



Australian Government

PMBTECH510 Analyse failure in polymeric materials

Release: 1

PMBTECH510 Analyse failure in polymeric materials

Modification History

Release 1. Supersedes and is equivalent to PMBTECH510A Analyse failure in polymeric materials

Application

This unit of competency covers the skills and knowledge required to analyse failure in polymeric materials. It applies to polymer compounds, such as crystalline and amorphous polymers, reinforced (fillers or fibres) and filled compounds, crosslinked and uncrosslinked polymers.

This unit of competency applies to experienced technicians or those in similar roles who are required to apply in-depth knowledge of materials, process, equipment and problem solving in order to analyse the mechanical/physical responses of different polymers, compounds and physical shapes to different applications of stress and strain and identify options for modifying these responses to suit different applications.

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	Analyse response to steady and	1.1	Determine stress strain response
		1.2	Determine tear/notch failures

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| static loads | | 1.3 | Identify modulus and yield |
| | | 1.4 | Identify creep and stress relaxation |
| | | 1.5 | Determine stiffness |
| | | 1.6 | Identify applications where the typical viscoelastic response of polymers is an advantage |
| | | 1.7 | Identify applications where the typical viscoelastic response of polymers must be modified and common methods of modification |
| 2 | Analyse response to time varying loads | 2.1 | Determine hysteresis in tensile and shear loadings |
| | | 2.2 | Determine the effect of slow/rapid (impact) loading |
| | | 2.3 | Identify failure modes in flex cycling |
| | | 2.4 | Identify fatigue failure |
| | | 2.5 | Identify failures in sinusoidal loadings |
| | | 2.6 | Identify applications where the typical viscoelastic response of polymers is an advantage |
| | | 2.7 | Identify applications where the typical viscoelastic response of polymers must be modified and common methods of modification |
| 3 | Analyse the effect of environment/history on mechanical response | 3.1 | Determine effect of temperature on response |
| | | 3.2 | Determine effect of surface degradation on response |
| | | 3.3 | Determine effect of molecule/fibre/filler orientation on response |
| | | 3.4 | Determine the effect of environmental degradation on failure |
| | | 3.5 | Identify applications where the typical response of polymers is an advantage |
| | | 3.6 | Identify applications where the typical response of polymers must be modified and common methods of modification |

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| 4 | Analyse the effect of shape on mechanical response | 4.1 | Determine the effect of shape on the stress/strain relationship (triaxiality) |
| | | 4.2 | Determine the effect of shape on stiffness |
| | | 4.3 | Determine the effect of shape on response to cyclical loads |
| | | 4.4 | Determine the effect of shape on creep and relaxation |
| | | 4.5 | Identify applications where the typical response of polymers is an advantage |
| | | 4.6 | Identify applications where the typical response of polymers must be modified and common methods of modification |

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, materials and processes being used and products being made
- Australian/international standards relevant to the materials and products being tested
- 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:

- test procedures
- technical specifications
- technical drawings
- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulae/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

Tools and equipment

Tools and equipment include:

- stress/strain testers
- impact testers
- cycling testers
- environmental ageing equipment
- basic length/thickness measuring equipment.

Hazards

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

- stored energy (e.g. in stressed test samples)
- test preparation equipment
- conditions and materials used for causing sample degradation
- hazardous products and materials
- other hazards that might arise.

Unit Mapping Information

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Links

MSA Training Package Implementation Guides - <http://mskills.org.au/training-packages/info/>