



Australian Government

PMAOPS511 Determine energy transfer loads

Release: 1

PMAOPS511 Determine energy transfer loads

Modification History

Release 1. Supersedes and is equivalent to PMAOPS511B Determine energy transfer loads

Application

This unit of competency covers the skills and knowledge required to determine energy transfer loads. It applies to activities which aim to resolve identified plant or process problems, such as ensuring that systems are adequate for the load, improving heat/cooling efficiency or specification of new or modified equipment.

This unit of competency applies to any heat transfer mode, including conduction, convection (forced and natural), radiation, and combined conduction/convection/ radiation. It applies to sources of heating/cooling, such as:

- chemical reaction (including combustion)
- water cooling
- air cooling
- steam heating (calculations for saturated steam only)
- evaporative cooling
- hot fluid (e.g. oil) heating.

This unit of competency applies to senior technicians or those in similar roles who are required to calculate heat transfer and temperature change for a plant item/plant area in order to determine heating/cooling load or efficiency or losses from/gains to the system. This may be done as a step to improve efficiency, for plant/process design/improvement or other reasons.

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

Pre-requisite Unit

Nil

Competency Field

Operations

Unit Sector

Elements and Performance Criteria

Elements describe the Performance criteria describe the performance needed to

essential outcomes.	demonstrate achievement of the element.
1 Prepare for energy balance	1.1 Identify purpose of energy balance 1.2 Determine possible boundary for analysis 1.3 Identify plant and energy sources and sinks within boundary
2 Calculate heat transferred from/to items	2.1 Calculate conductive heat transfer to/from an object 2.2 Calculate convective heat transfer to/from an object 2.3 Calculate radiative heat transfer to/from an object 2.4 Calculate combined heat transfer to/from an object, including resistances in series and parallel
3 Calculate temperature change	3.1 Calculate temperature change caused by heating/cooling of process materials in typical examples of processing equipment 3.2 Calculate change in heat content caused by chemical reaction 3.3 Calculate temperature rise caused by chemical reaction
4 Select appropriate heating and/or cooling mechanism for an application	4.1 Compare rates of heat transfer/overall heat transfer coefficients for major methods/media of heating and cooling 4.2 Determine appropriate methods of varying/controlling rates of heat transfer 4.3 Calculate heat transfer rates under a range of conditions 4.4 Recommend most appropriate heat transfer mechanism/medium for this application
5 Conduct energy balance over	5.1 Determine desired boundaries for energy balance calculation

process components	5.2	Determine possible sources of data required from the plant
	5.3	Match and adjust sources of data to desired boundary for energy balance
	5.4	Determine overall heating load
	5.5	Determine overall cooling load
	5.6	Interpret results to meet purpose of the energy balance

Foundation Skills

This section describes those language, literacy, numeracy and employment skills 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, and include one or more of the following:

- legislative requirements, including work health and safety (WHS)
- industry codes of practice and guidelines
- environmental regulations and guidelines
- Australian and other standards
- licence and certification requirements

All operations to which this unit applies are subject to stringent health, safety and environment (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 HSE requirements, the HSE 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,

include one or more of the following:

- 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 PMAOPS511B Determine energy transfer loads

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=9fc2cf53-e570-4e9f-ad6a-b228ffdb6875>

Assessment Requirements for PMAOPS511 Determine energy transfer loads

Modification History

Release 1. Supersedes and is equivalent to PMAOPS511B Determine energy transfer loads

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 include the ability to:

- determine the boundaries of the system to be studied
- collect the required plant data from measurements, readings or calculated quantities
- calculate the energy transfer loads
- calculate change in heat content from exothermic/endothermic reactions relevant to the plant
- conduct energy balances
- report the results as required by the purpose of the energy balance.

Knowledge Evidence

Evidence must be provided that demonstrates knowledge of:

- conduction, convection and radiation
- thermal properties of materials, particularly process materials
- methods of heating process materials
- cooling systems
- energy balances
- relevant process specific science.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence 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 practical, assessment must occur using a sufficiently rigorous simulated environment reflecting 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.
- Knowledge evidence may be collected concurrently with performance evidence or through an independent process, such as workbooks, written assessments or interviews (provided a record is kept).
- 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 must demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they must 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.

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=9fc2cf53-e570-4e9f-ad6a-b228ffdb6875>

