



Australian Government

Department of Education, Employment and Workplace Relations

PMBPROD312C Produce continuous thermoforming products

Revision Number: 1

PMBPROD312C Produce continuous thermoforming products

Modification History

Not applicable.

Unit Descriptor

Unit descriptor

This competency covers production of continuous thermoforming products using thermoforming equipment and the solving of problems.

Application of the Unit

Application of this unit

This competency 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 judgement to recognise and resolve a range of problems. The operator should:

- start up the thermoforming machine
- check settings and adjustments of equipment
- monitor equipment operation
- make appropriate adjustments to correct materials, equipment or process variations
- solve thermoforming equipment, material and process problems, seeking guidance where necessary or appropriate.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisites

This unit has the prerequisite of *PMBPROD212A Operate thermoforming equipment*.

Employability Skills Information

Employability Skills

The required outcomes described in this unit contain applicable Employability Skills. The Employability Skills Summary of the qualification(s) in which this unit is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

ELEMENT	PERFORMANCE CRITERIA
Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT ELEMENT	PERFORMANCE CRITERIA Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.
1. Plan own work requirements.	1.1 Identify the most appropriate equipment to be used for production and upstream and downstream operations from production plan or request. 1.2 Identify and check materials required, including additives and regrind and their amounts or percentages. 1.3 Implement measures to control identified hazards in line with procedures and duty of care. 1.4 Identify requirements for materials, quality, production and equipment checks.
2. Start up continuous thermoforming process to procedures.	2.1 Identify process settings required for product. 2.2 Set process to required settings. 2.3 Check materials are correct. 2.4 Take appropriate action for non-conforming materials. 2.5 Set up date, batch and materials markings to specifications, as required. 2.6 Complete pre-start checks. 2.7 Start up thermoforming process.
3. Operate and make adjustments to the continuous thermoforming process to procedures.	3.1 Operate thermoforming process, noting key variables. 3.2 Monitor controls/ displays/terminals for production and process data. 3.3 Take samples as required and identify product out of specification. 3.4 Monitor product/process quality. 3.5 Make adjustments to remedy faults and nonconformity as required. 3.6 Establish a stable thermoforming process. 3.7 Adjust process to minimise scrap and trim. 3.8 Clean, adjust and lubricate equipment as required.
4. Shut down machine to procedures.	4.1 Determine type of shut down. 4.2 Leave machine in appropriate condition and with appropriate locks, tags or notices.

ELEMENT	PERFORMANCE CRITERIA
ELEMENT	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.
	4.3 Complete relevant documentation. 4.4 Ensure area is clean and clear after the shutdown, in readiness for the next start up.
5. Anticipate and solve problems	5.1 Recognise a problem or a potential problem. 5.2 Determine problems needing priority action. 5.3 Refer problems outside area of responsibility to designated person, with possible causes. 5.4 Seek information and assistance as required to solve problems. 5.5 Solve problems within area of responsibility. 5.6 Follow through items initiated until final resolution has occurred.

Required Skills and Knowledge

This describes the essential skills and knowledge and their level required for this unit.

Application of knowledge of the 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.

Knowledge of 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 the knowledge 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.

Knowledge as a 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.

Competence also includes the ability 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 thermoforming process
- identify factors which may affect product quality or production output and appropriate remedies
- identify when assistance is required to solve problems.

Language, literacy and numeracy requirements

This unit requires the ability to read and interpret 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.

Basic numeracy is required, eg, to determine how many 2 kg, 3 kg and 5 kg bags are needed to make up a requirement for 50 kg.

Evidence Guide

The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the assessment guidelines for this training package.

Overview of assessment

Assessment will occur on an industrial thermoforming machine(s) equipment and will be undertaken in a work like environment.

Where the assessee does not currently possess evidence of competency in *PMBPROD212 Operate thermoforming equipment*, it may be co-assessed with this unit.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

It is essential that competence is demonstrated in the knowledge and skills defined in this unit. These may include the ability 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.

Consistent performance should be demonstrated. 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.

Assessment method and context

Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the Elements, Performance Criteria and skills and knowledge. A holistic approach should be taken to the assessment.

Competence in this unit may be assessed:

- by use of an appropriate, thermoforming machine requiring demonstration of start up, operation and shut down procedures
- in a situation allowing the generation of evidence of the ability to recognise, anticipate and solve problems
- by use of a suitable simulation and/or a range of case studies/scenarios
- by a combination of these techniques.

In all cases it is expected that practical assessment will be combined with targeted questioning to assess the underpinning knowledge and theoretical assessment will be combined with appropriate practical/simulation or similar assessment. Assessors need to be aware of any cultural issues that may affect responses to questions.

Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.

Specific resources for assessment

This section should be read in conjunction with the range of variables for this unit of competency. Resources required include suitable access to an operating plant or equipment that allows for appropriate and realistic simulation. A bank of case studies/scenarios and questions will also be required to the extent that they form part of the assessment method. Questioning may take place either in the workplace, or in an adjacent, quiet facility such as an office or lunchroom. No other special resources are required.

Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Where reference is made to industry codes of practice, and/or Australian/international standards, the latest version must be used.

Context

This competency applies to continuous thermoforming processes and includes the use of air pressure or vacuum processes. It includes the operation of all relevant additional equipment where that equipment is integral to the thermoforming process.

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

This competency includes use of equipment and tools such as:

- 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 (eg due to leaks)
- temperature (eg from ovens)
- hazardous substances
- moving equipment (eg changing heater rods)
- manual handling hazards.
- stationary and moving machinery, parts and components.

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 routine faults 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
- mould sticking.

Typical process and product problems may include:

- equipment malfunction
- variations in temperature (eg uneven oven temperatures)
- pressure
- speed (eg 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.

Variables

Key variables to be monitored include:

- temperature

- speeds (eg 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.
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Unit Sector(s)

Not applicable.