated in accordance with OHS and organizational requirements. 3. 5. Improvements gained by elimination of waste/MUDA are reported to relevant bodies.
4. Prevent occurrence of wastes/MUDA.	4.1 Plan of MUDA prevention is prepared and implemented.

	4.2 Standards required for machines, operations, defining normal and abnormal conditions, clerical procedures and procurement are discussed and prepared. 4.3 Occurrences of wastes/MUDA are prevented by using ***visual and auditory control methods***. 4.4 Waste-free workplace is created using ***5W and 1H***sheet. 4.5 The completion of required operation is done in accordance with standard procedures and practices. 4.6 The updating of standard procedures and practices is facilitated. 4.7 The capability of the work team that aligns with the requirements of the procedure is ensured.

Variable	**Range**
OHS requirements	May include but not limited to: • Are to be in accordance with legislation/ regulations/codes of practice and enterprise safety policies and procedures. This may include protective clothing and equipment, use of tooling and equipment, workplace environment and safety, handling of material, use of fire fighting equipment, enterprise first aid, hazard control and hazardous materials and substances. • Personal protective equipment is to include that prescribed under legislation/regulations/codes of practice and workplace policies and practices. • Safe operating procedures are to include, but are not limited to the conduct of operational risk assessment and treatments associated with workplace organization. • Emergency procedures related to this unit are to include but may not be limited to emergency shutdown and stopping of equipment, extinguishing fires, enterprise first aid requirements and site evacuation.
Safety equipment and tools	May include but not limited to: • dust masks / goggles • glove • working cloth • first aid • safety shoes
Tools and techniques	May include but not limited to: • Plant Layout • Process flow • Other Analysis tools • Do time study by work element

	• Measure Travel distance • Take a photo of workplace • Measure Total steps • Make list of items/products, who produces them and who uses them & those in warehouses, storages etc. • Focal points to Check and find out existing problems • 5S • Layout improvement • Brainstorming • Andon • U-line • In-lining • Unification • Multi-process handling & Multi-skilled operators • A.B. control (Two point control) • Cell production line • TPM (Total Productive Maintenance)
Relevant procedures	May include but not limited to: • Make waste visible • Be conscious of the waste • Be accountable for the waste. • Measure the waste.
The ten basic principles for improvement	May include but not limited to: • Throw out all of your fixed ideas about how to do things. • Think of how the new method will work- not how it won. • Don't accept excuses. Totally deny the status quo. • Don't seek perfection. A 5o percent implementation rate is fine as long as it's done on the spot. • Correct mistakes the moment they are found. • Don't spend a lot of money on improvements. • Problems give you a chance to use your brain. • Ask "why?" At least five times until you find the ultimate cause. • Ten people's ideas are better than one person's. • Improvement knows no limits.
Visual and auditory control methods	May include but not limited to: • Red Tagging • Sign boards • Outlining • Andons • Kanban, etc.
5W and 1H	May include but not limited to: • Who • What

	• Where • When • Why • How

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge to: • discuss why wastes occur in the workplace • discuss causes and effects of wastes/MUDA in the workplace • analyze the current situation of the workplace by using appropriate tools and techniques • identify, measure, eliminate and prevent occurrence of wastes by using appropriate tools and techniques • use 5W and 1H sheet to prevent
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Targets of customers and manufacturer/service provider • Traditional and kaizen thinking of price setting • Kaizen thinking in relation to targets of manufacturer/service provider and customer • value • The three categories of operations • the 3“MU” • waste/MUDA • wastes occur in the workplace • The 7 types of MUDA • The Benefits of identifying and eliminating waste • Causes and effects of 7 MUDA • Procedures to identify MUDA • Necessary attitude and the ten basic principles for improvement • Procedures to eliminate MUDA • Prevention of wastes • Methods of waste prevention • Definition and purpose of standardization • Standards required for machines, operations, defining normal and abnormal conditions, clerical procedures and procurement • Methods of visual and auditory control • TPM concept and its pillars. • Relevant Occupational Health and Safety (OHS) and environment requirements • Plan and report • Method of communication

Underpinning Skills	Demonstrates skills to: • draw & analyze current situation of the work place • use measurement apparatus (stop watch, tape, etc.) • calculate volume and area • use and follow checklists to identify, measure and eliminate wastes/MUDA • identify and measure wastes/MUDA in accordance with OHS and procedures • use tools and techniques to eliminate wastes/MUDA in accordance with OHS procedure • apply 5W and 1H sheet • update and use standard procedures for completion of required operation • work with others • read and interpret documents • observe situations • solve problems • communicate • gather evidence by using different means • report activities and results using report formats
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

NTQF Level IV

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Perform Chemical Tests and Procedures**
Unit Code	**IND PMP4 01 0613**
Unit Descriptor	This unit of competency covers the ability to interpret chemical test requirements, prepare samples, conduct pre-use and calibration checks on equipment and perform routine chemical tests/procedures. These tests will involve several measurement steps. It includes data processing and interpretation of results and tracking of obvious test malfunctions where the procedure is standardized.

Elements	Performance Criteria
1. Interpret and schedule test requirements	1.1 Test request, ***chemical principles and concepts*** are reviewed to identify samples to be tested, test method and equipment/instruments involved. 1.2 ***Hazards*** and enterprise ***control measures*** associated with the sample, preparation/test methods, reagents and/or equipment are identified. 1.3 Work sequences is planned to optimize throughput of multiple samples, if appropriate.
2. Receive and prepare samples	2.1 Samples using Standard Operating Procedures (SOPs) are logged. 2.2 Sample description is recorded, compare with specification and note and report discrepancies. 2.3 ***Samples*** and ***standards*** are prepared in accordance with chemical testing requirements. 2.4 Traceability of samples is ensured from receipt to reporting of results.
3. Check equipment before use	3.1 ***Types of instrumentation and instrumental techniques*** are identified. 3.2 Equipment/instruments are set up in accordance with test method requirements. 3.3 Pre-use and safety checks are performed in accordance with relevant enterprise and operating procedures. 3.4 Faulty or unsafe components and equipment are identified and reported to appropriate personnel. 3.5 Equipment calibration is checked using specified standards and procedures, if applicable.

	3.6 Calibration equipment/instruments are quarantined out. 3.7 Reagents required for ***chemical tests*** are available and meet quality requirements are ensured.
4. Test samples to determine chemical species or properties	4.1 Equipment/instruments are operated in accordance with test method requirements. 4.2 Tests/procedures including ***instrumental and non-instrumental*** ones on all samples and standards are performed, if appropriate, in accordance with specified methods. 4.3 Equipment/instruments are shut down in accordance with operating procedures.
5. Process and interpret data	5.1 Test data noting atypical observations is ***recorded***. 5.2 Calibration graphs, if appropriate, are constructed and results for all samples from these graphs are computed. 5.3 Calculated values consistent with expectations are ensured. 5.4 Results are recorded and reported in accordance with enterprise procedures. 5.5 Uncertainty of measurement are estimated and documented in accordance with enterprise procedures, if required. 5.6 Trends in data and/or results are interpreted and reported out of specification or atypical results promptly to appropriate personnel. 5.7 If obvious procedure or equipment problems have led to atypical data or results are determined.
6. Maintain a safe work environment	6.1 Established safe work practices and personal protective equipment are used to ensure personal safety and that of other laboratory personnel. 6.2 The generation of wastes and environmental impacts are minimized. 6.3 The safe collection of laboratory and hazardous waste for subsequent disposal as per ***Occupational Health and Safety (OHS) and environmental management requirements*** is ensured***.*** 6.4 Equipment and reagents are taking cared for and stored as required.
7. Maintain laboratory records	7.1 Approved data are entered into laboratory information management system.

	7.2 Confidentiality and security of enterprise information and laboratory data are maintained. 7.3 Equipment and calibration logs are maintained in accordance with enterprise procedures.

Variable	Range
Chemical principles and concepts	May include: • ions, atoms, molecules, bonding and links to chemical properties • chemical reactions involving acid/base, redox, complex ion formation, solubility and equilibrium • energy levels and absorption/emission spectra
Hazards	May include: • chemicals • acids (e.g. sulphuric, perchloric and hydrofluoric) • heavy metals and pesticides • anions (e.g. fluoride) • hydrocarbons (e.g. mono-aromatics) • aerosols from broken centrifuge tubes, pipetting • sharps and broken glassware • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • fluids under pressure, such as hydrogen in gas liquid chromatography, acetylene in atomic absorption spectrometry • sources of ignition • high-temperature ashing processes • disturbance or interruption of services
Hazard control measures	May include: • ensuring access to service shut-off points • recognizing and observing hazard warnings and safety signs • labeling of samples, reagents, aliquoted samples and hazardous materials • handling and storage of hazardous materials and equipment in accordance with labeling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as gloves, safety glasses and coveralls • using containment facilities (PCII, PCIII and PCIV physical containment laboratories), containment equipment

	(biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets) and containment procedures • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapor, fumes, odor and particulates to appropriate personnel
Sample preparation processes	May include: • grinding • mulling • preparation of discs • digestion • dissolving • ashing • refluxing • tracting • filtration • evaporation • flocculation • precipitation • washing • drying • centrifugation
Standards**,** codes**,** procedures and**/**or enterprise requirements	May include Ethiopian and international standards, such as: • (Include Standard No)Recommended practice for chemical analysis by atomic absorption spectrometry - Flame atomic absorption spectrometry • (Include Standard No)Verification and use of volumetric apparatus - General - Volumetric glassware • (Include Standard No)Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry • ISO 1000-1998 The international system of units (SI) and its application • ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • (Include Standard No)Safety in laboratories set • ISO 9000 Set:2008 Quality management systems set • Ethiopian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment manuals • equipment startup, operation and shutdown procedures • industry methods for inorganic constituents • Material Safety Data Sheets (MSDS) and safety procedures

	• material, production and product specifications • national measurement regulations and guidelines • principles of Good Laboratory Practice (GLP) • production and laboratory schedules • quality manuals and equipment and procedure manuals • SOPs • waste minimization and safe disposal procedures
Types of instrumentation and instrumental techniques	May include: • colorimetric techniques, such as enzyme activity, chlorine in water, specific cations and anions • infrared, ultraviolet-visible (UV-VIS) spectrophotometry • Other spectrometric techniques: ➢ fluorimetric analysis, flame atomic emission and flame atomic absorption spectrometry ➢ fourier transform infrared ➢ Chromatographic techniques: ➢ column and thin layer analytical and preparative chromatography ➢ gas or liquid chromatography for purity, raw material and formulation checks ➢ ion chromatography for detection of nitrates, phosphates, sulphates, chlorides and bromides ➢ gel filtration chromatography for purification of proteins ➢ electrochemical techniques, such as pH, eH, conductivity and ion-selective electrodes ➢ electrophoretic techniques for DNA patterns and determination of protein purity • Soil testing: ➢ moisture content ➢ organic matter content ➢ specific anions and cations ➢ auto-analyzers for determination of total P, total Kjeldahl N, orthophosphate, nitrite/nitrate and ammonia
Chemical tests methods	May include: • control of starting materials, in-process materials and finished products • environmental monitoring • basic troubleshooting and/or problem solving within the scope of SOPs and enterprise processes
Instrumental tests	May include: • spectrometry • chromatography • electrochemistry
Non-instrumental test**/**procedures	May include: • Gravimetric analysis:

	➢ loss on drying ➢ suspended solids ➢ ashes, such as sulphated and gravimetric assays (e.g. sulphates and nitrogen in fertilizers) ➢ Ni by dimethylglyoxime ➢ bitumen content of asphaltic concrete • Titrimetric analysis: ➢ acid/base determinations ➢ complexiometric, such as water hardness, Fe by dichromate and binder content analysis ➢ redox, such as precipitation of chlorides in water ➢ Dissolved Oxygen (DO), chemical oxygen demand (COD) and biochemical oxygen demand (BOD) ➢ filtration, separation and solvent extraction techniques ➢ corrosion testing, cement content and accelerated weathering
Records	• test and calibration results • equipment use, maintenance and servicing history • faulty or unsafe equipment
Occupational Health and Safety (OHS) and environmental management requirements	May include: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to : • interpret test methods/procedures accurately • prepare and test samples using procedures appropriate to the nature of sample • perform calibration checks (if required) • safely operate test equipment/instruments to enterprise standards and/or manufacturer's specification • prepare calibration graphs and calculate results using appropriate units and precision • apply basic theoretical knowledge to interpret gross features of data and make relevant conclusions • identify atypical results as out of normal range or an artefact • traces and source obvious causes of an artefact

	• communicate problems to a supervisor or outside service technician • record and communicate results in accordance with enterprise procedures • Maintain security, integrity, traceability of samples, sub-samples, test data and results and documentation.
Underpinning Knowledge and Attitudes	• chemical principles and concepts underpinning test/procedure • purpose of the tests • concepts of metrology • principles and concepts related to equipment/instrument operation and testing • function of key components of the equipment/instrument and/or reagents • effects of modifying equipment/instrument variables • use of calibration procedures • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements
Underpinning Skills	• interpret test methods and procedures • sample preparation procedures • perform calibration checks • use instruments for qualitative and/or quantitative analysis • maintain and evaluate reagents • troubleshoot basic equipment/method • use calculation methods, including appropriate units, uncertainties, balancing equations, and the concentration of the solution given the chemical reaction for the titration • prepare calibration graphs and calculating results using appropriate units and precision • apply theoretical knowledge to interpret gross features of data and make relevant conclusions such as identifying atypical results as out of normal range or an artefact • trace and sourcing obvious causes of an artefact • record and communicating results in accordance with enterprise procedures • maintain security, integrity, traceability of samples, sub-samples, test data, results and documentation
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Perform Physical-Mechanical Tests**
Unit Code	**IND PMP4 02 0613**
Unit Descriptor	This unit of competency covers the ability to interpret physical and mechanical tests requirements, prepare samples, conduct pre-use and calibration checks on equipment and perform routine physical and mechanical tests. These tests will involve several measurement steps. It includes data processing and interpretation of results and tracking of obvious test malfunctions where the procedure is standardized. However, personnel are not required to analyze data, optimize tests/procedures for specific samples or troubleshoot equipment problems where the solution is not apparent.

Elements	Performance Criteria
1. Interpret and schedule test requirements	1.1 Test request and ***physical and mechanical principles and concepts underpinning the test/procedure*** are reviewed to identify samples to be. tested, test method and equipment/instruments involved 1.2 ***Hazards*** and enterprise ***control measures*** associated with the sample, ***preparation/test and/or equipment methods*** are identified. 1.3 Work sequences are planned to optimize throughput of multiple samples, if appropriate.
2. Receive and prepare samples	2.1 Samples using Standard Operating Procedures (SOPs) are logged. 2.2 Sample description, compare with specification and note and report discrepancies are recorded. 2.3 ***Samples*** and ***standards*** are ***prepared*** in accordance with physical and mechanical testing requirements. 2.4 Traceability of samples from receipt to reporting of results is ensured.
3. Check equipment before use	3.1 Equipment/instruments are set up in accordance with test method requirements. 3.2 Pre-use and safety checks are performed in accordance with relevant enterprise and operating procedures. 3.3 Faulty or unsafe components and equipment are identified and reported to appropriate personnel. 3.4 Equipment calibration using specified procedures, if applicable is checked. 3.5 Calibration equipment/instruments are quarantined out.

4. Test samples to determine physical properties	4.1 Equipment/instruments are operated in accordance with test method requirements. 4.2 ***Tests/procedures*** on all samples and standards, if appropriate, are performed in accordance with specified methods. 4.3 Equipment/instruments are shut down in accordance with operating procedures.
5. Process and interpret data	5.1 Test data noting atypical observations is recorded. 5.2 Calculated values consistent with expectations are ensured. 5.3 Uncertainty of measurement is estimated and documented in accordance with enterprise procedures, if required. 5.4 Results are ***recorded*** and reported in accordance with enterprise procedures 5.5 Trends in data and/or results are interpreted and reported out of specification or atypical results promptly to appropriate personnel. 5.6 If obvious procedure or equipment problems have led to atypical data or results are determined.
6. Maintain a safe work environment	6.1 Established safe work practices and personal protective equipment are used to ensure personal safety and that of other laboratory personnel 6.2 The generation of wastes and environmental impacts are minimized. 6.3 The safe collection of laboratory and hazardous waste for subsequent disposal as per ***Occupational Health and Safety (OHS) and environmental management requirements*** is ensured. 6.4 Equipment and materials are taking cared for and stored as required.
7. Maintain laboratory records	7.1 Approved data is entered into laboratory information management system (LIMS). 7.2 Confidentiality and security of enterprise information and laboratory data are maintained. 7.3 Equipment and calibration logs are maintained in accordance with enterprise procedures.

