

<b>Title</b>	<b>Demonstrate knowledge of modern manufacturing concepts and their significance in plant maintenance</b>		
<b>Level</b>	<b>4</b>	<b>Credits</b>	<b>3</b>

<b>Purpose</b>	<p>This unit standard is for use in training of mechanical engineering trades employed in the maintenance of manufacturing plants, and covers a range of concepts used in modern manufacturing enterprises and their significance in the maintenance of engineering plant.</p> <p>People credited with this unit standard are able to demonstrate knowledge of modern manufacturing concepts, and statistical process control.</p>
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<b>Classification</b>	Mechanical Engineering > Maintenance and Diagnostics in Mechanical Engineering
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<b>Available grade</b>	Achieved
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**Explanatory notes**

Definitions

3 *Sigma* – a process in which the control limits are at  $\pm 3$  standard deviations from the mean.

5S – methodology for waste elimination through workplace organisation, centred around five Japanese concepts, translated as: sort, straighten, shine, standardise, and sustain.

6 *Sigma* – quality measurement and improvement programme which focuses on achieving very low failure rates, such as when the process control limits are  $\pm 6$  standard deviations from the mean.

*Agile manufacturing* – the ability to accomplish rapid changeover between the manufacture of different products.

*Just in Time* – an inventory strategy for improvement of return on investment by reducing in-process inventory and associated costs.

*Kaizen* – an approach to productivity, based on continuous incremental process improvements through elimination of waste in machinery, labour, and production methods.

*Kanban* – a ‘pull’ system at a stock point in which a supply batch is ordered only when a previous batch is withdrawn. Used to implement Just in Time.

*Lean manufacturing* – a manufacturing methodology emphasizing the minimisation of all resources (including time) used in an enterprise, and typically employing Just in Time, Kaizen, Kanban, TQM, and TPM. Also referred to as Competitive Manufacturing.

*Poka Yoke* – a methodology for preventing errors by imposing limits on an operation which force its correct completion.

*SMED* – Single Minute Exchange of Die, a strategy for rapid changeover of tooling.

*TPM* – Total Productive Maintenance, an approach to maintenance emphasizing preventive and predictive maintenance activities.

TQM – Total Quality Management, a management strategy aimed at embedding awareness of quality in all processes of an organisation.

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## Outcomes and evidence requirements

### Outcome 1

Demonstrate knowledge of modern manufacturing concepts.

#### Evidence requirements

- 1.1 The concept of lean manufacturing is explained with reference to the types of waste in production processes.
- 1.2 Practical examples of waste in a manufacturing environment are given.
- Range examples covering – over-production, waiting time, transportation, over-processing, inventory, motion, scrap.
- 1.3 The key tools used to implement lean manufacturing are briefly explained, with reference to their influence on plant maintenance.
- Range key tools – Kaizen, Just in Time, Kanban, Poka Yoke, TQM, TPM, 5S, SMED.
- 1.4 The concept of agile manufacturing is explained with reference to its purpose and how it can be achieved.

### Outcome 2

Demonstrate knowledge of statistical process control.

#### Evidence requirements

- 2.1 The nature and purpose of statistical process control are explained without use of mathematics.
- 2.2 The use of control charts in a production process is explained from the perspective of plant maintenance activities.
- 2.3 The concepts of 3 Sigma and 6 Sigma in process control are explained without use of mathematics.
- 2.4 An Xbar-R (Shewhart) chart is prepared from given process measurements and analysed to establish whether the process is in control or not.

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**This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.**

**Status information and last date for assessment for superseded versions**

Process	Version	Date	Last Date for Assessment
Registration	1	20 June 2006	31 December 2022
Review	2	15 April 2011	31 December 2022
Review	3	20 July 2017	31 December 2022

<b>Consent and Moderation Requirements (CMR) reference</b>	0013
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

**Please note**

Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.

Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.

Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMR). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

This unit standard is expiring