



Australian Government

PMBTECH301 Use material and process knowledge to solve problems

Release: 1

PMBTECH301 Use material and process knowledge to solve problems

Modification History

Release 1. Supersedes and is equivalent to PMBTECH301B Use material and process knowledge to solve problems

Application

This unit of competency covers the skills and knowledge required to apply material and process knowledge to solve problems.

This unit of competency applies to experienced operators who are required to recognise actual and potential process and product problems; identify the role of polymers, additives and other materials in the problems; and determine corrective action.

This unit of competency applies to an experienced operator demonstrating theoretical and technical knowledge and well developed skills in situations that require some discretion and judgement. The operator may work alone or as a member of a team or group and will work in liaison with other shift team members, team leader and supervisor, as appropriate.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil

Competency Field

Technical

Unit Sector

Not applicable

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

1	Identify and apply applications of polymer materials	1.1	Identify typical applications for common polymer materials
		1.2	Recognise physical properties of common polymers
		1.3	Use additives with knowledge of the effects of using the

			incorrect amount/type of additive
		1.4	Handle additives to minimise the associated risks
2	Identify and apply impacts of impurities on polymer products	2.1	Identify major impurities of concern to product and process
		2.2	Examine polymer materials for impurities
		2.3	Apply corrective actions to remove/compensate for impurities
3	Determine expected material properties from polymer type and grade	3.1	Identify the relationship between polymer type and polymer characteristics
		3.2	Identify the relationship between polymer grade and degree of polymerisation
		3.3	Identify the influence of polymer structure on properties
4	Solve process problems related to polymer flow characteristics	4.1	Use polymer flow test methods and recognise the importance of flow properties to the process
		4.2	Control critical factors leading to changes of state of the polymer during processing using knowledge of the causes
		4.3	Identify the relationship between polymer flow and other polymer properties
		4.4	Recognise process/product signs of incorrect polymer flow characteristics
		4.5	Recommend corrective actions for problems caused by polymer flow
5	Solve process/product problems related to heating and cooling of product/material	5.1	Recognise the importance of the degree of cross linking on product properties if appropriate
		5.2	Recognise the importance of the degree of crystallisation/crystal size on product properties if appropriate

	in process	5.3	Recognise the impact of shrinkage on product properties if appropriate
		5.4	Recognise the impact of annealing on product properties if appropriate
		5.5	Recognise process/product signs of incorrect heating/cooling
		5.6	Recommend corrective actions for problems caused by heating
6	Solve process problems related to polymer faults	6.1	Recognise an actual or a potential process problem
		6.2	Analyse that problem in a formal manner
		6.3	Determine appropriate corrective action
		6.4	Implement that corrective action if it is within the range of workplace authority
		6.5	Make recommendations for corrective action outside range of workplace authority
		6.6	Follow through on corrective action and make sure problem is resolved

Foundation Skills

This section describes those required skills (language, literacy and numeracy) that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory framework The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used.

Applicable legislation, regulations, standards and codes of practice include:

- health, safety and environmental (HSE) legislation, regulations and codes of practice relevant to the workplace, manual handling and hazardous materials
- Australian/international standards relevant to the materials being used and products being made
- any relevant licence and certification requirements.

All operations to which this unit applies are subject to stringent HSE requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and such requirements the legislative requirements take precedence.

Procedures All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, and include one or any combination of:

- problem solving techniques
- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

Hazards Hazards must be identified and controlled. Identifying hazards requires consideration of:

- hazardous products and materials
- vapours or other atmospheric hazards
- interaction of polymers, additives and other materials with process variables
- other hazards that might arise.

Unit Mapping Information

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Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=932aacef-7947-4c80-acc6-593719fe4090>

Assessment Requirements for PMBTECH301 Use material and process knowledge to solve problems

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and demonstrate the ability to:

- read and interpret procedures, job specifications, instruments/control panels, material labels and safety data sheets (SDS)
- recognise actual and potential process and product problems in which materials properties and/or characteristics may play a role
- analyse actual and potential process and product problems to identify the role of materials properties and/or characteristics
- apply formal problem analysis/solving methods
- distinguish between causes of problems, including:
 - instrument failure/malfunction
 - electrical failure/malfunction
 - mechanical failure/malfunction
 - wrong readings
 - equipment design deficiencies
 - wrong raw materials/additives or wrong grade
 - incorrect quantity of materials/additives
 - contaminated materials/additives
 - out-of-specification materials
 - process set-up and/or operation process variables
- apply a theoretical understanding of polymers to determine corrective action
- implement corrective action within area of responsibility or make recommendation according to procedures
- communicate effectively with team/work group and supervisors
- complete workplace records
- do basic arithmetical manipulations, including additions, subtractions, divisions, fractions and percentages.

Knowledge Evidence

Must provide evidence that demonstrates knowledge relevant to their job sufficient to operate independently and to solve routine and non-routine problems, including knowledge of:

- types and application of common polymer materials and additives
- structure of common polymers
- commonly accepted diagrammatic representations of polymer molecular shape and arrangement
- polymer properties related to flow, including:
 - molecular weight
 - molecular structure
 - factors effecting viscosity
- polymer properties related to common polymer types and grades
- impact of common impurities on process and product
- the impact of temperature and heating/cooling rate on processing and properties
- characteristics of materials and their behaviour in relation to process conditions and stages of production
- application of problem analysis/solving methods to polymer processing/products
- organisation procedures relevant to the work environment/job role
- hierarchy of control
- hazards that may arise in the job/work environment and:
 - their possible causes
 - potential consequences
 - appropriate risk controls.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence shall be based on a holistic assessment of the evidence.
- The collection of performance evidence is best done from a report and/or folio of evidence drawn from:
 - a single project which provides sufficient evidence of the requirements of all the elements and performance criteria
 - multiple smaller projects which together provide sufficient evidence of the requirements of all the elements and performance criteria.
- A third-party report, or similar, may be needed to testify to the work done by the individual, particularly when the project has been done as part of a project team.
- Assessment should use a real project in an operational workplace. Where this is not possible or where personal safety or environmental damage are limiting factors assessment must occur using a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from demonstration of skills and one or more of:
 - walk-throughs
 - pilot plant operation

- industry-based case studies/scenarios
- ‘what ifs’
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process, such as workbooks, written assessments or interviews.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- In addition the assessor or anyone acting in subject matter expert role in assessment shall demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they shall assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
 - relevant VET or other qualification/Statement of Attainment
 - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
 - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions
- Currency can be demonstrated through one or more of:
 - being currently employed undertaking the type of work being assessed
 - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation’s policies and procedures
 - having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
 - conducting on the job training/assessments of the type of work being assessed
 - being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

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