Variable	**Range**
Physical and mechanical principles and concepts underpinning the test**/**procedure	• matter, interatomic and intermolecular forces and states of matter • mass, weight, forces, pressure, energy, friction and slip resistance

	• properties of gases, pressure/volume/temperature, density, diffusion and compressibility • cohesive/adhesive forces, hydrostatic pressure, fluid flow, viscosity and friction • thermal expansion, thermal conductivity and coefficients of expansion • changes of state, energy content, enthalpy change and endothermic and exothermic processes • electromagnetic spectrum, primary/secondary colors, reflection, refraction diffraction and interference of light • electrical concepts, including electric field, voltage, current, resistance and AC/DC • electromagnetic concepts, including magnetic field and flux, and electromagnetic induction • sound concepts, including wave properties, amplitude, frequency and loudness (dB) • elasticity, hardness, strength of materials, plasticity, permeability and dispersion • electrical safety concepts including voltage, current, resistance, conductors/insulators and AC/DC • Mechanical principles and concepts underpinning the test/procedure may include: • matter, interatomic and intermolecular forces and states of matter • mass, weight, forces, pressure and energy • cohesive/adhesive forces, friction and slip resistance • elasticity, hardness, ductility, malleability, strength of materials, elastic limit, elastic moduli and ultimate stress • electrical concepts, including electric field, voltage, current, resistance and AC/DC • elasticity, hardness, strength of materials, plasticity, permeability and dispersion
Hazards	May include: • microbiological organisms and agents, associated with soil, air and water • chemicals, such as acids and solvents • radiation, such as alpha, beta, gamma, X-ray and neutron • sharps, broken glassware and hand tools • flammable liquids and gases • cryogenics, such as dry ice and liquid nitrogen • fluids under pressure, such as steam and industrial gases • sources of ignition • burners and ovens • disturbance or interruption of services

	• crushing, entanglement and cuts associated with moving machinery (grinders) or falling objects • sharps and hand tools
Test and sample preparation equipment/materials	may include: • crushers, mulchers, grinders, mills, riffles and sieves • moulds, bags and containers • ovens, microwaves and water baths • mass balances • microscopes • dimension apparatus (e.g. calipers and micrometer) • rammers, compression rigs and load cells • chemical reagents and volumetric glassware • temperature measuring devices, such as thermometers and thermocouples • pH and conductivity meters • analogue and digital meters, charts/recorders, data loggers and computers
Physical and mechanical tests and procedures	May include: • precise measurement of position, orientation and dimensions: ➢ three-dimensional setup of manufacturing tools using inclinometers, verniers and laser ➢ thickness using vernier, X-ray and gamma ray ➢ particle size using sieving and laser ➢ dimensional stability involving expansion, contraction and weathering ➢ movement using strain gauge and accelerometer • mass, density and specific gravity: ➢ moisture/density relationship ➢ compaction ➢ loose and compacted density ➢ thermal tests: ➢ thermal conductivity ➢ coefficients of expansion (e.g. linear and volume) ➢ melt flow index ➢ calorimetry, (e.g. specific heat and latent heat) ➢ combustion properties (e.g. enthalpy and energy content) ➢ drying times ➢ thermal stability of products • optical tests: ➢ flatness and surface finish ➢ refractive index ➢ optical rotation ➢ transmission/absorption of filters

	➢ colour matching of products • acoustic tests: ➢ absorption, reflection and transmission ➢ intensity, attenuation and loudness (dB) ➢ amplitude and frequency ➢ electrical tests: ➢ conductance, resistance and insulation ➢ temperature dependence of dielectrics • magnetic tests: ➢ permeability ➢ retentivity, hysteresis loss and coercivity ➢ intrinsic induction ➢ adhesive strength ➢ elastic properties and strength of materials ➢ slip resistance and friction ➢ viscosity and torque ➢ creep and endurance ➢ abrasion, hardness, impact, indent and penetration resistance ➢ pressure and/or vacuum testing using manometers and load cells
Preparation of samples	May include: • drying, washing, grinding, sieving, melting and moisture conditioning • cutting, trimming or machining of test specimens, etching • cutting • trimming • machining • etching
Standards**,** codes**,** procedures and**/**or enterprise requirements	Ethiopian and international standards, such as: • (Include Standard No)Recommended practice for chemical analysis by atomic absorption spectrometry - Flame atomic absorption spectrometry • (Include Standard No)Verification and use of volumetric apparatus - General - Volumetric glassware • (Include Standard No)Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry • ISO 1000-1998 The international system of units (SI) and its application • ISO 17025-2005 General requirements for the competence of testing and calibration laboratories • (Include Standard No)Safety in laboratories set • ISO 9000 Set:2008 Quality management systems set • Ethiopian code of good manufacturing practice for medicinal products (GMP)

	• calibration and maintenance schedules • data quality procedures • enterprise recording and reporting procedures • equipment startup, operation and shutdown procedures • Material Safety Data Sheets (MSDS) • material, production and product specifications • national measurement regulations and guidelines • principles of Good Laboratory Practice (GLP) • production and laboratory schedules • quality manuals, equipment and procedures manuals • SOPs
Records	May include but not limited to: • test and calibration results • equipment use, maintenance and servicing history • faulty or unsafe equipment
Tests	May include but not limited to: • control of starting materials, in-process materials and finished products • investigation of sources of construction materials • basic troubleshooting of enterprise processes
Occupational Health and Safety (OHS) and environmental management requirements	May include but not limited to: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Evidence Guide	
Critical Aspects of Competence	Demonstrate knowledge and skills competencies to : • interpret test methods/procedures accurately • prepare and test samples in accordance with specified methods • perform calibration checks (if required) • safely operate test equipment/instruments to enterprise standards and/or manufacturer's specifications • apply basic knowledge of physical properties of materials to interpret gross features of data and make relevant conclusions • identify atypical results, such as out of normal range or an artefact

	• trace and source obvious causes of an artefact • communicate problems to a supervisor or outside service technician • calculate, record and communicate results in accordance with enterprise procedures • Maintain security, integrity and traceability of samples, sub-samples, test data/results and documentation.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • physical and mechanical principles and concepts underpinning the test/procedure • purpose of tests • function of key components of the equipment/instrument • effects on test of modifying equipment/instrument variables • sample preparation procedures • concepts of metrology • basic equipment/method troubleshooting procedures • enterprise and/or legal traceability requirements • relevant health, safety and environment requirements • metrology techniques underpinning test/procedure • principles and concepts related to equipment/instrument operation and testing • effects on test of modifying equipment/instrument variables • calibration procedures • calculation steps to give results in appropriate units and precision
Underpinning Skills	• use instruments for qualitative and/or quantitative analysis • interpret test methods and procedures • sample preparation procedures • perform calibration checks • metrology techniques underpinning test/procedure including estimating uncertainty • use instruments for qualitative and/or quantitative analysis • maintain and evaluate reagents • troubleshooting basic equipment/method • prepare calibration graphs and calculating results using appropriate units and precision • apply theoretical knowledge to interpret gross features of data and make relevant conclusions such as identifying atypical results as out of normal range or an artefact • trace and sourcing obvious causes of an artefact • Calculate, record and communicate results in accordance with enterprise procedures • maintain security, integrity, traceability of samples, sub-samples, test data, results and documentation

Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Test fiber-Composites Materials and Laminates**
Unit Code	**IND PMP4 03 0613**
Unit Descriptor	This competency covers the knowledge and skill applied in testing fiber reinforced plastic materials and laminates for conformance with design and product quality specification.

Elements	Performance Criteria
1. Determine test requirements	1.1 Properties to be measured according to specification are identified. 1.2 Appropriate test methods according to specifications are selected. 1.3 Appropriate testing ***tools and equipment*** are selected according to standards and specifications.
2. Perform raw material tests	2.1 Samples are prepared according to specification. 2.2 Tests are performed in accordance with job specifications. 2.3 Test results are recorded according to standard ***procedures***. 2.4 Test results are interpreted and compared with manufacturer material data sheets.
3. Perform molded product tests	3.1 Samples are prepared according to specification. 3.2 Tests are performed in accordance with job specifications. 3.3 Test results are recorded according to standard procedures. 3.4 Test results are interpreted and compared against quality specification.
4. Record and report test results	4.1 Tests are documented to enterprise requirements. 4.2 Results are compared against standards. 4.3 Written recommendations (eg process control actions, raw material suitability, product acceptance) are made.

Variable	Range
Tools and equipment	May include but not limited to: • Testing equipment such as gel timer, flow meter, tensile tester, hardness tester, mold flow indexer, flammability/smoke tester, flexular tester etc.) • materials handling equipment • relevant PPE • Equipment as specified by AS/NZ standards (where applicable).

Procedures	May include but not limited to: • All operations are performed in accordance with procedures. • All relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards

Evidence Guide	
Critical Aspects of Competence	Demonstrate knowledge and skills competencies to : • select and apply the appropriate test methods for the job, and correctly interpret the test results • Identify and take appropriate action on problems and potential problems • Perform consistently. For example, to see that: ➢ tests are performed to procedures at all times ➢ All safety procedures are always followed
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Materials, equipment and process sufficient to predict their interactions and their impacts on performance. (For example, as resin is heated, its viscosity reduces. If viscosity is too low, there is a risk that the mould will fill before the fiber is fully impregnated; if too high, the reinforcement will have a tendency to distort.) • organization procedures and policies, quality requirements at each production stage and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and in a manner relevant to the job.(Eg manufacturing design requirements, enterprise requirements for testing documentation) • types of tests, their purposes and functions • product or material test performance indices within standard variation, and standard response procedures • safe test procedures • role of testing in quality control and quality assurance procedures • interpreting manufacturer material data sheets • interpreting variances from specifications • safety factors; • effects on laminate design • relevance of failure mode to FRP laminate design • effect of creep and fatigue on laminates • relationship of laminate thickness to bonding and material properties • Span and deflection.

Underpinning Skills	Demonstrates skills to: • Apply quality requirements at each production stage and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and in a manner relevant to the job.(e.g. manufacturing design requirements, enterprise requirements for testing documentation). • Interpret technical specifications and standard laboratory procedures. • write report, including graphical representations of results • Numeracy to perform required calculations and interpret results
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Predict Polymer Properties and Characteristics**
Unit Code	**IND PMP4 04 0613**
Unit Descriptor	This competency covers the ability to apply knowledge of polymer morphology, the properties of polymers in relation to their morphology, physical failure in polymers and test methods for polymeric materials to predict polymer properties and processing characteristics. It applies to all sectors of the industry. It is typically performed by technicians working either independently or as part of a work team.

Elements	Performance Criteria
1. Predict the impact of processing conditions on polymer properties	1.1 Property changes due to molecular weight and temperature is predicted. 1.2 The glass transition temperature and melting point relative to ambient temperature is identified. 1.3 The morphological changes occurring to polymers as the temperature is raised to typical moulding conditions is described. 1.4 The effect of cooling rate on polymer morphology is described. 1.5 Potential product dimension/shape changes due to internal stresses resulting from molecular orientation are predicted. 1.6 The affect of post-mould annealing on the degree of crystallization and crystal is determined.
2. Predict physical properties of polymers from their morphology	2.1 The effects on physical properties of temperature, crystal size, degree of crystallization and molecular orientation are predicted. 2.2 Shrinkage from morphology is predicted.
3. Determine likely physical failures of polymers	3.1 Impacts of physical use conditions on physical failure is determined. 3.2 Impacts of polymer characteristics on physical failure is determined.
4. Organize and interpret polymer tests	4.1 Melt flow properties from flow data is described. 4.2 Appropriate test type and ***procedure*** is chosen to measure desired criteria. 4.3 Relevant standard test method is specified. 4.4 Test result is interpreted, making allowance for possible variations in test.

Variable	Range
Procedures	May include but not limited to: • All operations are performed in accordance with procedures • All relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards

Evidence Guide	
Critical Aspects of Competence	Demonstrate knowledge and skills competencies to: • Understand morphology and that the importance of critical material properties and quantities is known. Competence must be demonstrated in the ability to interpret polymer properties from their morphology • Perform consistently. For example, to see that: ➢ test procedures are understood ➢ correct tests and methods are specified ➢ test results are interpreted appropriately ➢ polymer properties are described ➢ Changes in properties are adequately explained.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Morphology of polymers sufficient to predict common physical properties and behaviors and to interpret test results, allowing for normal variations in data • organization standard procedures and work instructions, relevant regulatory requirements and standard international and national test methods, along with the ability to implement them within appropriate time constraints and in a manner relevant to the job • polymer morphology using phase diagrams • properties of polymers in relation to their morphology • physical failure in polymers • polymer materials test methods and property data • changes in properties and variations in test data • changes in physical properties due to compounding, processing or environmental conditions
Underpinning Skills	Demonstrates skills to: • Relevant regulatory requirements and standard international and national test methods, along with the ability to implement them within appropriate time constraints and in a manner relevant to the job • Read and interpret technical literature and standard test methods. High level numeracy is also required, particularly graphical interpretation skills and data interpretation • Numeracy to be able to determine sizes, angles and shapes.

Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Trial a New Die-Tool**
Unit Code	**IND PMP4 05 0613**
Unit Descriptor	This competency covers the trialing of a new die or tool. It is intended to be applied to 'high pressure' dies such as might be used for injection or blow moulding. It is typically performed by technicians working either independently or as part of a work team.

Elements	Performance Criteria
1. Prepare for trial to procedures	1.1 All relevant information available at the enterprise is gathered. 1.2 Machine/ ***tools and equipment*** suitability is confirmed. 1.3 ***Die (simple, advanced and complex) and die***/tool state is confirmed. 1.4 Raw materials readiness is confirmed.
2. Set die/tool and machine	2.1 Die/Tool is fitted and set up. 2.2 Process conditions is set up. 2.3 Control panel to cycle time, temperatures and heating/cooling rates as required is set. 2.4 Cycle machine and die is dried according to ***procedures***.
3. Trial die/tool, interpret data and adjust operation to procedures	3.1 Trial procedures in a systematic manner are carried out to meet trial objectives. 3.2 Variations from normal is identified and recorded. 3.3 Control panel and ***variables*** is monitored and interpreted test results for fluctuations, variations and trends. 3.4 Process limitations with respect to product and production specifications are determined. 3.5 Controls are adjusted to ensure parameters are maintained to job specifications. 3.6 Process operations is checked if it has improved. 3.7 Continue analysing data and making adjustments until desired level of process operation is achieved and product is within specifications. 3.8 Equipment is shut down as required. 3.9 Trial results are recorded.

4. Rectify equipment and quality problems	4.1 Range of faults that will affect product and production specifications is identified. 4.2 Changes required to tooling and equipment to meet product and production specifications is determined. 4.3 Make sure appropriate records related to machinery and equipment is maintained to enterprise standards. 4.4 ***Problems*** and ***hazards*** that are within area of responsibility are identified and rectified. 4.5 Problems that are outside area of responsibility are reported to appropriate personnel.

Variable	**Range**
Tools and equipment	May include but not limited to: • hand tools as required • Relevant personal protective equipment.
Simple die	A two plate die including any ejection system operating in the mould open axis, but excluding moulds with molten material retained within the mould between cycles. Products are simple, straight drawn items. Typical features may include: • force • cavity • back plates • support plates • cold runner • sprue • nozzle seat • locating ring-tab • sub • fan • diaphragm and direct gating • ejector pins and sleeves • ejector plate and stripper plate, simple drilling for mould cooling
Advanced die	A two or three plate die with one or more product forming components which move in a direction other than the mould open axis, and which are driven by the mould rather than external actuation. Excludes moulds which retain molten material within the mould between cycles. Typical features may include: • sliding blocks or cores actuated by skew pins or cams • baffled • spiral • tube

	• heat pipe cooling systems • rising cores • internally actuated unscrewing systems
Complex die	Dies which use at least one external power and control source to actuate product forming components, which move in a direction other than the mould open axis, and require sequencing with the mould operation. Includes moulds which retain molten material within the mould between cycles. Typical features may include: • hot runners; • insulated runners; • externally actuated sliding blocks, • cores, and • unscrewing systems; safety interlocks
Die	A former used to give the required shape to the product and which is used under pressure. Dies are typically used in the extrusion, injection, blow moulding and general rubber sectors. Dies used which are not subject to pressure are referred to as 'moulds' in this Training Package.
Procedures	May include but not limited to: • All operations are performed in accordance with procedures • All relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards
Variables	May include but not limited to: • die/tool set up and adjustment • machine speed, cycle rate • temperature • Product quality measures.
Problems	May include but not limited to: • selecting the right tools for a new job • using new and untried die or tool • adapting the process to the new product and die/tool • observing the process to obtain useful trial data • comparing the product to the desired specification • Determining the cause of non-compliances. • materials/heat • equipment adjustment/set-up
Hazards	May include but not limited to: • noise, light, energy sources • humidity, air temperatures, radiant heat • Stationary and moving machinery, parts and components.

