



Australian Government

Department of Education, Employment and Workplace Relations

PMBTECH504B Determine heat transfer loads for processing equipment

Revision Number: 1

PMBTECH504B Determine heat transfer loads for processing equipment

Modification History

Not applicable.

Unit Descriptor

Unit descriptor

This competency covers the application of a knowledge of heat transfer and heat balance principles to the design and use of processing equipment.

This competency is typically performed by senior technicians.

Application of the Unit

Application of this unit

This competency applies to technicians who need to determine heating and/or cooling loads for processing equipment.

It includes:

- conduction, convection and radiation
- thermal properties of materials, particularly polymers
- methods of heating polymer materials
- cooling systems
- energy balances.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisites

This unit of competency has **no** prerequisites.

Employability Skills Information

Employability Skills

This unit contains employability skills.

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. 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. |

Required Skills and Knowledge

This describes the essential skills and knowledge and their level required for this unit. Knowledge and understanding of heat transfer principles and calculations sufficient to determine the heating/cooling loads of an existing or a new process. Knowledge of the effects of heat/temperature on the materials being processed and the products being made sufficient to determine the processing temperatures and heating/cooling rates required to achieve a satisfactory product from an efficient process.

Knowledge of the enterprise's procedures and policies along with the ability to implement them within appropriate time constraints and in a manner relevant to the job.

Knowledge as a basis for solving processing and material problems including:

- conduction
- convection
- radiation
- combined conduction/convection
- specific heat capacity
- mechanical work/heat relationships
- energy balances.

Language, literacy and numeracy requirements

This unit requires high level numeracy skills at least equivalent to senior secondary school levels.

Literacy is also required at least equivalent to senior secondary school level.

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

A holistic approach should be taken to the assessment.

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.

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

It is essential that the principles be understood and that they are able to be applied to real workplace situations. Competence must be demonstrated in the ability to undertake quantitative analyses and then apply the results to determine heating and cooling loads and flow/supply.

Assessment method and context

Assessment will occur using industrial situations and equipment using industrial polymers and will be undertaken in a work-like environment.

Competence in this unit may be assessed:

- using appropriate, industrial equipment, situations and polymers

- in a situation allowing for the generation of evidence of the ability to recognise, anticipate and respond to problems
 - by using a suitable simulation and/or a range of case studies/scenarios
 - through 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 Statement 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 unit includes the heating/cooling loads of all processing equipment and requires the quantitative determination of loads.

This competency applies to all sectors within the plastics, rubber and cabling industry. Standard procedures means all relevant workplace procedures, policies and relevant industry and government codes and standards.

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.

Unit Sector(s)

Not applicable.