



Australian Government

PMBTECH401 Predict polymer properties and characteristics

Release: 1

PMBTECH401 Predict polymer properties and characteristics

Modification History

Release 1. Supersedes and is equivalent to PMBTECH401B Predict polymer properties and characteristics

Application

This unit of competency covers the skills and knowledge required to predict polymer properties and characteristics as typically used in problem solving and product and process improvement.

This unit of competency applies to technicians or similar roles who are required to predict the impact of process conditions on polymer properties, predict physical properties from polymer morphology, determine the impact of use conditions and polymer characteristics on physical failure, and organise and interpret tests.

This unit of competency applies to an operator/technician applying specialised theoretical and technical knowledge and well developed skills in situations that require autonomy, discretion and judgement. The person 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

PMBTECH301 Use material and process knowledge to solve problems

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.

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|--------------------------------|---|
| 1 Predict the impact of | 1.1 Predict property changes due to molecular weight and temperature |
|--------------------------------|---|

	processing conditions on polymer properties	1.2	Identify the glass transition temperature and melting point relative to ambient temperature
		1.3	Describe the morphological changes occurring to polymers as the temperature is raised to typical moulding conditions
		1.4	Describe the effect of cooling rate on polymer morphology
		1.5	Predict potential product dimension/shape changes due to internal stresses resulting from molecular orientation
		1.6	Determine the affect of post-mould annealing on the degree of crystallisation and crystal
2	Predict physical properties of polymers from their morphology	2.1	Predict the effects temperature, crystal size, degree of crystallisation, molecular orientation on physical properties
		2.2	Predict shrinkage from morphology
3	Determine likely physical failures of polymers	3.1	Determine impact of physical use conditions on physical failure
		3.2	Determine impact of polymer characteristics on physical failure
4	Organise and interpret polymer tests	4.1	Describe melt flow properties from flow data
		4.2	Choose appropriate test type to measure desired criteria
		4.3	Specify relevant standard test method
		4.4	Interpret test result, making allowance for possible variations in test

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:

- technical specifications
- technical drawings
- 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

Release 1. Supersedes and is equivalent to PMBTECH401B Predict polymer properties and characteristics

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 PMBTECH401 Predict polymer properties and characteristics

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Performance Evidence

relevant to and satisfy the requirements of the elements and performance criteria and demonstrate the ability to:

- read and interpret technical reports and specifications, phase diagrams and standard test methods
- predict polymer properties in relation to:
 - polymer morphology
 - polymer phase change
 - processing conditions
- predict the impact of use conditions and polymer characteristics on physical failure of polymers
- organise tests
- record and interpret test results.

Knowledge Evidence

Must provide evidence that demonstrates knowledge relevant to their job sufficient to fulfil their job role, including knowledge of:

- function of equipment and stages of manufacturing process in at least one (1) method/field of polymer manufacturing
- 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
- 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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