Evidence Guide	
Critical Aspects of Competence	Demonstrate knowledge and skills competencies to: • understand procedures and know the importance of critical material properties and quantities • Recognize potential situations requiring action and then in implementing appropriate action. • Perform consistent. For example, look to see that: • new or un-tried dies/tools are tested thoroughly • product quality and output standards are met consistently • problems are anticipated from process observations • problems are efficiently resolved • The process runs consistently and smoothly.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Materials, equipment and process sufficient to recognize and rectify potential problems. Knowledge of organization standard procedures and work instructions and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and in a manner relevant to the job. • Understanding of the polymer/process interactions. • Managing risks using the hierarchy of controls applied to the process. Application of approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup. • product specifications and limitations • production equipment capability • types and grades of materials and their limitations • die or tool conditions and operational limitations • Use of ancillary equipment.
Underpinning Skills	Demonstrate skills to: • Apply of approved hazard control, safety procedures, and the use of PPE in relation to handling materials, equipment operation and cleanup. • The ability to interpret technical specifications and reports. Advanced numeracy allowing the calculation and interpretation of statistics, product formulae and process conditions is also required.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Trial a New, Advanced or Complex Mould**
Unit Code	**IND PMP4 06 0613**
Unit Descriptor	This competency covers the trialling of a new, advanced or complex mould. It is intended to be applied to 'low pressure' moulds as used in rotomoulding, thermoforming and composites manufacturing and not to dies such as might be used for injection or blow moulding. It is typically performed by technicians working either independently or as part of a work team. It applies to technicians who are involved in the trialing of moulds. The key factors are the monitoring of the production process and identifying routine problems.

Elements	Performance Criteria
1. Prepare for trial to procedures	1.1 All relevant information available at the enterprise is gathered. 1.2 Machine/***tools and equipment*** suitability are confirmed. 1.3 Mould states are confirmed. 1.4 Raw materials readiness is confirmed.
2. Set mould and machine	2.1 Moulds is fitted and set up. 2.2 Speed and ratios for rotation/'rock and roll' is set up. 2.3 Control panels to cycle time according to external temperature, humidity, type of heating used, cooling time is set. 2.4 Cycle machine and mould as per ***procedures*** is dried.
3. Trial mould, interpret data and adjust operation to procedures	3.1 Trial Procedures in a systematic manner are carried out to meet trial objectives. 3.2 Variations from normal is identified and recorded. 3.3 Control panel and ***variables*** are monitored and test results for fluctuations, variations and trends are interpreted. 3.4 Process limitations with respect to product and production specifications are determined. 3.5 Controls are adjusted to ensure that parameters are maintained to job specifications. 3.6 Process operations that have improved are checked. 3.7 Continue analysing data and making adjustments until desired level of process operation is achieved and product is within specifications.

	3.8 Equipment is shut down as required. 3.9 Trial results are recorded.
4. Rectify equipment and quality problems to procedures	4.1 The range of equipment and quality faults that can occur during the operation is identified. 4.2 Equipment and quality fault causes are determined and rectified. 4.3 Equipment failure causes are identified and rectified. 4.4 Make sure appropriate records and log books of equipment operations are maintained. 4.5 Non-routine ***problems*** and ***hazards*** are identified and rectified within area of responsibility. 4.6 Problems Outside area of responsibility is reported to designated person.

Variable	**Range**
Tools and equipment	May include but not limited to: • hand tools as required • Relevant personal protective equipment. • Rotational moulding (e.g. fixed spindle, single spindle, multiple spindle, shuttle open-flame, swing, carousel, shuttle and 'rock and roll'). • complex composite moulds • complex thermoforming moulds.
Procedures	May include but not limited to: • All relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.
Variables	May include but not limited to: • performance of mould • temperatures • machine speed • materials, quantities and composition • Product quality requirements.
Problems	May include but not limited to: • selecting the right tools for a new job • using new and untried moulds • adapting the process to the new product and mould • observing the process to obtain useful trial data • comparing the product to the desired specification • Determining the cause of non-compliances.
Hazards	May include but not limited to: • noise, light, energy sources

	• humidity, air temperatures, radiant heat • Stationary and moving machinery, parts and components.

Evidence Guide	
Critical Aspects of Competence	Demonstrate knowledge and skills competencies to : • understand procedures and know the importance of critical material properties and quantities • Recognize potential situations requiring action and then in implementing appropriate action. • Perform consistently. For example, to see that: ➢ new or un-tried moulds are tested thoroughly ➢ product quality and output standards are met consistently ➢ problems are anticipated from process observations ➢ problems are efficiently resolved ➢ The process runs consistently and smoothly.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • The materials, equipment and process sufficient to recognize and rectify potential problems. • Organization standard procedures and work instructions and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and in a manner relevant to the job. • Understanding of the polymer/process interactions. • Managing risks using the hierarchy of controls applied to the process. • Application of approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup. • a basis for solving processing and material problems, including product specifications and limitations • production equipment capability • types and grades of materials and their limitations • die or tool conditions and operational limitations • Use of ancillary equipment. • high levels of numeracy and literacy with the ability to interpret technical specifications and reports. • Advanced numeracy allowing the calculation and interpretation of statistics, product formulae and process conditions is also required.
Underpinning Skills	• Application of the knowledge of managing risks using the hierarchy of controls applied to the process. • Application of approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup.

	• The ability to interpret technical specifications and reports. Advanced numeracy allowing the calculation and interpretation of statistics, product formulae and process conditions is also required.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Set Advanced or Complex Dies**
Unit Code	**IND PMP4 07 0613**
Unit Descriptor	This competency covers the ability to set advanced or complex dies, verify machine, die, and ancillary equipment functions and remove advanced or complex injection dies. It applies to technicians typically in the injection moulding and blow moulding sectors that set complex dies and make sure they are ready for production. The key factors are the efficient setting and validation of the right die for the job and the tuning of this die for efficient production.

Elements	Performance Criteria
1. Prepare to change advanced or complex die	1.1 Determine when changeover will be required, and requirements for ***die, advanced die and complex die*** change are planned. 1.2 ***Dies, machines, ancillary equipment*** and all ***tools and equipments*** related to the advanced or complex die change are prepared. 1.3 The moulding machine for die removal according to enterprise ***procedures*** is prepared.
2. Change dies	2.1 ***Fit die*** is removed according to enterprise procedures, in a safe, systematic and time efficient manner. 2.2 Die is cleaned and stored according to workplace procedures applying corrosion protection if required. 2.3 The moulding machine and ancillary equipment for operations according to procedures are prepared. 2.4 Replacement die is attached to the machine according to procedures.
3. Set advanced or complex die	3.1 Machine conditions for new die are set. 3.2 ***Machine operation*** as per procedure is restarted. 3.3 Cycle machine is dried and died according to enterprise procedures. 3.4 ***Die operation*** and power are checked and devices are controlled against die set up specifications. 3.5 The first off sample is checked for compliance with required standards. 3.6 ***Settings*** are fine-tuned and other production ***variables*** as required.

	3.7 Any equipment variances between actual productions are noted and documented set up conditions. 3.8 Workplace documentation is completed and reported to appropriate personnel.
4. Anticipate die setting problems	4.1 potential ***problems*** and ***hazards*** which may occur during the die changing and setting process are identified and ***anticipated.*** 4.2 possible causes of these problems are determined. 4.3 most likely causes are identified and prioritized appropriate actions. 4.4 problems using appropriate solutions within area of responsibility are rectified. 4.5 improvements in systems or procedures are recommended.

Variable	**Range**
Die	A die is a former used to give shape to the product and used under pressure. Dies are typically used in the extrusion, injection, blow moulding and general rubber sectors. Dies which are not subject to pressure are referred to as 'moulds' in this competence standard
Advanced dies	are two or three plate dies with one or more product forming components which move in a direction other than the mould open axis, and which are driven by the mould rather than external actuation. May include but not limited to: • sliding blocks or cores actuated by skew pins or cams • baffled, spiral, tube, and heat pipe cooling systems • rising cores • Internally actuated unscrewing systems
Complex dies	are dies which: • use at least one external power and control source to actuate product forming components • move in a direction other than the mould open axis • Require sequencing with the mould operation. • May include but not limited to: • Moulds which retain polymer melt within the mould between cycles. • hot runners • insulated runners • externally actuated sliding blocks, cores and unscrewing systems • Safety interlocks

Die and machine preparation	The die and machine preparation may include making connections such as: • hydraulic • pneumatic • Electrical
Ancillary equipment operations	May include but not limited to: • hot-runner temperature control • hydraulic or pneumatic power supply for actuation of equipment such as cores or sliding blocks • Mould temperature control
Tools and equipment	May include but not limited to: • hand carts and trolleys • hoists/lifting equipment not requiring any special permits or licenses • basic hand tools • Relevant personal protective equipment
Procedures	May include but not limited to: • All operations are performed in accordance with procedures. • All relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards
Die fitting	includes the placement, attachment and adjustment of dies against predetermined specifications, but does not include the modification of dies or equipment to make them fit against new specifications or to change their performance as might be done by a toolmaker or similar metals tradesperson. Repairs to dies are also not covered by this unit
Machine operations	May include but not limited to: • machine movement speed and stroke • pressure • sequencing • Interlocks
Die operations	May include but not limited to: • die temperature control • die component stroke • clamping force • speed • pressure • sequencing • interlocks
Setting	Setting of the machine conditions may include setting the mould height on the machine, the clamp force, the mould safety system, the ejector system, the mould opening and closing distances, speeds and forces and the injection unit.

	These settings may be performed automatically, using an electronic storage device to load settings from a previous run of this product, or may be performed by manually setting controls individually
Variables	Key variables, and their causes, to be monitored include: time/effort required to set a die number of attempts to produce a first off within specification the need to reset/adjust a die during then production run
Anticipate problems	May include but not limited to: • Taking a proactive approach to a wide range of routine and non-routine problems, using product and process knowledge to develop solutions to problems which do not have a known solution/a solution recorded in the procedures, and endeavoring to learn from the problem so that it does not recur. • lack of cleaning of die surface and cooling channels, leading to corrosion • inadequate fitting of the dies to the platens, causing poor alignment or movement during production • fine adjustments of die movements, to optimize production. • All operations are performed in accordance with procedures.
Hazards	May include but not limited to: • hazardous materials • manual handling hazards • Hot surfaces

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies of: • Procedures and the importance of critical die characteristics be understood. Competence must be demonstrated in the ability to recognize potential situations requiring action and then in implementing appropriate action • Perform consistently. For example, look to see that at least one type of advanced or complex die has been correctly set and removed and that there is evidence that other types of advanced or complex dies can also be set/removed
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • Advanced and complex dies and their interactions with the process, materials and products are required • Organization standard procedures and work instructions and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and in a manner relevant to the job • Advanced/complex dies and their features which make

	them more complex for setting than simple dies • This may include knowledge of: ➢ sliding blocks or cores actuated by skew pins or cams ➢ baffled, spiral, tube, and heat pipe cooling systems ➢ rising cores ➢ internally actuated unscrewing systems ➢ external power and control sources, ➢ externally actuated sliding blocks, cores, and unscrewing systems ➢ Safety interlocks ➢ die setting procedures for advanced/complex dies ➢ Verification procedures for advanced/complex dies ➢ wrong dies ➢ wrongly set die ➢ worn or damaged die ➢ non-optimum process conditions ➢ Material type or quality. ➢ Read and interpret technical specifications and data
Underpinning Skills	Demonstrates skills to: • Read and interpret technical specifications and data. • Safe, precise, efficient and correct installation of advanced and complex dies. • apply and/or explain to a level sufficient for the practical completion of the job: • die setting procedures for advanced/complex dies • Verification procedures for advanced/complex dies. • Competence also includes the ability to distinguish between causes of faults such as: ➢ wrong dies ➢ wrongly set die ➢ worn or damaged die ➢ non-optimum process conditions ➢ Material type or quality.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Trial New Process or Product**
Unit Code	**IND PMP4 08 0613**
Unit Descriptor	This competency typically applies to a technician in a plant who is taking a lead technical role in the trialing of a new product or the trialing of a new or significantly altered process. The technician is expected to be a technical expert in that part of the plant/process where the trial is being conducted. The technician would be expected to operate and control all equipment required for the trial. Generally the technician would be part of a team during the trial, and would usually be working in conjunction with a process/product development expert such as a chemist or engineer. The technician is often the most technically competent member of an operational team. As such they may not have the 'hands on' role of operating items of equipment, but they are expected to have the competence to direct the operation of equipment as appropriate throughout the trial.

Elements	Performance Criteria
1. Contribute to the selection of equipment/ process condition	1.1 Liaise with appropriate technical expert(s). 1.2 Properties of materials and desired product characteristics are interpreted. 1.3 Technical specifications/drawings of plant requirements are interpreted. 1.4 Equipment/ancillary equipment appropriate for the materials, products and conditions are recommended. 1.5 Process conditions appropriate for the equipment, materials and product characteristics are recommended. 1.6 Feed rates/order/condition appropriate to the process conditions, equipment, materials and product characteristics are recommended. 1.7 Hazard identification are ensured and analysis ***procedures*** are completed, including consultation with stakeholders, and findings included in plan. 1.8 Recommendations meet the identified need are ensured.
2. Prepare for trials	2.1 The availability of resources required such as materials, equipment, people and skills are determined. 2.2 times required for ***trial*** is estimated. 2.3 ***Liaise*** with relevant stakeholders.

	2.4 Trials at a convenient time are scheduled. 2.5 Documentation for the trial is developed. 2.6 Potential ***hazards*** are identified and hazard control procedures by applying the hierarchy of control are required. 2.7 clearance requirements and special safety and storage requirements are determined. 2.8 decisions with appropriate experts/stakeholders are verified. 2.9 people with adequate skills are available for the trial is ensured.
3. Conduct test runs/trials	3.1 Ensure hazard controls are implemented prior to commencement. 3.2 Trials are run. 3.3 Communication with all relevant people is maintained. 3.4 Critical parameters are closely monitored. 3.5 Recognize actual and potential ***problems*** are monitored. 3.6 Adjustments to process conditions as required during trial is made. 3.7 Product as required is sampled and tested. 3.8 Performance data is recorded and reported. 3.9 Ensure all materials, products and ***wastes are handled*** correctly. 3.10 Leave plant in a condition suitable for routine production to recommence.
4. Evaluate results and identify modifications	4.1 Data from trial is interpreted. 4.2 Factors which might be related to low rates or low charge amounts are identified. 4.3 Modifications and improvements required are recommended. 4.4 Standard operating procedure is developed and checked. 4.5 Complete documentation is completed and reported to appropriate personnel. 4.6 All relevant staff has required skill levels for the introduction of the new process is ensured. 4.7 ***hazard analysis*** is conducted as required.

Variable	Range
Procedures	May include but not limited to: • All operations are performed in accordance with procedures • All relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards
Trialing	Refers to the scale-up and other development steps required to take a new product or process from its design/laboratory trials to full commercial operation on a plant. Trialing may be done on a pilot plant where available and/or on a full scale plant
Liaison	May include but not limited to: • manufacturers • chemists • engineering personnel • designers • OHS advisors • maintenance personnel • Potential customers.
Hazards	May be determined from: • Materials Safety Data Sheets (MSDSs) • other relevant documentation such as hazard logs, incident reports • company hazard identification procedures • hazard analysis results • Standard operating procedures.
Problems	May include but not limited to: • mixing is poor • materials do not behave as expected • process/reaction does not proceed /proceeds too slowly • process/reaction proceeds too quickly/runs away • yield is low • quality is out of specification • process is unstable • instrumentation is not sufficiently sensitive/too sensitive • variable catalyst activity and Surging flow/pressure.
Waste handling	May include but not limited to: • collection for re-use • recycling • Disposal in accordance with health and environmental regulations.
Hazard analysis	May include but not limited to: • JSA/JHA (Job Safety Analysis/Job Hazard Analysis) • hazard and operability (HAZOP) studies

	• hazard analysis (HAZAN) studies • Other company specified procedures. • It is not expected that the candidate will be able to conduct technical hazard analysis procedures (such as HAZOP or HAZAN) but they should be able to interpret and use the outcomes of such analyses where relevant.
Health**,** Safety and Environment (HSE)	All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies in: • The ability to recognize and analyze potential situations requiring action and then in implementing appropriate corrective action. • On the ability to stay out of trouble rather than on recovery from a disaster. • Consistent performance. For example, look to see that: ➢ hazards are identified and controlled ➢ early warning signs of equipment/processes needing attention or with potential problems are recognized ➢ the range of possible causes can be identified and analyzed and the most likely cause determined ➢ appropriate and timely action is taken to ensure the safety and success of the trial ➢ Obvious problems in related plant areas are recognized and an appropriate contribution made to their solution.
Underpinning Skills	Demonstrate skills to: • identify all items on a schematic of the plant and describe the function of each • describe the nature/condition of materials entering and leaving each stage of the process, the changes which have occurred in that stage and why they have occurred • state the major design features of plant equipment, plant conditions and variables and the impact of these on the properties of materials passing through them • describe the causes and remedies of common problems such as those selected in the Range Statement • apply the hierarchy of control to minimize the risk of hazards identified • describe methods of changing rate and the advantages and disadvantages of each • Describe methods of controlling other process variables and the advantages and disadvantages of each.

