Title	**Demonstrate knowledge of process theory for industrial measurement and control systems**		
Level	**5**	**Credits**	**5**

Purpose	This unit standard is intended for use in the training and assessment of industrial measurement and control. People credited with this unit standard are able to demonstrate knowledge of: – process dynamics; – controlled variable/manipulated variable pairing; – process disturbances; – process control criteria; and – standard control system strategies.

Classification	Industrial Measurement and Control > Industrial Measurement and Control - Theory

Available grade	Achieved

Guidance Information

1 This unit standard has been designed for learning and assessment off-job.

2 Definition
Industry practice – those practices that competent practitioners within the industry recognise as current industry best practice.

3 Range
a All activities and evidence presented for all outcomes and performance criteria in this unit standard must be in accordance with legislation, policies, procedures, ethical codes and standards, and industry practice; and where appropriate, manufacturers' instructions, specifications, and data sheets.
b Evidence of outcomes 1 to 4 comprise knowledge that is to be applied to outcome 5 which is a case study of combustion/boilers and one other process.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of process dynamics.

Performance criteria

1.1 Processes are described in terms of equilibrium conditions and response to imbalance.

Range material balance, energy balance, force or momentum balance; evidence of two is required.

1.2 Control strategies are described in terms of effects on equilibrium.

1.3 Response rate is estimated from process data.

Outcome 2

Demonstrate knowledge of controlled variable/manipulated variable pairing.

Performance criteria

2.1 Requirement for one manipulated variable for each controlled variable is explained.

2.2 Requirement to match manipulated variable to manipulated variable in multivariable systems is explained.

Outcome 3

Demonstrate knowledge of process disturbances.

Performance criteria

3.1 Disturbances are characterised and the differences explained.

Range supply side, demand side; must be consistent with previously used terminology.

3.2 Rate of change of disturbance is compared with process response time.

Outcome 4

Demonstrate knowledge of process control criteria.

Performance criteria

4.1 Requirements for control systems are described.

Range dynamic response, control limits, operator interaction, start-up and shut-down, safety and protection.

Outcome 5

Demonstrate knowledge of standard control system strategies.

Range may include but is not limited to – boiler drum level control strategies – 1, 2, and 3 element control; cross-limiting boiler combustion control; distillation control; pH control for wastewater treatment; steam turbine governing and pressure control, multi-effect evaporators;
evidence of three is required.

Performance criteria

5.1 Constraints and limitations of the controlled process are explained.

Range constraints may include but are not limited to – safety restrictions, loading or unloading rates, temperature rates of rise or fall, temperature differentials, capacity of associated equipment.

5.2 Performance of the control strategy is described.

Range normal operation, process upsets, emergency conditions.

5.3 Configuration requirements for control system are explained in terms of system sensitivity.

Range transmitter ranges, signal conditioning, final control element sizing and selection, measurement span.

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	21 August 2009	31 December 2027
Rollover and Revision	2	28 June 2018	31 December 2027
Review	3	30 January 2025	31 December 2027

Consent and Moderation Requirements (CMR) reference	0003

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.