



Australian Government

PMBTECH504 Determine heat transfer loads for processing equipment

Release: 1

PMBTECH504 Determine heat transfer loads for processing equipment

Modification History

Release 1. Supersedes and is equivalent to PMBTECH504B Determine heat transfer loads for processing equipment

Application

This unit of competency covers the skills and knowledge required to determine heat transfer loads for processing equipment.

This competency applies to senior technicians or similar roles who are required to apply in-depth knowledge of materials, process, equipment and problem solving in order to calculate heating/cooling loads of processing equipment/components, select appropriate heating and/or cooling mechanism for an application and determine heating requirements for process conditions.

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	Calculate heat transferred from/to items	1.1	Calculate conductive heat transfer to/from an object
		1.2	Calculate convective heat transfer to/from an object
		1.3	Calculate radiative heat transfer to/from an object
		1.4	Calculate combined heat transfer to/from an object, including resistances in series and parallel

2	Calculate temperature change caused by a change in heat content	2.1	Calculate temperature change caused by heating/cooling of polymer compounds in typical examples of processing equipment
		2.2	Calculate change in heat content caused by shear on a polymer compound
		2.3	Calculate temperature rise caused by shear on a polymer.
3	Select appropriate heating and/or cooling mechanism for an application	3.1	Compare rates of heat transfer/overall heat transfer coefficients for major methods of heating and cooling
		3.2	Determine appropriate methods of varying/controlling rates of heat transfer
		3.3	Calculate heat transfer rates under a range of conditions
4	Determine heating required to suit process conditions	4.1	Determine heating requirements to obtain correct viscosity for processing
		4.2	Select appropriate heat transfer mechanism(s) to achieve desired conditions
5	Conduct energy balance over process components	5.1	Determine overall heating load for process components
		5.2	Determine overall cooling load for process components
		5.3	Determine the adequacy (or otherwise) of the process/plant heating/cooling system to cope with this

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 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 may be written, verbal, visual, computer-based or in some other form. They 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)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

Unit Mapping Information

Release 1. Supersedes and is equivalent to PMBTECH504B Determine heat transfer loads for processing equipment

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 PMBTECH504 Determine heat transfer loads for processing equipment

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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 test results, technical information, equipment specifications and instruments/control panels
- calculate heating/cooling loads of processing equipment/components
- calculate temperature changes due to changes in heat content
- select appropriate heating and/or cooling mechanism for an application
- determine heating requirements for process conditions
- determine heat/cooling
- calculate energy balance
- perform complex algebraic equations, non-linear functions and simultaneous equations
- interpret non-linear graphs.

Knowledge Evidence

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

- heat transfer principles and calculations
- effects of heat/temperature on the materials being processed and the products being made
- conduction, convection and radiation
- thermal properties of materials, particularly polymers
- methods of heating polymer materials
- combined conduction/convection
- specific heat capacity
- mechanical work/heat relationships
- cooling systems
- energy balances
- 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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