	• process material variations • instrument failure/wrong reading • electrical failure • mechanical failure • Operational problem. • Communicate and liaise with people at a range of levels about technical matters. • Reading to the level of interpreting technical specifications, manuals and procedures; and writing technical documentation such as specifications and procedures required for the trial. • Numeracy to the level of interpreting technical specifications and test results, analyzing process data and determining required variations in process variables.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Diagnose Production Equipment Problems**
Unit Code	**IND PMP4 09 0613**
Unit Descriptor	This competency covers diagnosing the causes of products faults and problems arising from the equipment/plant. These problems may be caused by inappropriate process conditions and/or equipment faults. It includes diagnosis to a sufficient level so that identification of faults as equipment or process based can be made and appropriate directions can be given to rectify the problem. The unit also requires an understanding of the principles of operation of the equipment and the impact of process conditions and equipment faults or changes on the product characteristics/properties. It also requires an understanding of the quality/ inspection/testing regime and the results of this regime and how process conditions and equipment faults or changes impact these results of this regime.

Elements	Performance Criteria
1. Identify faults in products/ production	1.1 Products/production process is ***examined.***
	1.2 ***Faults*** are identified.
	1.3 Faults according to type/likely cause is categorized.
	1.4 Faults are prioritized for action.
2. Determine most probable possible cause(s) of fault	2.1 Faults are analyzed to determine ***possible causes***.
	2.2 Possible causes are ***investigated*** to eliminate less probable cause.
	2.3 Probable causes are shortlisted.
	2.4 Hypothesis of cause(s) is checked and supported by the data available.
	2.5 Most probable cause is identified.
3. Implement solution to fault	3.1 Recommended solution to fault after monitoring ***process/equipment conditions*** is developed.
	3.2 ***HSE*** implications of solution are checked and modified solution as appropriate.
	3.3 This recommendation is communicated as appropriate.
	3.4 Recommendation is checked, has been understood and can be implemented.
	3.5 All hazard controls are checked and in place.
	3.6 Progress of implementation is monitored.

	3.7 Recommended solutions are modified as required. 3.8 Diagnosis and improvement activities are implemented.
4. Check fault solution has worked	4.1 Product/process is monitored for fault. 4.2 HSE impacts of changes is monitored. 4.3 Analysis and solution process are repeated if required. 4.4 Records and ***procedures*** are updated to reflect successful solution. 4.5 Laboratory ***tools and equipment*** are used to check plant condition.

Variable	**Range**
Examine	May include but not limited to: • visual examination • examination of product quality or other records • examination of inspection records (if used) • examination of test results (routine or otherwise) • Specific examination testing undertaken as part of a product improvement activity
Fault	May include but not limited to: • colour variation (non-uniform, not to standard hue/intensity/opacity) • surface blemishes (specs, marks) • surface finish (gloss level, uneven) • size/shape (distorted, wrong, variable) • within specification, but highly variable, forms patterns etc. (i.e. has 'assignable cause') • strength/stiffness/physical properties (too high/low, variable, uneven) • chemical properties • physical/mechanical properties • biological/biochemical/microbiological properties
Possible causes	May include but not limited to: • all feasible causes of the problem, before checking to eliminate some
Investigate	May include but not limited to: • talking with operators and others • checking machine histories for prevailing process conditions • checking current process/equipment conditions • Carrying out small tests to determine the likelihood of a causal link between a condition and a fault

Process/equipment conditions	May include but not limited to: • settings such as temperature, pressure • rates such as feed rate, flow rate • setting and adjustment of equipment parts • Worn and broken equipment parts
Health Safety and Environment (HSE)	May include but not limited to: • All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence
Procedures	May include but not limited to: • All operations are performed in accordance with procedures. • All relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards
Tools and equipment	May include but not limited to: • laboratory test facilities for the product (although the conduct of tests is not part of this unit) • equipment test instruments for checking the condition of plant
Diagnosis and improvement	May take place as a result of a problem where the fault level is causing reject product, or it may occur as part of continuous improvement, or a kaizen blitz or other situation where the products are not faulty, but are being improved

Evidence Guide	
Critical Aspects of Competence	Demonstrate knowledge and ability competencies to: • recognize defective product • isolate one or two most likely causes, and justify the selection of those causes • devise a permanent solution to the problem and justify that solution • check that the solution works • Work with all the required people to make it happen. • Perform consistently. For example, look to see that: • defects with different root causes are analyzed • defects with both process condition and equipment problem causes are solved • defects across the applicable range of products and processes are solved

Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • how the process/equipment works • how raw material changes into product through the process/equipment • impacts of different process conditions on the product • impacts of different equipment settings/components on the product • impacts of equipment failure/change/variation on the product • product faults and their categories according to causes • Causes of all possible product faults due to process/equipment problems. • Note this is not primarily about faults caused by things outside the process/equipment (e.g. unspecified changes in feed/raw materials), but the possibility of this cause for a fault should be included as required knowledge.
Underpinning Skills	Demonstrate skill to: • Communicate to operators, trades people and other technical experts about technical issues. • Interpret and apply procedures, technical manuals and manufacturer manuals. • Write maintenance and similar requests/orders, update procedures and write equipment/process condition specifications. • Demonstrate Interpret test data, technical specifications, instrument readings and measurements. Some calculation may be involved in developing and implementing solutions.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Identify Problems in Electronic Control Systems**
Unit Code	**IND PMP4 10 0613**
Unit Descriptor	This competency covers the recognition and diagnosis of control system problems in electrical/electronic control systems on process equipment. It includes the implementation of appropriate corrective action. It applies to all sectors of the industry. It applies to operators who are required to apply knowledge of electronic control systems and components to the identification and isolation of faults in equipment. The key factors are the diagnosis and the recommendation of action to resolve routine and non-routine faults, in order to return the equipment to production.

Elements	Performance Criteria
1. Identify electrical/ electronic control system problems	1.1 The types of machine malfunctions due to electrical/electronic faults is categorized. 1.2 The effects on product quality of electrical/electronic ***problems*** are described. 1.3 Possible faulty components is isolated from a circuit diagram and knowledge of the function of each component. 1.4 Possible causes for ***hazards*** are identified.
2. Implement appropriate corrective action	2.1 Other possible faults are examined. 2.2 Possible fault causes are short listed. 2.3 Investigations of ***tools and equipment***, machine, products or data are conducted to determine most likely fault cause(s). 2.4 Appropriate actions are taken to ensure fault is rectified. 2.5 Actions are followed up to ensure completion in an appropriate time frame. 2.6 Corrective action is rechecked after to ensure fault has been rectified.
3. Identify maintenance requirements	3.1 Manufacturer instructions are checked to determine recommended maintenance schedule. 3.2 Fault and maintenance history are checked to determine adequacy of current regime and special requirements. 3.3 Criticality of machine is determined to production/business. 3.4 All ***variables*** to be checked are determined.

	3.5 Maintenance schedule/requirements for machine is developed. 3.6 Liaise with all relevant stakeholders to ensure schedule is appropriate. 3.7 Outcomes are reported to appropriate personnel.
4. Identify electronic control system problems	4.1 The types of machine malfunctions due to electronic control system faults are categorized. 4.2 The effects on product quality of electronic control system problems are described. 4.3 Possible faulty components from a circuit diagram and knowledge of the function of each component is isolated.
5. Implement appropriate corrective action	5.1 Other possible faults are examined. 5.2 Possible fault causes is shortlisted. 5.3 Investigations of machine, products or data are conducted to determine most likely fault cause(s) as per ***procedure.*** 5.4 Appropriate actions are taken to ensure fault is rectified. 5.5 actions are followed up to ensure completion in an appropriate time frame. 5.6 Corrective actions are rechecked after to ensure fault has been rectified.

Variable	**Range**
Problems	May include but not limited to: • Respond to/rectify 'non-routine problems' means 'apply known solutions to a variety of predictable problems'. • loss of flow, power • power failure • component malfunction • poor maintenance procedures • regular maintenance • shutdown • motor failure effect on cycle time • short shots • loss of clamp pressure • no power • electronic/electrical faults • Analysis with PLC.
Hazards	May include but not limited to: • electricity • temperature from hot surfaces and equipment

	• malfunctioning equipment • Test equipment.
Tools and equipment	May include but not limited to: • application and programming of PLC (programmable logic controls) and ancillaries • application of solid-state control/switching units • switches, relays and solenoids • position and pressure transducers • Temperature controllers.
Variables	May include but not limited to: • temperatures • cleanliness • poor performance • Safety aspects.
Procedures	May include but not limited to: • All operations are performed in accordance with procedures. • all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge competencies to: • Recognize potential situations requiring action and then in implementing appropriate action. • Perform consistent. For example, look to see that: • Machine reliability is high.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • Process and the interaction of process conditions on product quality sufficient to recognize and analyze control system faults. • Organization procedures and policies along with the ability to implement them within appropriate time constraints and in a manner relevant to the job. • Managing risks using the hierarchy of controls applied to the process. Approved hazard control, safety procedures, use of PPE in relation to handling materials, equipment operation and clean up. • for solving electronic control system problems, including: ➢ fundamentals of electricity and electronics ➢ electronic circuit diagrams ➢ principles of electronic circuit components ➢ principles of PLC programming, troubleshooting and diagnosis ➢ appropriate testing procedures and use of equipment for a range of equipment faults

	➢ urgency and timeliness factors in planning maintenance activities in relation to production requirements ➢ Collection, analysis and reporting of data. • identify and select testing methods based on cost and time effectiveness • conduct inspections, checks and tests on equipment as appropriate • read and interpret circuit diagrams for mechanical, hydraulic, pneumatic and electrical/electronic operating systems • use technical information and manufacturer information to locate relevant data • interpret technical specifications and manufacturer instructions • ensure workplace is safe for testing and maintenance of equipment • identify hazards of the materials and process • implement appropriate procedures for hazard control • Use PPE, safely handle products and materials, read relevant safety information and apply safety precautions appropriate to the task. • The ability to read and interpret technical specifications and manufacturer manuals. • Writing procedures and schedules. • The interpretation of machine and product data and the comparison of actual with desired readings.
Underpinning Skills	Demonstrates skills of: • Application of managing risks using the hierarchy of controls applied to the process. • Application of approved hazard control, safety procedures, use of PPE in relation to handling materials, equipment operation and clean up. • for solving electronic control system problems, including: ➢ fundamentals of electricity and electronics ➢ electronic circuit diagrams ➢ principles of electronic circuit components ➢ principles of PLC programming, troubleshooting and diagnosis ➢ appropriate testing procedures and use of equipment for a range of equipment faults ➢ urgency and timeliness factors in planning maintenance activities in relation to production requirements ➢ Collection, analysis and reporting of data. • identifying and selecting testing methods based on cost and time effectiveness

	• conducting inspections, checks and tests on equipment as appropriate • reading and interpret circuit diagrams for mechanical, hydraulic, pneumatic and electrical/electronic operating systems • use of technical information and manufacturer information to locate relevant data • interpreting technical specifications and manufacturer instructions • ensuring workplace is safe for testing and maintenance of equipment • identifying hazards of the materials and process • implement appropriate procedures for hazard control • Use PPE, safely handle products and materials, read relevant safety information and apply safety precautions appropriate to the task: ➢ Reading and interpreting technical specifications and manufacturer manuals. ➢ Writing procedures and schedules. ➢ Interpreting machine and product data and the comparison of actual with desired readings.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Undertake Process Capability Improvements**
Unit Code	**IND PMP4 12 0613**
Unit Descriptor	This unit covers the knowledge and skills required by a team leader/technical expert to analyze data from the process, develop improvements to eliminate variation due to assignable causes and then implement actions. It primarily requires the application of skills associated with communication, information gathering, and analysis. Initiative, enterprise, and problem solving are also required to identify opportunities to improve process capacity. It also requires aspects of self-management and learning to validate own analysis.

Elements	Performance Criteria
1. Obtain required data	1.1 Process for study is identified. 1.2 Required data/information is obtained/organized.
2. Analyze information	2.1 Past data is analyzed and assignable causes using tools such as ***Six sigma*** ***(6s)*** and ***Three sigma*** ***(3s)*** are determined. 2.2 Possible improvements are determined to eliminate assignable causes 2.3 Own experience and learning are incorporated into proposed process improvements.
3. Improve process capability	3.1 Relevant people are liaised with to implement improvements. 3.2 Required authorities are obtained to implement improvements. 3.3 Required data is obtained/organized for improved process. 3.4 Process capability is recalculated. 3.5 Revised data collection/processing and new capability information are implemented. 3.6 Plant ***procedures*** are followed to implement improvement activities.

Variable	Range
Six sigma (6s)	Six sigma is a statistical tool for recording defects and determining capability. Six sigma limits equate to 3.4 defects per million opportunities for each product or service transaction. Six sigma is also used as a general term covering a competitive manufacturing approach. Six sigma training typically covers several units of competency in this Training Package.
Three sigma (3s)	Traditional statistical process control uses three sigma limits which equates to 3 defects per thousand opportunities for each product or service transaction.

Procedures	• All work instructions, standard operating procedures, formulas/recipes, batch sheets, temporary instructions and similar instructions provided for the smooth running of the plant. They may be written, verbal, computer based or in some other form. • Good operating practice as may be defined by industry codes of practice (e.g. Good Manufacturing Practice (GMP), Responsible Care) and government regulations.

Evidence Guide	
Critical Aspects of Competence	Demonstrates skills and knowledge competencies to: • Analyze a process and recalculate process capability/trial limits after changes have been made. • Analyze process information and the recalculation of process capability/trial limits.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • data collection methods • data processing techniques required • variability and normal distribution • three sigma or six sigma processes as relevant • random and non-random results - recognition of assignable causes • causes of different types of non-random results • causes of random variation • Process understanding sufficient to translate the data into variations in the process and determine methods of controlling them.
Underpinning Skills	Demonstrates skills in: • mathematical • statistical methods • communication • negotiation • planning • analysis • problem solving • teamwork and computer operation.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Apply Statistics to Processes in Manufacturing**
Unit Code	**IND PMP4 13 0613**
Unit Descriptor	This unit covers the knowledge and skills required to apply statistical theory and principles to the analysis and control of processes in manufacturing. Statistical process control is being used on a process in a manufacturing organization to monitor the process and determine when action needs to be taken. The appropriate action will then be taken in accordance with standard procedures. It primarily requires the application of skills associated with gathering and analyzing data and communicating statistical information to others. This unit also has a strong emphasis on problem solving, initiative and enterprise, planning and organizing, and self-management to solve problems and manage processes.

Elements	Performance Criteria
1. Collect process data	1.1 Sampling scheme is interpreted. 1.2 Measurements is obtained in accordance with standard procedures 1.3 ***Data is handled*** as required.
2. Interpret data	2.1 Data is plotted on appropriate ***control chart***. 2.2 Between ***random*** and ***non-random*** patterns of results is distinguished. 2.3 Results outside the ***control limits*** are identified. 2.4 Situations requiring action is recognized. 2.5 Appropriate action is taken in accordance with standard procedures 2.6 ***Cost of non-conformance*** is determined.
3. Calculate control limits	3.1 Relevant stakeholders are consulted to determine appropriate limits 3.2 Relevant methods are used to calculate/revise control limits 3.3 Limits on control chart are plotted. 3.4 Impact of limit is explained to relevant stakeholders.

