



Australian Government

MSS017002 Determine process loss through mass or energy balancing

Release: 1

MSS017002 Determine process loss through mass or energy balancing

Modification History

Release 1. Supersedes and is equivalent to MSS017002A Determine process loss through mass or energy balancing.

Application

This unit of competency covers the analysis of a process to determine loss of resources by the application of the first law of thermodynamics (more commonly known as mass and energy balancing). It includes the selection of mass or energy balancing or both as appropriate to the type of processes being examined and may be applied to an entire process, part of a large process, or part/all of a value chain.

This unit covers the analysis of a mass (material) and energy (usually heat or motive force) flows through a process to determine overall mass and energy efficiency, losses which occur through the process and how much loss occurs in each part of the process. This is achieved by the application of the techniques of mass balancing, energy balancing and combined mass and energy balancing. The application of this unit is especially suitable where high volumes of materials or large amounts of energy are used in a production process. The unit may also apply to other large energy or materials use processes in the value chain, such as logistics and transport.

This unit will lead to the identification of parts of the process which have the greatest resource loss/lowest resource use efficiency and so provides the basis for eliminating or reducing this loss and improving this efficiency.

A manager or senior technologist who has significant responsibility for sustainability in their work role would typically undertake this unit. Skills covered by this unit may be applied individually or in a team context.

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

Pre-requisite Unit

Nil

Competency Field

Sustainable operations

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 | Acquire required data | 1.1 | Identify system to be analysed. |
| | | 1.2 | Define appropriate boundaries for this system. |
| | | 1.3 | Identify relevant data which is available for the system and its subsystems. |
| | | 1.4 | Identify required data which is not currently available. |
| | | 1.5 | Negotiate with relevant stakeholders to obtain data which is not currently available. |
| | | 1.6 | Acquire necessary and appropriate data. |
| | | | |
| 2 | Calculate resource efficiency/loss | 2.1 | Undertake mass/energy balance over system. |
| | | 2.2 | Identify subsystems making greatest contributions to loss by mass/energy balances over selected subsystems. |
| | | 2.3 | Calculate sustainability impact of identified losses. |
| | | 2.4 | Calculate mass/energy efficiencies of system and analysed subsystems. |
| | | | |
| 3 | Prepare recommendations | 3.1 | Investigate subsystems responsible for significant loss. |
| | | 3.2 | Determine currently available responses. |
| | | 3.3 | Determine required longer term responses. |
| | | 3.4 | Draft recommended responses in appropriate form. |
| | | | |
| 4 | Communicate with relevant stakeholders | 4.1 | Identify relevant stakeholders. |
| | | 4.2 | Determine stakeholder information needs and wants. |
| | | 4.3 | Analyse data which may be appropriate to communicate with stakeholders. |

		4.4	Prepare and disseminate information to stakeholders, as appropriate.
		4.5	Negotiate solutions with stakeholders, as required.
5	Communicate required responses as appropriate	5.1	Identify what communications are required and to whom.
		5.2	Prepare appropriate reports and recommendations.
		5.3	Pitch reports and recommendations, as appropriate.
		5.4	Brief appropriate persons as required by determined responses.
		5.5	Finalise appropriate recording.

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.

Sustainability incorporates all of

- survival of the ecology/physical environment (to manage the impact of the business to ensure the survival of the physical environment)
- economic viability (efficiency, cost and waste reduction and competitiveness to support survival of the business)
- social sustainability (to manage the impact of the business to ensure its continued survival within the community and the survival of the community).

Mass/energy balancing includes

- mass balancing is an analysis technique which allows for the calculation of mass flows and consumption through a process

- one or more of**
- and losses of mass from the system/product
 - energy balancing is an analysis technique which allows for the calculation of energy flows and consumption through a process and the losses of energy from the system/product
 - mass and energy balancing may be undertaken as separate activities or in some circumstances as a combined mass/energy balance.
- Appropriate response when impact cannot be prevented includes one or more of**
- capture and storage (e.g. scrubbing) and similar ‘end of pipe’ solutions
 - dilution/dispersion and similar techniques which reduce concentration but not amount
 - other approaches which meet the sustainability requirements.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MSS017002A Determine process loss through mass or energy balancing.

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=5b04f318-804f-4dc0-9463-c3fb9a3fe998>

Assessment Requirements for MSS017002 Determine process loss through mass or energy balancing

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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 include the ability, for one (1) or more system, each of which contains five (5) or more subsystems/plant units, to:

- undertake a mass and an energy balance (which may be on different systems) or a combined mass/energy balance
- identify appropriate responses
- communicate the above as appropriate.
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Knowledge Evidence

Must provide evidence that demonstrates sufficient knowledge to interact with relevant personnel and be able to determine process loss through mass or energy balancing including knowledge of:

- process and changes which occur at each step in selected value chain
- principles of sustainability
- root cause analysis
- relevant legislation, regulation and protocols, government incentives and other initiatives
- first law of thermodynamics
- defining boundaries for systems subject to mass/energy balancing
- required data, sources of data from process, and use of data proxies, where necessary
- mass balancing techniques
- energy balancing techniques, including the use of tables of thermodynamic properties (steam tables), and the use of specific heat capacity and specific latent heat
- combined mass/energy balancing techniques, including the use of heats or reaction/dissolution
- methods of reducing resource losses for process and equipment.

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 where the analysis of a process to determine loss of resources by the application of mass and energy balancing occurs for an operational workplace.
- 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.
- 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.
- The assessor must demonstrate both technical competency and currency.
- Technical competence can be demonstrated through:
 - relevant VET or other qualification/Statement of Attainment AND/OR
 - relevant workplace experience
- Currency can be demonstrated through:
 - performing the competency being assessed as part of current employment OR
 - having consulted with an organisation providing relevant environmental monitoring, management or technology services about performing the competency being assessed within the last twelve months.

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