



Australian Government

# **MSS017010 Determine process loss through mass or energy balancing**

Release: 1

# **MSS017010 Determine process loss through mass or energy balancing**

## **Modification History**

Release 1. Updated unit code. Changes to elements and performance criteria. Range of conditions removed. Assessment requirements amended. Equivalent outcome.

## **Application**

This unit describes the skills and knowledge for 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 or all of a value chain.

This unit applies to 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 or lowest resource use efficiency and so provides the basis for eliminating or reducing this loss and improving this efficiency.

This unit applies to a manager or senior technologist who has significant responsibility for sustainability in their work role. Skills covered by this unit may be applied individually or in a team context.

No licensing or certification requirements exist at the time of publication. Relevant legislation, industry standards and codes of practice within Australia must be applied.

## **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.

- |   |                                              |     |                                                                                                                |
|---|----------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------|
| 1 | <b>Acquire required data</b>                 | 1.1 | Identify system to be analysed                                                                                 |
|   |                                              | 1.2 | Define boundaries for this system                                                                              |
|   |                                              | 1.3 | Identify and acquire data which is available for the system and its subsystems                                 |
|   |                                              | 1.4 | Identify required data which is not currently available                                                        |
|   |                                              | 1.5 | Negotiate with stakeholders and obtain data which is not currently available                                   |
|   |                                              |     |                                                                                                                |
| 2 | <b>Calculate resource efficiency or loss</b> | 2.1 | Undertake mass and energy balance over system                                                                  |
|   |                                              | 2.2 | Identify subsystems making greatest contributions to loss by mass and energy balances over selected subsystems |
|   |                                              | 2.3 | Calculate sustainability impact of identified losses                                                           |
|   |                                              | 2.4 | Calculate mass and energy efficiencies of system and analysed subsystems                                       |
|   |                                              |     |                                                                                                                |
| 3 | <b>Prepare recommendations</b>               | 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 | <b>Communicate with stakeholders</b>         | 4.1 | Identify stakeholders and information needs and wants                                                          |
|   |                                              | 4.2 | Analyse data which may be appropriate to communicate with stakeholders                                         |
|   |                                              | 4.3 | Prepare and disseminate information to stakeholders                                                            |
|   |                                              | 4.4 | Negotiate solutions with stakeholders                                                                          |

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

- |   |                                       |     |                                                                   |
|---|---------------------------------------|-----|-------------------------------------------------------------------|
| 5 | <b>Communicate required responses</b> | 5.1 | Identify what communications are required and to whom             |
|   |                                       | 5.2 | Prepare reports and recommendations                               |
|   |                                       | 5.3 | Pitch reports and recommendations                                 |
|   |                                       | 5.4 | Brief relevant persons as required by determined responses        |
|   |                                       | 5.5 | Finalise recording in accordance with organisational requirements |

## 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.

## Unit Mapping Information

Release 1. Supersedes and is equivalent to MSS017002 Determine process loss through mass or energy balancing.

## Links

The MSS Sustainability Companion Volume implementation Guides are available from VETNet: -

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

# Assessment Requirements for MSS017010 Determine process loss through mass or energy balancing

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## Performance Evidence

There must be evidence the candidate has completed the tasks outlined in the elements and performance criteria of this unit, and:

- undertaken a mass and an energy balance (which may be on different systems) or a combined mass and energy balance for 1 or more systems, each of which contains 5 or more subsystems or plant units.

## Knowledge Evidence

There must be evidence the candidate has knowledge of:

- process and changes which occur at each step in selected value chain
- principles of sustainability
- root cause analysis
- sustainability legislation, regulation and protocols, government incentives and initiatives
- first law of thermodynamics
- defining boundaries for systems subject to mass and energy balancing
- required data, sources of data from process, and use of data proxies
- mass balancing as an analysis technique which allows for the calculation of mass flows and consumption through a process and losses of mass from the system or product
- energy balancing as an analysis technique which allows for the calculation of energy flows and consumption through a process and the losses of energy from the system or product
- 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 and energy balancing techniques, including the use of heats and reaction and dissolution
- methods of reducing resource losses for process and equipment.

## Assessment Conditions

Skills must have been demonstrated in the workplace or in a simulated environment that reflects workplace conditions, contingencies, facilities, equipment and resources.

Assessors must satisfy the NVR/AQTF mandatory competency requirements for assessors.

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