Variable	Range
Sampling scheme	May include but not limited to: • sampling for attributes or sampling for variables • batch, continuous or custom made products

	• number of items/samples • size of sample • timing of sampling • location of sampling points • type of sample • number/type of measurements to be done on each sample • sampling equipment • measurement/testing equipment/methods
Procedures	May include but not limited to: • All work instructions, standard operating procedures, formulas/ recipes, batch sheets, temporary instructions and similar instructions provided for the smooth running of the plant. They may be written, verbal, computer based or in some other form. • Good operating practice as may be defined by industry codes of practice (e.g. Good Manufacturing Practice (GMP), Responsible Care) and government regulations.
Handle data	May include but not limited to: • calculating means, ranges, mean of means, standard deviation (using appropriate calculation aids) • entering data into a software package • recording data either in writing or electronically • other required manipulations of the data.
Control chart	May include but not limited to: • run • tally • mean/range • attributes • other relevant charts
Random	variation is the term used in statistical control to refer to those variations for which no cause can be found.
Non-random	also called identifiable cause, or assignable cause or special causes are those variations for which a cause can be found and so the cause of the variation eliminated. Non-random variation may also be used to predict possible breaches of the control limits.
Control limits	also referred to as process capability are those limits within which the process will operate if it is 'under control'.
Cost of non-conformance	May include but not limited to: • reprocessing/rework • expediting • unplanned service • excess inventory • complaint handling • downtime

	• returns • scrap • labor costs • material costs • infrastructure costs/overhead • utility costs
Appropriate limits	May include but not limited to: • 1 sigma warning limits • 2 sigma warning limits • 3 sigma control limits • 6 sigma limits

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • Collect process data • Interpret data • Calculate control limits
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • sampling techniques • purpose of sampling and measurement • random, systematic, stratified sampling • relevance, reliability and representativeness of samples/data collected • purpose of replication of data for statistical control • samples, populations, finite and infinite populations and the differences • methods of calculating means, standard deviations and the like and their purpose in statistical control • the causes of variation in a process • the meaning of broad/ narrow frequency distributions/ range/standard deviations and skewed distributions in process terms • types of control charts and their applications to different types of process/product and for different purposes • process causes of variation and typical cause types of non-random variation • non-process (e.g. measurement) causes of variation • recognition of stable and unstable processes • causes of stability/instability in the process • calculation of control limits/process capability and the applications of different control limits • Standard distribution curve and confidence limits.
Underpinning Skills	Demonstrate skills to: • analysis

	• problem solving • communication • documenting • calculations • use of statistics
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Optimize Process or Plant Area**
Unit Code	**IND PMP4 14 0613**
Unit Descriptor	This competency covers the ability to optimize the process performance of a complete plant area. It includes ensuring that production systems comply with Health, Safety and Environment (HSE) requirements, that process, plant and equipment utilization is planned and carried out, and that problems are solved to fully meet operational needs and ensure that production of finished goods meets customer requirements. It requires the application of detailed operational and process knowledge, including the principles of operation of equipment, and the chemistry and/or physics and/or biology/biochemistry of changes to materials occurring during processing. It embodies a significant breadth and depth of technical knowledge and process understanding.

Elements	Performance Criteria
1. Analyze and evaluate current plant, equipment and processes.	1.1 Actual process, plant and equipment performance with requirements and/or historical ***data/records*** and/or design performance are compared. 1.2 Abnormal or sub-optimal process, plant and equipment performance are identified. 1.3 Hazards associated with the plant and equipment are identified. 1.4 Product, materials and/or process records are collected and evaluated to determine possible causes for sub-optimal performance. 1.5 Appropriate techniques are used to rank possible causes from most to least probable cause.
2. Develop plan for corrective and/or optimization action.	2.1 Cause(s) is analyzed to determine appropriate corrective action. 2.2 The impact of a ***change*** in one unit/area on other related plant units/areas are predicted. 2.3 The impact of a change on ***health, safety and environmental*** performance are predicted. 2.4 Measurable objectives are developed and alternatives are evaluated. 2.5 Requirements are identified to implement change. 2.6 Stakeholders are consulted with regarding planned changes and impacts.

	2.7 Optimization plan taking account of hazards identified and HSE implications are developed and communicated to ***appropriate personnel.*** 2.8 Optimization action is evaluated to determine measures of effectiveness.
3. Coordinate corrective and/ or optimization action plan	3.1 All appropriate unit areas and operations in order to rectify problem causes in process, plant and equipment performance are coordinated. 3.2 And/or implement all required corrective/ optimization actions are initiated. 3.3 Corrective/optimization outcomes are communicated to all relevant personnel. 3.4 ***Procedures***/systems are implemented to eliminate possible future causes. 3.5 Log of all ***relevant information*** is recorded and maintained.
4. Develop continuous improvement strategies.	4.1 ***Sources of information*** is reviewed to identify possible factors causing sub-optimal performance. 4.2 Options for removing or controlling the risk of sub-optimal performance are identified. 4.3 The adequacy of existing control and quality methods and systems are assessed. 4.4 Opportunities are identified to continuously improve performance. 4.5 Recommendations for continual improvement of process, plant and equipment effectiveness are developed. 4.6 With appropriate personnel is consulted with and continuous improvement strategies are implemented. 4.7 Implementation of continuous improvement strategies are documented.

Variable	**Range**
Data/records	May include but not limited to: • hazard logs • incident reports • maintenance records • product non-conformance reports • Production records.
Implementing change	May include but not limited to: • changes to procedures • training of operators

	• equipment modifications • Ensuring all HSE requirements are addressed.
Health**,** Safety and Environment (HSE)	All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time.
Relevant/appropriate personnel	May include but not limited to: • managers • OHS representatives and OHS committee.
Procedures	May include but not limited to: • All relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards. These may include or have been prepared from/to comply with: ➢ industry codes of practice ➢ materials safety data sheets ➢ equipment manuals ➢ equipment start up, operation and shut down procedures ➢ calibration and maintenance schedules ➢ quality manuals and procedures ➢ organization recording and reporting procedures ➢ production and laboratory schedules ➢ Material, production and product specifications. • All operations are performed in accordance with organization procedures, licensing requirements, legislative requirements and industrial awards and agreements.
Relevant information	May include but not limited to: • Modifications to plant or equipment • Modifications to procedures or practices.
Sources of information	May include but not limited to: • hazard logs • incident reports • maintenance records • work practices • procedures • industry journals • equipment supplier information • Industry best practice information.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies in: • Equipment/process/system is understood in depth and that the importance of critical material properties/settings/readings is known.

	• Ability to recognize and analyze potential situations requiring action and then in implementing appropriate corrective action. • the operation of all ancillary equipment to the level required • The ability to implement improvements within appropriate time constraints and in a manner relevant to the operation of the equipment, processes and systems. • Consistent performance should be demonstrated to see that: ➢ non-routine problems are recognized and defined ➢ hazards are identified and controlled by applying the hierarchy of control ➢ possible causes of complex problems are identified based on experience and the use of analytical techniques in solving the problem, including identifying variations and cause, separating single problems from multiple problems and the recognition of recurring problems ➢ fundamental cause of process or equipment faults is determined ➢ corrective/preventative actions are developed to avoid recurrence of the problem and optimize the condition of the process, plant and equipment ➢ Product quality and uniformity are maintained.
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • equipment, • processes • systems • sufficient to • identify hazards associated with the process • Recognize opportunities to improve and/or enhance the quality of performance of the plant. • This knowledge needs to include: ➢ the relevant technical theory of the plant area ➢ an in depth understanding across the entire plant area ➢ the organization standard procedures and work instructions ➢ Relevant regulatory requirements, including those related to OHS risk control as appropriate to process/plant area optimization.
Underpinning Skills	Demonstrates skills to: • apply analytical skills which enable corrective or optimal conditions to prevail • identify and control hazards by applying the hierarchy of control as part of the optimization process

	• Interpret information and make appropriate process control decisions. • Competence includes the ability to distinguish between: • optimum and marginal performance of the plant • Effective and marginal performance corrections and actions. • As is relevant to the practical operation of all major equipment/process/ systems within the area. • Optimizing process systems requires application of detailed operational and process knowledge to address issues such as: ➢ starting material quality ➢ yield maximization ➢ throughput maximization ➢ energy efficiency ➢ use of utilities ➢ labor utilization ➢ overall cost ➢ efficient use of equipment ➢ reducing downtime ➢ minimization of waste and rework ➢ Improved workplace layout and workflow. • The ability to communicate at all levels about what may be complex technical matters. • The ability to evaluate complex information and sort often conflicting information into useful and distracting and to rank/prioritize information. • Writing is skills to the level of reading and interpreting technical information, developing and modifying plans and procedures and interpreting relevant regulatory requirements. • Numeracy skills to the level of analyzing product/process performance data, interpreting process condition information and deriving useful information from technical brochures, papers and similar. • Computing skills to determine priorities for optimization plans (i.e. benefit/cost or other quantitative criteria)
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Mistake Proof a Production Process**
Unit Code	**IND PMP4 16 0613**
Unit Descriptor	This unit covers the knowledge and skills needed to make changes which prevent errors and/or backsliding to a pre-improvement level of practice. In the CM environment, this unit would typically be done by a team leader, technical expert of similar person.

Elements	Performance Criteria
1. Analyze process	1.1 Sources of variability/non-conformance in the process are identified. 1.2 Critical control points in process are identified. 1.3 Causes of variability/non-conformance are analyzed.
2. Develop preventative techniques/systems	2.1 Team members and other people are liaised with to develop mistake proof method of performing operation. 2.2 ***Mistake proofing*** is tested and validated.
3. Implement permanent fix	3.1 Relevant people are liaised with to have systems/***procedures*** changed to implement solution. 3.2 Relevant people are liaised with to implement the solution. 3.3 Relevant people are liaised with to ensure the workforce has an appropriate skills set. 3.4 To ensure implementation occurs are followed through.
4. Monitor implementation	4.1 The implementation is critically observed. 4.2 The results of the implementation against the expected outcomes are compared. 4.3 Solution is modified to improve outcomes 4.4 Procedures reflect change is ensured. 4.5 Training/assessment reflects change is ensured. 4.6 Change at agreed period/cycle is audited. 4.7 Action on any observed deviation is taken.
5. Seek improvements	5.1 Changes are observed. 5.2 Process again if required is analyzed to ensure improvements are sustained.

Variable	Range
Mistake proofing	• Sometimes known as baka-yoke/poka-yoke, a manufacturing technique of preventing mistakes by designing the manufacturing process, equipment, tools and components/subassemblies etc so that an operation literally cannot be performed incorrectly. An attempt to perform incorrectly, as well as being prevented, is usually met with a warning signal of some sort.
Procedures	May include but not limited to: • All work instructions, standard operating procedures, formulas/recipes, batch sheets, temporary instructions and similar instructions provided for the operation of the plant. They may be written, verbal, computer based or in some other form. • Good operating practice as may be defined by industry codes of practice (e.g. Good Manufacturing Practice (GMP), Responsible Care) and government regulations.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • Analyze process • Develop preventative techniques/systems • Implement permanent fix • Monitor implementation • Seek improvements
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • their process • factors in the process which may cause variability • methods of controlling the variability in the process • Mistake proofing methods relevant to the process/product.
Underpinning Skills	Demonstrate skills to: • communication ability to discuss items with both operators and technical support personnel • problem solving • analysis • team work • Design conceptualization.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Determine Rheology and Output of Plastics Materials from Processing Equipment**
Unit Code	**IND PMP4 17 0613**
Unit Descriptor	This competency covers the application of knowledge of polymer rheology to the flow of polymers through processing equipment, including extruders and injection moulding equipment and the dies and moulds fitted to that equipment. It applies to technicians who need to perform calculations using the rheological properties of polymers and apply that to their performance in process equipment. It includes Newtonian and non-Newtonian flow, shear force and shear rate calculations output calculations, Density/temperature/viscosity relationships and calculations.

Elements	Performance Criteria
1. Determine flow characteristics of polymer compound	1.1 Shear and shear rates are calculated and described. 1.2 Between Newtonian and non-Newtonian flow are distinguished. 1.3 The characteristics of polymer structures which influence flow are identified. 1.4 The relationships between density, temperature and viscosity for polymers is identified. 1.5 The flow characteristics of a polymer compound based on its structure and temperature is identified. 1.6 Technical problems associated with the design and manufacturing ***procedures*** are solved.
2. Calculate flow rate of polymer compound	2.1 Equipment dimensions and data are used to determine shear rate of polymers through that equipment. 2.2 Output from equipment using viscosity curves and shear rate diagrams are calculated. 2.3 Mean velocity at critical points in a process is calculated. 2.4 The characteristic curves for the screws and dies in processing equipment, and the resultant operating point for the system are determined.

Variable	Range
Procedures	include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards. All operations are performed in accordance with procedures.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • determine and apply rheology tests on relevant polymers • determine flow characteristics of polymer compound • calculate flow rate of polymer compound
Underpinning Knowledge and Attitudes	Demonstrate knowledge and understanding of: • The principles of rheology, how rheological properties vary with temperature and how they impact on process efficiency and equipment design. • Organization procedures and policies along with the ability to implement them within appropriate time constraints and in a manner relevant to the job. • A basis for solving processing and material problems including: • Newtonian flow • non-Newtonian flow • density/temperature/viscosity relationships • Quantitatively determining shear, shear rate, output, and viscosity/density changes with temperature. • Use of complex algebraic equations, non-linear functions, simultaneous equations and the interpretation of non-linear graphs. Literacy is also required at least equivalent to senior secondary school.
Underpinning Skills	Demonstrate skills to: • Apply the principles of rheology, how rheological properties vary with temperature and how they impact on process efficiency and equipment design. • Apply organization procedures and policies along with the ability to implement them within appropriate time constraints and in a manner relevant to the job. • High level numeracy skills such as are needed for the use of complex algebraic equations, non-linear functions, simultaneous equations and the interpretation of non-linear graphs. Literacy is also required at least equivalent to senior secondary school.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Analyze Equipment Performance**
Unit Code	**IND PMP4 16 0613**
Unit Descriptor	This competency covers the analysis of the performance, and performance verification, of existing equipment. It applies typically to the extrusion, injection and related sectors of the industry. Technicians who will set up and operate performance verification trials and then analyze the results to determine actual compared to theoretical performance of equipment and equipment components. The technician will calculate the theoretical performance of a screw, die, etc., gather data to determine the actual performance of the screw, die etc., calculate of actual versus theoretical performance, make recommendations as to the appropriate action to be taken based on the performance verification results.

Elements	Performance Criteria
1. Determine theoretical performance	1.1 Items of plant and plant component(s) to be analyzed are identified. 1.2 Design specification is located and interpreted. 1.3 Process materials being processes/to be processed during verification trial are identified. 1.4 Process material properties under process conditions are determined. 1.5 Theoretical performance of component(s) with that material under those conditions is calculated.
2. Conduct trial	2.1 Verification trial to be compatible with theoretical analysis is designed. 2.2 Measurements needed from trial to yield required data are determined. 2.3 ***Equipment*** suitable to give required measurements is selected. 2.4 For verification trial with relevant process personnel is arranged. 2.5 Required measurement equipment is set up. 2.6 Trial is supervised and ensured trial conditions are appropriate. 2.7 Trial data for analysis is collected. 2.8 Measures are implemented to control identified ***hazards*** in line with procedures and duty of care

3. Verify performance of component(s)	3.1 Theoretical with actual performance is compared. 3.2 Significance of variation between theoretical and actual performance are determined. 3.3 Any suspicious results are investigated and appropriate action is taken. 3.4 ***Problems*** are analyzed for any long term impact and potential solutions are assessed and action taken. 3.5 Equipment performance, noting key ***variables*** are analyzed.
4. Recommend required action	4.1 Appropriate action is determined to bring performance to desired level. 4.2 The corrective action is initiated to ***procedures***. 4.3 Measures are determined to increase equipment productivity. 4.4 Re-check performance after corrective action is implemented.

