Title	**Demonstrate knowledge of and operate a steam turbine in an energy and chemical plant**		
Level	**4**	**Credits**	**20**

Purpose	This unit standard is intended for people working as boiler operators and energy and chemical process operators in an energy and chemical plant. People credited with this unit standard are able to: describe steam turbine design concepts and operating principles; demonstrate knowledge of steam turbine steam flow, control systems and supervisory protection; and demonstrate knowledge of operational procedures for a steam turbine; in an energy and chemical plant. They are also able to operate a steam turbine in an energy and chemical plant.

Classification	Energy and Chemical Plant > Operation of Energy and Chemical Plant

Available grade	Achieved

Guidance Information

1 Legislation relevant to this unit standard includes but is not limited to:
- Health and Safety at Work Act 2015;
- Hazardous Substances and New Organisms Act 1996;
- Resource Management Act 1991;
  and any subsequent amendments.

2 Definitions
Energy or chemical plant may be in – petrochemical, agri-nutrient, power generation, dairy processing, meat processing, and wood fibre manufacturing, or other plants that operate with a combination of high temperatures, pressures, steam and/or chemicals in gas, liquid or solid form.
Organisational requirements – documented policies and procedures. These may include: equipment manufacturers' procedures; plant procedures; suppliers' instructions; site signage; codes of practice; company health and safety plans; on site briefings; and supervisor's instructions. This includes all regulatory and legislative obligations that apply to the plant.
Plant – the operational unit, equipment and/or workplace at which the person is working.

3 For the purposes of assessment:
- evidence for the practical components of this unit standard must be supplied from the workplace.

Outcomes and performance criteria

Outcome 1

Describe steam turbine design concepts and operating principles used in an energy and chemical plant.

Performance criteria

1.1 Describe steam turbines in terms of design and operating principles.

Range types of steam turbine include but are not limited to – impulse, reaction, axial, radial, induction, tandem, reheat, condensing, back pressure.

1.2 Describe components of steam turbines in terms of operating and design concepts.

Range components include but are not limited to – Pedestal, casing, steam admission valves, steam-chest, nozzles, rotor, blades, root, diaphragms shrouding, gland sealing, bearings, couplings, barring gear, gear box, turbine drains.

Outcome 2

Demonstrate knowledge of steam turbine steam flow, control systems and supervisory protection used in an energy and chemical plant.

Performance criteria

2.1 Describe steam turbine steam flow and control systems in terms of their purpose and operating principles.

Range steam flow and control systems include but are not limited to – mechanical governor, hydraulic governor, electronic governor, emergency trip mechanism.

2.2 Identify and describe supervisory devices used to monitor steam turbine conditions in terms of their purpose.

Range conditions include but are not limited to – vibration, axial displacement and differential expansion, sliding feet, thrust, critical speeds, balance.

2.3 Describe equipment protection systems for a steam turbine in terms of their purpose and operating principles.

Range protection systems include but are not limited to – trip systems, vibration monitors, overpressure control, electrical and mechanical overspeed.

2.4 Identify control systems for selected steam turbine equipment and describe their auxiliary systems in terms of operation.

Range control systems include but are not limited to – flow, temperature, speed, back pressure, pressure, level.

Outcome 3

Demonstrate knowledge of operational procedures for a steam turbine in an energy and chemical plant.

Performance criteria

3.1 Describe start-up procedures in accordance with organisational procedures.

3.2 Describe shutdown procedures in accordance with organisational procedures.

3.3 Describe emergency shutdown procedures in accordance with organisational procedures.

3.4 Identify deviations from normal operating parameters that can occur in a steam turbine and describe the operational steps and techniques used to respond to each deviation in accordance with organisational procedures.

Range deviations include but are not limited to – speed, temperature, pressure, vibration.

3.5 Identify equipment malfunctions that can occur in a steam turbine and describe the operational steps and techniques used to respond to each equipment malfunction in accordance with organisational procedures.

Range evidence of four equipment malfunctions is required which may include but are not limited to – thermal stress, uneven heating, loss of vacuum, turbine supervisory deviations.

3.6 Describe methods of water ingress management into a steam turbine in terms of their signs and effects in accordance with organisational procedures.

Outcome 4

Operate a steam turbine in an energy and chemical plant.

Performance criteria

4.1 Start up and shutdown a steam turbine plant in accordance with organisational procedures.

4.2 Operate a steam turbine in accordance with organisational procedures.

4.3 Carry out monitoring procedures in accordance with organisational procedures.

4.4 Complete all plant documentation related to process and equipment operation in accordance with organisational procedures.

4.5 Carry out steam turbine operational testing and record findings in accordance with organisational procedures.

Replacement information	This unit standard replaced unit standard 21458.

Planned review date	31 December 2024

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	27 February 2020	N/A

Consent and Moderation Requirements (CMR) reference	0079

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

Comments on this unit standard

Please contact the Primary Industry Training Organisation standards@primaryito.ac.nz if you wish to suggest changes to the content of this unit standard.