Variable	**Range**
Tools and equipment	This competency includes use of equipment and tools such as: • measuring equipment (E.g. micrometers, tapes, verniers, scales) • hand tools • Data analysis tools (e.g. computer programs for data recording and presentation)
Hazards	Typical hazards include: • moving machinery • Hot surfaces and products
Problems	Typical process and product problems may include: • worn components • validation of new components to design specification • component performance analysis in order to upgrade process performance
Variables	Key variables to be monitored include: • measurements • machine characteristics
Procedures	include: • all relevant workplace procedures, • work instructions, • temporary instructions and relevant industry and government codes and standards. All operations are performed in accordance with procedures • extrusion

	• injection • Blow moulding.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • Determine theoretical performance • Conduct trial • Verify performance of component(s) • Recommend required action
Underpinning Knowledge and Attitudes	Demonstrate knowledge and skills competencies of: • the materials, equipment and process sufficient to predict their interactions and their impacts on performance. • organization procedures and policies along with the ability to implement them within appropriate time constraints and in a manner relevant to the job. • Application of managing risks using the hierarchy of controls applied to the process. Application of approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup. • a basis for solving processing and material problems • the characteristics and manufacturing behaviours of polymers involved in the process • polymer materials, their additives and the rheological, heat and other effects of processing to the design of equipment and components to predict practical performance results • calculate equipment and component performance from the design specification • determine equipment and design performance from practical trials • determine the 'limiting component' in the performance of an item of equipment or a process • Determine possible performance of an item of equipment/process if practical improvements were made to the 'limiting item'.
Underpinning Skills	Demonstrate skills to: • Apply managing risks using the hierarchy of controls applied to the process. Application of approved hazard control, safety procedures, the use of PPE in relation to handling materials, equipment operation and cleanup. • High levels of numeracy and literacy with the ability to interpret technical specifications and reports. Advanced numeracy allowing the calculation and interpretation of statistics, product formulae and process conditions is also required.

Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Use Computer Aided Drafting Systems to Produce Basic Engineering Drawings**
Unit Code	**IND PMP4 17 0613**
Unit Descriptor	This unit covers producing basic engineering drawings using a CAD system, under the direction of a supervisor. It applies to the production of drawings according to defined parameters and predetermined specifications that include materials, tolerances, codes and other specifications. All work is conducted under supervision. Standard CAD software would be used including inbuilt file management, macros and reports. Drawings include plans, diagrams, charts, circuits, systems or schematics.

Elements	Performance Criteria
1. Prepare the CAD environment	1.1 All relevant manuals, instructions and operating procedures for the CAD software are obtained in accordance with workplace procedures. 1.2 The CAD package is booted up in accordance with workplace procedures. 1.3 Screen display areas and ***basic parameters*** are set in accordance with instructions.
2. Produce a basic drawing	2.1 ***Basic CAD drawings*** are created and guidance is sought as required. 2.2 Drawings are prepared in accordance with AS 1100 or equivalent or in accordance with standard operating procedures. 2.3 As required, CAD drawings are reviewed with supervisor and/or other designated staff in accordance with company procedures.
3. Modify existing CAD drawings	3.1 Existing CAD drawings are located and modified by adding, deleting or changing drawing elements within that drawing.
4. Produce output	4.1 Drawing files are saved in the appropriate format in accordance with standard operating procedures. 4.2 Drawing files are printed out using plotter or ***equivalent devices***.
5. Perform exit and shut-down procedures	5.1 Programs and computer are shut down in accordance with workplace procedures.

Variable	Range
Basic parameters	May include but not limited to: • layer or level, line type, line width, colour and text format etc.
Basic CAD drawings	May include but not limited to: • lines, arcs, circles, polygons, ellipses, hatching or filling of areas, text, dimensions and tangents
Equivalent devices	May include but not limited to: • ink jet printers or the like

Evidence Guide	
Critical Aspects of Competence	Demonstrate knowledge and skills competencies of: • Prepare the CAD environment • Produce a basic drawing • Modify existing CAD drawings • Produce output • Perform exit and shut-down procedures
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • CAD program capabilities and processes
Underpinning Skills	Demonstrate skills to: • read and interpreting engineering specifications • organize information • use computer and peripherals • use CAD program • prepare simple drawings in plane orthogonal, isometric projection or equivalent
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Choose Polymer Materials for an Application**
Unit Code	**IND PMP4 18 0613**
Unit Descriptor	This competency covers the application of knowledge of polymerization, polymer structure and modifications of polymer materials to their properties so enabling the choice of an appropriate polymer compound for an application. It is typically performed by technicians developing new products or applying this knowledge set to advanced processes/product problem solving. It applies to technicians who are able to bring together an understanding of the basics of chemistry and polymers and apply this understanding to determine the properties of polymers and polymer products. It includes the influence of polymerization mechanisms on polymer properties, the influence of polymer structure on polymer properties, methods of modifying the properties of raw polymers, the selection and interpretation of polymer tests, the ability to bring these skills together to select appropriate material(s) for an application.

Elements	Performance Criteria
1. Determine possible polymer properties based on polymer type	1.1 Molecular weight distribution changes with polymerization mechanisms and conditions are estimated. 1.2 The impact of monomer and polymer structure on polymer properties are predicted.
2. Estimate polymer properties based on polymer structure	2.1 Property changes caused by polarity and intermolecular forces are predicted. 2.2 Possible polymer properties based on chain flexibility variations caused by changes in regularity, tacticity and intermolecular forces are determined. 2.3 Polymer properties based on molecular weight/molecular weight distribution, degree of cross-linking are estimated. 2.4 Barrier properties based on molecular orientation and degree of crystallization are predicted. 2.5 Solve technical problems associated with the design and manufacturing ***procedures***
3. Choose a polymer compound for an application	3.1 Appropriate base polymer/polymers are selected for an application based on the polymer properties. 3.2 Reinforcement(s)/additives required is determined to meet product specification.

	3.3 Failure mechanism for selected compound is predicted and modified selection if appropriate. 3.4 The need for polymer compatibilizers are determined and specified appropriate use if required. 3.5 Formulation is developed and appropriate production is selected.
4. Organize testing of polymer and interpret test results	4.1 Appropriate test(s) is selected for compounded polymer based on test purpose and limitations and material being tested. 4.2 Color is tested using color coordinates as required. 4.3 Test results are interpreted and modified formulation/production method as required to meet product specification.

Variable	**Range**
Procedures	May include but not limited to: • All operations are performed in accordance with procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.

Evidence Guide	
Critical Aspects of Competence	Demonstrate knowledge and skills competencies to: • Determine possible polymer properties based on polymer type • Estimate polymer properties based on polymer structure • Choose a polymer compound for an application • Organize testing of polymer and interpret test results
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • the polymerization process and polymer characteristics sufficient to enable the selection of polymers with appropriate base properties. • organization standard procedures and policies. Knowledge of the relevant regulatory requirements and national/international standards along with the ability to implement them within appropriate time constraints and in a manner relevant to the job.. • basic chemistry, including atomic structure, molecular weight, periodic table, ionic and covalent bonding, intermolecular bonding, hydrogen bonding, structure of organic compounds, functional groups and typical reactions, saturated and unsaturated compounds, aromatic compounds, hydrolysis and addition reactions.

Underpinning Skills	Demonstrate skills to: • requirements and national/international standards along with the ability to implement them within appropriate time constraints and in a manner relevant to the job. • predict appropriate polymers and additives from the required properties of a product. • Consistent performance. For example, to see that selections made can be justified.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Develop a New Compound**
Unit Code	**IND PMP4 19 0613**
Unit Descriptor	This competency covers the development of a new compound/formulation or the major modification of an existing compound. It includes determining the appropriate base polymer/polymer blend, determining the appropriate additives, determining the appropriate mixing methods and order, verifying that compound and methods are acceptable in the factory, and ensuring the factory is able to mix this compound as a routine product.

Elements	Performance Criteria
1. Confirm required properties of compound.	1.1 Stakeholders are communicated with regarding technical and aesthetic specification. 1.2 Project constraints such as timelines and cost are identified. 1.3 ***Compound*** specification and project plan are drafted. 1.4 Required ***tests*** are identified to verify compound meets specification. 1.5 Stakeholders are confirmed with and modified as appropriate.
2. Develop base formulation.	2.1 ***Appropriate base polymer/polymer*** blend is identified. 2.2 Appropriate fillers/reinforcers are ***selected*** and required proportions are estimated. 2.3 Appropriate plasticizers and related materials are selected and required proportions are estimated. 2.4 Appropriate other materials are selected and required proportions are estimated. 2.5 Initial formulation is drafted. 2.6 Trial mixing procedure and order of addition are drafted. 2.7 Any ***Health Safety and Environment (HSE)*** issues are identified and modified as appropriate.
3. Mix, test and modify formulation.	3.1 All hazards for laboratory development program are identified and controlled. 3.2 All required materials and tools/ equipment are obtained. 3.3 The trial compound following the draft ***procedures*** is produced. 3.4 The compound compliance with the specification is evaluated.

	3.5Formulation and procedure as required are modified. 3.6Factory trial formula and procedure are drafted.
4. Monitor factory trials.	4.1All HSE issues are identified and controlled for factory trials. 4.2All required materials and tools/equipment available are ensured. 4.3Trial(s) is organized at an appropriate time. 4.4Ensure trial is monitored and required data collected. 4.5Factory trial compound and procedure are evaluated. 4.6Formulation and procedure are modified as required.
5. Complete compound development.	5.1Ensure final formulation and procedures are recorded in standard procedures. 5.2Ensure all required materials and tools and equipment will be routinely available as required. 5.3Ensure HSE controls are standardized. 5.4Ensure skill needs of operators have been addressed. 5.5All required reports and records are completed. 5.6Stakeholders are advised of the outcome of the project.

Variable	**Range**
Compound	is used to mean any mixture of materials which is undertaken to a set formula and in specified proportions.
Tests	include the normal range of physical, chemical and environmental (weathering) tests which might be applied to the product.
Identify polymers	of base polymer is a necessary starting point for any compound, but this competency does not necessarily require the choosing of a polymer from an understanding of its characteristics. Identification may be done in liaison with others, or by choosing the base polymer used in other products with similar requirements.
Select components	and the proportions of components to be used should be done from knowledge of a wide range of possible components, the properties each would bring to the compound, the relative advantages and disadvantages of each and the change in compound properties with changing amounts of each component.
Procedures	All operations are performed in accordance with procedures. Procedures mean all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.

Health**,** Safety and Environment (HSE)	All operations are subject to stringent Health, Safety and Environment requirements, which may be imposed through State or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the technician needs to ensure the HSE requirements take precedence.

Evidence Guide	
Critical Aspects of Competence	Demonstrate knowledge and skills competencies to: • interpret the requirements of the new compound and express this in suitable form • make appropriate choices of components and justify those choices • develop appropriate mixing procedures and conditions and justify those choices • Introduce the new compound into the factory successfully. • Perform consistently. For example, to see that: • a range of compounds meeting different types of specifications are developed • a range of compounds requiring different components/component amounts are developed.
Underpinning Knowledge and Attitudes	• compound components to a level necessary to select appropriate components from a range of similar, competing components • mixing processes to a level necessary to select an appropriate mixing method, an order of addition and mixing conditions • appropriate tests so as to select the tests needed to check for compliance with the specification, and interpret test results • HSE issues related to various compound components.
Underpinning Skills	• communicate at all levels about technical issues and bring agreement as to requirements from the different parties. • Interpret technical information, and writing technical specifications, procedures and reports. • Interpret technical information and test results, calculating required proportions and scaling up to a factory sized trial.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Determine Heat Transfer Loads for Processing Equipment**
Unit Code	**IND PMP4 20 0613**
Unit Descriptor	This competency covers the application of a knowledge of heat transfer and heat balance principles to the design and use of processing equipment. It is typically performed by senior technicians. It applies to technicians who need to determine heating and/or cooling loads for processing equipment. It includes conduction, convection and radiation, thermal properties of materials, particularly polymers, methods of heating polymer materials, cooling systems, energy balances.

Elements	Performance Criteria
1. Calculate heat transferred from/to items	1.1 Conductive heat transfer to/from an object is calculated. 1.2 Convective heat transfer to/from an object is calculated. 1.3 Radiative heat transfer to/from an object is calculated. 1.4 Combined heat transfer to/from an object, including resistances in series and parallel is calculated.
2. Calculate temperature change caused by a change in heat content	2.1 Temperature change caused by heating/cooling of polymer compounds in typical examples of processing equipment is calculated. 2.2 Change in heat content caused by shear on a polymer compound is calculated. 2.3 Temperature rise caused by shear on a polymer is calculated.
3. Select appropriate heating and/or cooling mechanism for an application	3.1 Rates of heat transfer/overall heat transfer coefficients for major methods of heating and cooling is compared. 3.2 Appropriate methods of varying/controlling rates of heat transfer are determined. 3.3 Heat transfer rates under a range of conditions is calculated. 3.4 Any changes of heat transfer and heat balance principles to the design and use of processing equipment ***procedures*** is checked.
4. Determine heating required to suit process conditions	4.1 Heating requirements are determined to obtain correct viscosity for processing. 4.2 Appropriate heat transfer mechanism(s) is selected to achieve desired conditions.

5. Conduct energy balance over process components.	5.1 Overall heating load for process components is determined. 5.2 Overall cooling load for process components is determined. 5.3 The adequacy (or otherwise) of the process/plant heating/cooling system to cope with this is determined.

Variable	**Range**
Procedures	include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards. All operations are performed in accordance with procedures.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • Calculate heat transferred from/to items • Calculate temperature change caused by a change in heat content • Select appropriate heating and/or cooling mechanism for an application • Determine heating required to suit process conditions • Conduct energy balance over process components
Underpinning Knowledge and Attitudes	Demonstrate knowledge and understanding of: • heat transfer principles and calculations sufficient to determine the heating/cooling loads of an existing or a new process. • the effects of heat/temperature on the materials being processed and the products being made sufficient to determine the processing temperatures and heating/cooling rates required to achieve a satisfactory product from an efficient process. • the enterprise's procedures and policies along with the ability to implement them within appropriate time constraints and in a manner relevant to the job. • Knowledge as a basis for solving processing and material problems including: ➢ conduction ➢ convection ➢ radiation ➢ combined conduction/convection ➢ specific heat capacity ➢ mechanical work/heat relationships ➢ energy balances. • Literacy is also required at least equivalent to senior secondary school level.

Underpinning Skills	Demonstrate skills to: • apply heat transfer principles and calculations sufficient to determine the heating/cooling loads of an existing or a new process. • apply enterprise's procedures and policies along with the ability to implement them within appropriate time constraints and in a manner relevant to the job. • high level numeracy skills at least equivalent to senior secondary school levels. • literacy required and at least equivalent to senior secondary school level.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Analyze Failure in Polymeric Materials**
Unit Code	**IND PMP4 21 0613**
Unit Descriptor	This competency covers the viscoelastic response of polymeric materials to stress and strain under various conditions. It covers the response of different polymers, compounds and physical shapes with different applications of stress and strain. It applies to technicians who are required to differentiate between products and compounds based on their response to applied stress/strain. It includes crystalline and amorphous polymers, reinforced (fillers or fibers) and filled compounds, cross linked and uncross linked polymers, impact, steady and repeated application, application under different physical and chemical conditions, response of different shapes, and applications of this to typical products/situations.

Elements	Performance Criteria
1. Analyze response to steady and static loads	1.1 Stress strain response is determined. 1.2 Tear/notch failures is determined. 1.3 Modulus and yield is identified. 1.4 Creep and stress relaxation are identified. 1.5 Stiffness is determined. 1.6 Applications where the typical viscoelastic response of polymers is an advantage are identified. 1.7 Applications where the typical viscoelastic response of polymers must be modified and common methods of modification are identified. 1.8 All ***tools and equipment*** are analyzed for failure in polymeric materials is ensured.
2. Analyze response to time varying loads	2.1 Hysteresis in tensile and shear loadings are determined. 2.2 The effect of slow/rapid (impact) loading are determined. 2.3 Failure modes in flex cycling are identified. 2.4 Fatigue failure is identified. 2.5 Failures in sinusoidal loadings are identified. 2.6 Applications are identified where the typical viscoelastic response of polymers is an advantage. 2.7 Applications are identified where the typical viscoelastic response of polymers must be modified and common methods of modification.

3. Analyze the effect of environment/ history on mechanical response	3.1 Effect of temperature on response is determined. 3.2 Effect of surface degradation on response is determined. 3.3 Effect of molecule/fiber/filler orientation on response is determined. 3.4 The effect of environmental degradation on failure is determined. 3.5 Applications are identified where the typical response of polymers is an advantage. 3.6 Applications are identified where the typical response of polymers must be modified and common methods of modification. 3.7 All ***hazards*** are identified and controlled for failure in polymeric materials
4. Analyze the effect of shape on mechanical response	4.1 The effect of shape on the stress/strain relationship (triaxiality) is determined. 4.2 The effect of shape on stiffness is determined. 4.3 The effect of shape on response to cyclical loads is determined. 4.4 The effect of shape on creep and relaxation is determined. 4.5 Applications are identified where the typical response of polymers is an advantage. 4.6 Applications are identified where the typical response of polymers must be modified and common methods of modification. 4.7 ***Procedures*** for analyzing failure in polymeric materials are followed.

Variable	**Range**
Tools and equipment	May include but not limited to: • stress/strain testers • impact testers • cycling testers • environmental aging equipment • Basic length/thickness measuring equipment
Hazards	Typical hazards include: • stored energy (e.g. in stressed test samples • test preparation equipment • conditions and materials used for causing sample degradation

Procedures	All operations are performed in accordance with procedures. Procedures mean all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards. ISO standards for mechanical/physical testing of polymers will be relevant here and appropriate standards should be followed.

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • explain test results in terms which are appropriate to the polymeric material of the sample • apply the results of the analyses to typical applications • identify applications where typical polymer properties are an advantage • distinguish between applications where polymers may be used satisfactorily (although without an inherent advantage) and those where it has an inherent advantage. • Perform consistently. For example, to see that: ➢ the model(s) of viscoelasticity can be consistently applied to a range of likely situations ➢ the response to the application of stress in a range of circumstances can be explained ➢ the effect of shape can be predicated and explained for different stress application situations.
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • classical (i.e. elastic) stress and strain • classical (i.e. elastic) Young's modulus and Poisson ratio • stress, compression, shear and torsion • stiffness and bending moments • application of the above for viscoelastic bodies • models of viscoelasticity • creep and relaxation • effects of temperature (above and below the glass transition point) • effects of degradation, e.g. surface oxidation (such as UV, O3); swelling (such as solvent, chemical) • three dimensional responses to stress • responses to stress cycling, including heat build up • mechanical responses to changing the properties of polymer structures and components
Underpinning Skills	• interpret and apply technical information. • read and apply technical brochures, books and other information. • apply technical information and calculating stress/strain and related data, drawing and interpreting graphs.

Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Plan and Organize Work**
Unit Code	**IND PMP4 22 0613**
Unit Descriptor	This unit covers the knowledge, skills and attitude required in planning and organizing work activities in a production application. It may be applied to a small independent operation or to a section of a large organization.

Elements	Performance Criteria
1. Set objectives	1.1 ***Objectives*** are planned consistent with and linked to work activities in accordance with organizational aims. 1.2 Objectives are stated as measurable targets with clear time frames. 1.3 Support and commitment of team members are reflected in the objectives. 1.4 Realistic and attainable objectives are identified.
2. Plan and schedule work activities	2.1 Tasks/work activities to be completed are identified and prioritized as directed. 2.2 Tasks/work activities are broken down into steps in accordance with set time frames and achievable components. 2.3 Task/work activities are assigned to appropriate team or individuals in accordance with agreed functions. 2.4 ***Resources*** are allocated as per requirements of the activity. 2.5 ***Schedule of work activities*** is coordinated with personnel concerned.
3. Implement work plans	3.1 ***Work methods and practices*** are identified in consultation with personnel concerned. 3.2 ***Work plans*** are implemented in accordance with set time frames, resources and ***standards***.
4. Monitor work activities	4.1 Work activities are monitored and compared with set objectives. 4.2 Work performance is monitored. 4.3 Deviations from work activities are reported and recommendations are coordinated with appropriate personnel and in accordance with set standards. 4.4 Reporting requirements are complied with in accordance with recommended format. 4.5 Timeliness of report is observed. 4.6 Files are established and maintained in accordance with standard operating procedures.

5. Review and evaluate work plans and activities	5.1 Work plans, strategies and implementation are reviewed based on accurate, relevant and current information. 5.2 Review is done based on comprehensive consultation with appropriate personnel on outcomes of work plans and reliable feedback. 5.3 Results of review are provided to concerned parties and formed as the basis for adjustments/simplifications to be made to policies, processes and activities. 5.4 Performance appraisal is conducted in accordance with organization rules and regulations. 5.5 Performance appraisal report is prepared and documented regularly as per organization requirements. 5.6 Recommendations are prepared and presented to ***appropriate personnel/authorities***. 5.7 ***Feedback mechanisms*** are implemented in line with organization policies.

Variable	**Range**
Objectives	May include but not limited to: • Specific • General
Resources	May include but not limited to: • Personnel • Equipment and technology • Services • Supplies and materials • Sources for accessing specialist advice • Budget
Schedule of work activities	May include but not limited to: • Daily • Work-based • Contractual Regular
Work methods and practices	May include but not limited to: • Legislated regulations and codes of practice • Industry regulations and codes of practice • Occupational health and safety practices
Work plans	May include but not limited to: • Daily work plans • Project plans • Program plans • Resource plans • Skills development plans • Management strategies and objectives

Standards	May include but not limited to: • Performance targets • Performance management and evaluation systems • Occupational standards • Employment contracts • Client contracts • Discipline procedures • Workplace assessment guidelines • Internal quality assurance • Internal and external accountability and auditing requirements • Training Regulation Standards • Safety Standards
Appropriate personnel/ authorities	May include but not limited to: • Appropriate personnel include: • Management • Line Staff
Feedback mechanisms	May include but not limited to: • Verbal feedback • Informal feedback • Formal feedback • Questionnaire • Survey • Group discussion

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • set objectives • plan and scheduled work activities • implement work plans • monitor work activities • review and evaluate work plans and activities
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • organization's strategic plan, policies rules and regulations, laws and objectives for work unit activities and priorities • organizations policies, strategic plans, guidelines related to the role of the work unit • team work and consultation strategies
Underpinning Skills	Demonstrates skill of: • planning • leading • organizing • coordinating • communication skills • inter-and intra-person/motivation skills

	• presentation skills
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Migrate to New Technology**
Unit Code	**IND PMP4 22 0613**
Unit Descriptor	This unit defines the competence required to apply skills and knowledge in using new or upgraded technology. The rationale behind this unit emphasizes the importance of constantly reviewing work processes, skills and techniques in order to ensure that the quality of the entire business process is maintained at the highest level possible through the appropriate application of new technology. To this end, the person is typically engaged in on-going review and research in order to discover and apply new technology or techniques to improve aspects of the organization's activities.

Elements	Performance Criteria
1. Apply existing knowledge and techniques to technology and transfer	1.1 Situations are identified where existing knowledge can be used as the basis for developing new skills. 1.2 New or upgraded technology skills are acquired and used to enhance learning. 1.3 New or upgraded equipment are identified, classified and used where appropriate, for the benefit of the organization.
2. Apply functions of technology to assist in solving organizational problems	2.1 Testing of new or upgraded equipment is conducted according to the specification manual. 2.2 Features of new or upgraded equipment are applied within the organization 2.3 Features and functions of new or upgraded equipment are used for solving organizational problems 2.4 Sources of information relating to new or upgraded equipment are accessed and used
3. Evaluate new or upgraded technology performance	3.1 New or upgraded equipment is evaluated for performance, usability and against OHS standards**.** 3.2 ***Environmental considerations*** are determined from new or upgraded equipment. 3.3 ***Feedback*** is sought from users where appropriate.

Variables	Range
Environmental Considerations	May include but is not limited to: • recycling, safe disposal of packaging (e.g. cardboard, polystirene, paper, plastic) and correct disposal of waste materials by an authorized body

Feedback	May include but is not limited to: • surveys, • questionnaires, • interviews and meetings

Evidence Guide	
Critical Aspects of Competence	Competence must confirm the ability to transfer the application of existing skills and knowledge to new technology
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • Broad awareness of current technology trends and directions in the industry (e.g. systems/procedures, services, new developments, new protocols) • Vendor product directions • Ability to locate appropriate sources of information regarding metal manufacturing and new technologies • Current industry products/services, procedures and techniques with knowledge of general features • Information gathering techniques
Underpinning Skills	Demonstrate skills of: • Research skills for identifying broad features of new technologies • Ability to assist in the decision making process • Literacy skills in regard to interpretation of technical manuals • Ability to solve known problems in a variety of situations and locations • Evaluate and apply new technology to assist in solving organizational problems • General analytical skills in relation to known problems
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Establish Quality Standards**
Unit Code	**IND PMP4 24 0613**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to establish quality specifications for work outcomes and work performance. It includes monitoring and participation in maintaining and improving quality, identifying critical control points in the production of quality output and assisting in planning and implementing of quality assurance procedures.

Elements	Performance Criteria
1. Establish quality specifications for product	1.1 Market specifications are ***sourced*** and ***legislated requirements*** identified. 1.2 Quality specifications are developed and agreed upon 1.3 Quality specifications are documented and introduced to organization staff / personnel in accordance with the organization policy 1.4 Quality specifications are updated when necessary
2. Identify hazards and critical control points	2.1 Critical control points impacting on quality are identified. 2.2 Degree of risk for each hazard is determined. 2.3 Necessary documentation is accomplished in accordance with organization quality procedures.
3. Assist in planning of quality assurance procedures	3.1 Procedures for each identified control point are developed to ensure optimum quality. 3.2 Hazards and risks are minimized through application of appropriate controls. 3.3 Processes are developed to monitor the effectiveness of quality assurance procedures.
4. Implement quality assurance procedures	4.1 Responsibilities for carrying out procedures are allocated to staff and contractors. 4.2 Instructions are prepared in accordance with the enterprise's quality assurance program. 4.3 Staff and contractors are given induction training on the quality assurance policy. 4.4 Staff and contractors are given in-service training relevant to their allocated ***safety procedures***.
5. Monitor quality of work outcome	5.1 Quality requirements are identified 5.2 Inputs are inspected to confirm capability to meet quality requirements

	5.3 Work is conducted to produce required outcomes 5.4 Work processes are monitored to confirm quality of output and/or service 5.5 Processes are adjusted to maintain outputs within specification.
6. Participate in maintaining and improving quality at work	6.1 Work area, materials, processes and product are routinely monitored to ensure compliance with quality requirements 6.2 Non-conformance in inputs, process, product and/or service is identified and reported according to workplace reporting requirements 6.3 Corrective action is taken within level of responsibility, to maintain quality standards 6.4 Quality issues are raised with designated personnel
7. Report problems that affect quality	7.1 Potential or existing quality problems are recognized. 7.2 Instances of variation in quality are identified from specifications or work instructions. 7.3 Variation and potential problems are reported to supervisor/manager according to enterprise guidelines.

Variable	Range
Sourced	May include but is not limited to: • End-users • Customers or stakeholders
Legislated requirements	May include but is not limited to: • Verification of product quality as part of consumer legislation or specific legislation related to product content or composition.
Safety procedures	May include but is not limited to: • Use of tools and equipment for fabrication/production/ manufacturing works • Workplace environment and handling of material safety, • Following occupational health and safety procedures designated for the task • Respect the policies, regulations, legislations, rule and procedures for manufacturing/production/fabrication works
Materials	May include but is not limited to: • gloves, bucket, scrubbing brush, gauze, cotton and plasters • aluminum foils, gowns, apron, rubber boots, disinfectants, antiseptics, scalpel blade, stationeries, tap water, alcohol, and soap, detergents, protective eyewear, overall, cleaning reagents cleaning materials

Tools and Equipment	May include but is not limited to: • projector, white board, computers, printers, calculators, copying machines, bucket, wheelbarrow/trolley for disposal of carcass, different quality evaluating equipment

Evidence Guide	
Critical Aspect of Competence	Demonstrate skills and knowledge competencies to: • Monitor quality of work • Establish quality specifications for product • Participate in maintaining and improving quality at work • Identify hazards and critical control points in the production of quality product • Assist in planning of quality assurance procedures • Report problems that affect quality • Implement quality assurance procedures
Underpinning Knowledge	Demonstrate knowledge of: • work and product quality specifications • quality policies and procedures • improving quality at work • hazards and critical points of operation • obtaining and using information • applying federal and regional legislation within day-today work activities • accessing and using management systems to keep and maintain accurate records • requirements for correct preparation and operation • technical writing
Underpinning Skills	Demonstrates skills in: • monitoring quality of work • establishing quality specifications for product • participating in maintaining and improving quality at work • identifying hazards and critical control points in the production of quality product • assisting in planning of quality assurance procedures • reporting problems that affect quality • implementing quality assurance procedures
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Develop Individuals and Team**
Unit Code	**IND PMP4 25 0613**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to determine individual and team development needs and facilitate the development of the workgroup.

Elements	Performance Criteria
1. Provide team leadership	1.1 ***Learning and development needs*** are systematically identified and implemented in line with ***organizational requirements***. 1.2 Learning plan to meet individual and group training and developmental needs is collaboratively developed and implemented. 1.3 Individuals are encouraged to self-evaluate performance and identify areas for improvement. 1.4 ***Feedback on performance*** of team members is collected from relevant sources and compared with established team learning process.
2. Foster individual and organizational growth	2.1 Learning and development program goals and objectives are identified to match the specific knowledge and skills requirements of competence standards. 2.2 ***Learning delivery methods*** are made appropriate to the learning goals, the learning style of participants and availability of equipment and resources. 2.3 Workplace learning opportunities and coaching/ mentoring assistance are provided to facilitate individual and team achievement of competencies. 2.4 Resources and timelines required for learning activities are identified and approved in accordance with organizational requirements.
3. Monitor and evaluate workplace learning	3.1 Feedback from individuals or teams is used to identify and implement improvements in future learning arrangements. 3.2 Outcomes and performance of individuals/teams are assessed and recorded to determine the effectiveness of development programs and the extent of additional support. 3.3 Modifications to learning plans are negotiated to improve the efficiency and effectiveness of learning. 3.4 Records and reports of competence are maintained within organizational requirement.

4. Develop team commitment and cooperation	4.1 Open communication processes to obtain and share information is used by team. 4.2 Decisions are reached by the team in accordance with its agreed roles and responsibilities. 4.3 Mutual concern and camaraderie are developed in the team.
5. Facilitate accomplishment of organizational goals	5.1 Team members are actively participated in team activities and communication processes. 5.2 Individual and joint responsibility is developed by teams members for their actions. 5.3 Collaborative efforts are sustained to attain organizational goals.

Variable	Range
Learning and development needs	May include but is not limited to: • Coaching, monitoring and/or supervision • Formal/informal learning program • Internal/external training provision • Work experience/exchange/opportunities • Personal study • Career planning/development • Performance evaluation • Workplace skills assessment & Recognition of prior learning
Organizational requirements	May include but is not limited to: • Quality assurance and/or procedures manuals • Goals, objectives, plans, systems and processes • Legal and organizational policy/guidelines and requirements • Safety policies, procedures and programs • Confidentiality and security requirements • Business and performance plans • Ethical standards • Quality and continuous improvement processes and standards
Feedback on performance	May include but is not limited to: • Formal/informal performance evaluation • Obtaining feedback from supervisors and colleagues • Obtaining feedback from clients • Personal and reflective behavior strategies • Routine and organizational methods for monitoring service delivery
Learning delivery methods	May include but is not limited to: • On the job coaching or monitoring • Problem solving

	• Presentation/demonstration • Formal course participation • Work experience and involvement in professional networks • Conference and seminar attendance

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • identify and implement learning opportunities for others • give and receive feedback constructively • facilitate participation of individuals in the work of the team • negotiate plans to improve the effectiveness of learning • prepare learning plans to match skill needs • access and designate learning opportunities
Underpinning Knowledge and Attitude	Demonstrate knowledge of: • coaching and monitoring principles • how to work effectively with team members who have diverse work styles, aspirations, cultures and perspective • how to facilitate team development and improvement • methods and techniques to obtain and interpreting feedback • methods for identifying and prioritizing personal development opportunities and options • career paths and competence standards in the industry
Underpinning Skills	• reading and understanding a variety of texts, preparing general information and documents according to target audience; spell with accuracy; use grammar and punctuation effective relationships and conflict management • communication including receiving feedback and reporting, maintaining effective relationships and conflict management • planning skills to organize required resources and equipment to meet learning needs • coaching and mentoring skills to provide support to colleagues • reporting to organize information; assess information for relevance and accuracy; identify and elaborate on learning outcomes • facilitation to conduct small group training sessions • relating to people from a range of social, cultural, physical and mental backgrounds
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Utilize Specialized Communication Skills**
Unit Code	**IND PMP4 26 0613**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to use specialized communication skills to meet specific needs of internal and external clients, conduct interviews, facilitate group discussions, and contribute to the development of communication strategies.

Elements	Performance Criteria
1. Meet common and specific communication needs of clients and colleagues	1.1 Specific communication needs of clients and colleagues are identified and met. 1.2 Different approaches are used to meet communication needs of clients and colleagues. 1.3 Conflict is addressed promptly and in a timely way and in a manner which does not compromise the standing of the organization.
2. Contribute to the development of communication strategies	2.1 ***Strategies*** for internal and external dissemination of information are developed, promoted, implemented and reviewed as required. 2.2 Channels of communication are established and reviewed regularly. 2.3 Coaching in effective communication is provided . 2.4 Work related network and relationship are maintained as necessary. 2.5 Negotiation and conflict resolution strategies are used where required. 2.6 Communication with clients and colleagues is appropriate to individual needs and organizational objectives.
3. Represent the organization	3.1 When participating in internal or external fora, presentation is relevant, appropriately researched and presented in a manner to promote the organization. 3.2 Presentation is made clear and sequential and delivered within a predetermined time. 3.3 Appropriate media is utilized to enhance presentation. 3.4 Differences in views are respected. 3.5 Written communication is made consistent with organizational standards.

	3.6 Inquiries are responded in a manner consistent with organizational standard.
4. Facilitate group discussion	4.1 Mechanisms which enhance ***effective group interaction*** are defined and implemented. 4.2 Strategies which encourage all group members to participate are used routinely. 4.3 Objectives and agenda are routinely set and followed for meetings and discussions . 4.4 Relevant information are provided to group to facilitate outcomes. 4.5 Evaluation of group communication strategies is undertaken to promote participation of all parties. 4.6 Specific communication needs of individuals are identified and addressed.
5. Conduct interview	5.1 A range of appropriate communication strategies are employed in ***interview situations***. 5.2 Different ***types of interview*** are conducted in accordance with the organizational procedures. 5.3 Records of interviews are made and maintained in accordance with organizational procedures. 5.4 Effective questioning, listening and nonverbal communication techniques are used to ensure that required message is communicated.

Variable	**Range**
Strategies	May include but is not limited to: • Recognizing own limitations • Utilizing techniques and aids • Providing written drafts • Verbal and non-verbal communication
Effective group interaction	May include but is not limited to: • Identifying and evaluating what is occurring within an interaction in a non-judgmental way • Using active listening • Making decision about appropriate words, behavior • Putting together response which is culturally appropriate • Expressing an individual perspective • Expressing own philosophy, ideology and background and exploring impact with relevance to communication
Interview situations	May include but is not limited to: • Establish rapport

	• obtain facts and information • Facilitate resolution of issues • Develop action plans • Diffuse potentially difficult situation
Types of Interview	May include but is not limited to: • Related to staff issues • Routine • Confidential • Evidential • Non-disclosure • Disclosure

Evidence Guide	
Critical Aspects of Competence	Demonstrate skills and knowledge competencies to: • Demonstrate effective communication skills with clients and work colleagues accessing service • Adopt relevant communication techniques and strategies to meet client particular needs and difficulties
Underpinning Knowledge and Values	Demonstrates knowledge of: • communication process • dynamics of groups and different styles of group leadership • communication skills relevant to client groups
Underpinning Skills	Demonstrates skills of: • full range of communication techniques including: ➢ active listening ➢ feedback ➢ interpretation ➢ role boundaries setting ➢ negotiation ➢ establishing empathy ➢ communication strategies • communication required to fulfill job roles as specified by the organization
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Manage and Maintain Small/Medium Business Operations**
Unit Code	**IND PMP4 27 0613**
Unit Descriptor	This unit covers the operation of day-to-day business activities in a micro or small business. The strategies involve developing, monitoring and managing work activities and financial information, developing effective work habits, and adjusting work schedules as needed.

Elements	Performance Criteria
1. Identify daily work requirements	1.1 Work requirements are identified for a given time period by taking into consideration ***resources*** and constraints. 1.2 Work activities are prioritized based on business needs, requirements and deadlines. 1.3 If appropriate, work is allocated to relevant staff or contractors to optimize efficiency.
2. Monitor and manage work	2.1 People, resources and/or equipment are coordinated to provide optimum results. 2.2 Staff, clients and/or contractors are communicated within a clear and regular manner, to monitor work in relation to ***business goals*** or timelines. 2.3 ***Problem solving techniques*** are applied to work situations to overcome difficulties and achieve positive outcomes.
3. Develop effective work habits	3.1 Work and personal priorities are identified and a balance is achieved between competing priorities using appropriate ***time management strategies***. 3.2 Input from ***internal and external sources*** is sought and used to develop and refine new ideas and approaches. 3.3 Business or inquiries is/are responded to promptly and effectively. 3.4 Information is presented in a format appropriate to the industry and audience.
4. Interpret financial information	4.1 Relevant documents and reports are identified. 4.2 Documents and reports are read and understood and any implications discussed with appropriate persons. 4.3 Data and numerical calculations are analyzed, checked, evaluated, organized and reconciled. 4.4 Daily financial records and cash flow are maintained correctly and in accordance with legal and accounting requirements.

	4.5 Invoices and payments are prepared and distributed in a timely manner and in accordance with legal requirements. 4.6 Outstanding accounts are collected or followed-up on.
5. Evaluate work performance	5.1 Opportunities for improvements are monitored according to business demands. 5.2 Work schedules are adjusted to incorporate necessary modifications to existing work and routines or changing needs and requirements. 5.3 Proposed changes are clearly communicated and recorded to aid in future planning and evaluation. 5.4 Relevant codes of practice are used to guide an ethical approach to workplace practices and decisions.

Variable	Range
Resources	May include but is not limited to: • staff • money • time • equipment • space
Business goals	May include but is not limited to: • sales targets • budgetary targets • team and individual goals • production targets • reporting deadlines
Problem solving techniques	May include but is not limited to: • gaining additional research and information to make better informed decisions • looking for patterns • considering related problems or those from the past and how they were handled • eliminating possibilities • identifying and attempting sub-tasks • collaborating and asking for advice or help from additional sources
Time management strategies	May include but is not limited to: • prioritizing and anticipating • short term and long term planning and scheduling • creating a positive and organized work environment • clear timelines and goal setting that is regularly reviewed and adjusted as necessary

	• breaking large tasks into smaller tasks • getting additional support if identified and necessary
Internal and external sources	May include but is not limited to: • staff and colleagues • management, supervisors, advisors or head office • relevant professionals such as lawyers, accountants, management consultants • professional associations

Evidence Guide	
Critical Aspects of Competence	A person must be able to demonstrate: • ability to identify daily work requirements and allocate work appropriately • ability to interpret financial documents in accordance with legal requirements
Underpinning Knowledge and Attitudes	Demonstrate knowledge of: • Federal and Local Government legislative requirements affecting business operations, especially in regard to Occupational Health and Safety (OHS), equal employment opportunity, industrial relations and anti-discrimination • technical or specialist skills relevant to the business operation • relevant industry code of practice • planning techniques to establish realistic timelines and priorities • identification of relevant performance measures • quality assurance principles and methods • relevant marketing, management, sales and financial concepts • methods for monitoring performance and implementing improvements • structured approaches to problem solving, idea management and time management
Underpinning Skills	Demonstrate skills to: • interpret legal requirements, company policies and procedures and immediate, day-to-day demands • communicate using questioning, clarifying, reporting, and giving and receiving constructive feedback • numeracy skills for performance information, setting targets and interpreting financial documents and reports • technical and analytical skills to interpret business document, reports and financial statements and projections • relate to people from a range of social, cultural and ethnic backgrounds and physical and mental abilities • solve problem and develop contingency plans • use computers and software packages to record and manage data and to produce reports

	• evaluate using assessment work and outcomes • observe for identifying appropriate people, resources and to monitor work
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Occupational Standard: Polymer Processing Level IV	
Unit Title	**Apply Problem Solving Techniques and Tools**
Unit Code	**IND PMP4 28 0613**
Unit Descriptor	This unit of competency covers the knowledge, skills and attitude required to apply scientific problem solving techniques and tools to enhance quality, productivity and other kaizen elements on continual basis.

Elements	Performance criteria
1. Identify and select theme/problem.	1.1 ***Safety requirements*** are followed in accordance with safety plans and procedures. 1.2 All possible problems related to the process /Kaizen elements are listed using ***statistical tools and techniques***. 1.3 All possible problems related to kaizen elements are identified and listed on Visual Management Board/Kaizen Board. 1.4 Problems are classified based on obviousness of cause and action. 1.5 Critical factors like the number of customers affected, Potentials for bottlenecks, and number of complaints etc… is selected. 1.6 Problems related to priorities of ***Kaizen Elements*** are given due emphasis and selected.
2. Grasp current status and set goal.	2.1 The extent of the problem is defined. 2.2 Appropriate and achievable goal is set.
3. Establish activity plan.	3.1 The problem is confirmed. 3.2 High priority problem is selected. 3.3 The extent of the problem is defined. 3.4 Activity plan is established as per ***5W1H***.
4. Analyze causes of a problem.	4.1 All possible causes of a problem are listed. 4.2 Cause relationships are analyzed using ***4M1E***. 4.3 Causes of the problems are identified. 4.4 Root causes are selected. 4.5 The root cause which is most directly related to the problem is selected. 4.6 All possible ways are listed using ***creative idea generation*** to eliminate the most critical root cause.

	4.7 The suggested solutions are carefully tested and evaluated for potential complications. 4.8 Detailed summaries of the action plan are prepared to implement the suggested solution.
5. Examine countermeasures and their implementation.	5.1 Action plan is implemented by ***medium KPT*** members. 5.2 Implementation is monitored according to the agreed procedure and activities are checked with preset plan.
6. Assess effectiveness of the solution.	6.1 ***Tangible and intangible results*** are identified. 6.2 The results are verified over time. 6.3 Tangible results are compared with targets using ***various types of diagram***.
7. Standardize and sustain operation.	7.1 If the goal is achieved, the new procedures are standardized and made part of daily activities. 7.2 All employees are trained on the new ***Standard Operating Procedures (SOPs)***. 7.3 SOP is verified and followed by all employees. 7.4 The next problem is selected to be tackled by the team.

Variable	**Range**
Safety requirements	may include but not limited to: • OHS requirements include legislation, material safety, managements system, hazardous substances and dangerous goods code and local safe operating procedures • Work is carried out in accordance with legislative obligations, environmental legislations, relevant health regulation, manual handling procedure and organization insurance requirements
Statistical tools and techniques	may include but not limited to: • 7 QC tools may include: ➢ Stratification ➢ Pareto Diagram ➢ Cause and Effect Diagram ➢ Check Sheet ➢ Control Chart/Graph ➢ Histogram ➢ Scatter Diagram • QC techniques may include: ➢ Brain storming ➢ Why analysis ➢ What if analysis ➢ 5W1H

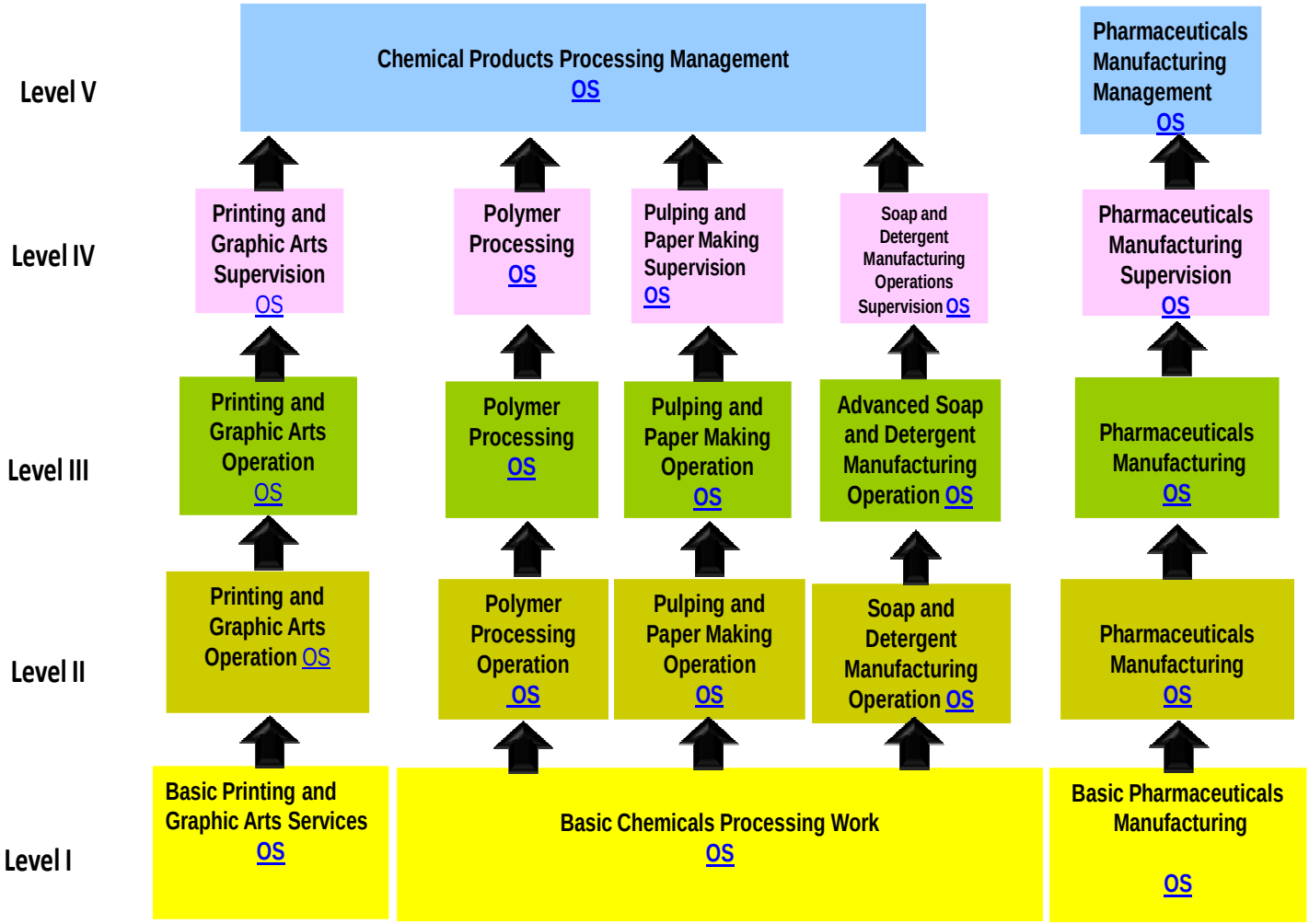
Kaizen Elements	may include but not limited to: • Quality • Cost • Productivity • Delivery • Safety • Moral • Environment • Gender equality
5W1H	may include but not limited to: • Who: person in charge • Why: objective • What: item to be implemented • Where: location • When: time frame • How: method
4M1E	may include but not limited to: • Man • Machine • Method • Material and • Environment
Creative idea generation	may include but not limited to: • Brainstorming • Exploring and examining ideas in varied ways • Elaborating and extrapolating • Conceptualizing
Medium KPT	may include but not limited to: • 5S • 4M (machine, method, material and man) • 4P (Policy, procedures, People and Plant) • PDCA cycle • Basics of IE tools and techniques
Tangible and intangible results	may include but not limited to: • Tangible result may include: ➢ Quantifiable data • Intangible result may include: ➢ Qualitative data
Various types of diagram	may include but not limited to: • Line graph • Bar graph • Pie-chart • Scatter diagram • Affinity diagram

Standard Operating Procedures (SOPs)	may include but not limited to: • The customer demand • The most efficient work routine (steps) • The cycle times required to complete work elements • All process quality checks required to minimize defects/errors • The exact amount of work in process required

Evidence Guide	
Critical Aspects of Assessment	Demonstrates skills and knowledge competencies to: • Apply all relevant procedures and regulatory requirements to ensure quality and productivity of an organization. • Detect non-conforming products/services in the work area • Apply effective problem solving approaches/strategies. • Implement and monitor improved practices and procedures • Apply statistical quality control tools and techniques.
Underpinning Knowledge and Attitude	Demonstrates knowledge of: • QC story/PDCA cycle/ • QC story/ Problem solving steps • QCC techniques • 7 QC tools • Basic IE tools and techniques. • SOP • Quality requirements associated with the individual's job function and/or work area • Workplace procedures associated with the candidate's regular technical duties • Relevant health, safety and environment requirements • organizational structure of the enterprise • Lines of communication • Methods of making/recommending improvements. • Reporting procedures
Underpinning Skills	Demonstrates skills to: • Apply problem solving techniques and tools • Apply statistical analysis tools • Apply Visual Management Board/Kaizen Board. • Detect non-conforming products or services in the work area • Document and report information about quality, productivity and other kaizen elements. • Contribute effectively within a team to recognize and recommend improvements in quality, productivity and other kaizen elements. • Implement and monitor improved practices and procedures.

	• Organize and prioritize activities and items. • Read and interpret documents describing procedures • Record activities and results against templates and other prescribed formats.
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation / Demonstration with Oral Questioning
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

Sector: Industry
Chemical Products Processing



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