Australian Government

MARL030 Demonstrate advanced knowledge of marine auxiliary boilers

Release: 1

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Modification History

Release 1. New unit of competency.

Application

This unit involves the skills and knowledge required to operate and maintenance of marine auxiliary boilers on a commercial vessel. It includes evaluating steam plant efficiency, interpreting steam plant cycles, evaluating repairs required for boilers and steam plants, outlining survey procedures, and explaining operating steam plant under different conditions.

This unit applies to the work of a Marine Engineer Class 1 on commercial vessels of unlimited propulsion power and forms part of the requirements for the Certificate of Competency Marine Engineer Class 1 issued by the Australian Maritime Safety Authority (AMSA).

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

Pre-requisite Unit

Not applicable.

Competency Field

L – Marine Engineering

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 Evaluate steam plant efficiency	1.1 Combustion efficiency from flue gas constituents is assessed
	1.2 Steam and fuel consumption to obtain heating efficiency is analysed
	1.3 Causes of loss of steam plant efficiency are evaluated and recorded

		1.4	Requirements of inert gas generation of boiler plant are determined
2	**Interpret complex steam plant cycles**	2.1	Operation, function and efficiency of dual pressure cycles and steam/steam generators are compared and contrasted
		2.2	Operation of dual pressure and pass in/out turbines is explained
3	**Evaluate boiler and steam plant repairs**	3.1	Types and properties of materials used in boilers and steam plant are identified
		3.2	Common component failures in boilers and steam plant are explained and reported
		3.3	Appropriate repairs for failed components in boilers and steam plant are determined
		3.4	Constraints on engineering staff engaged in repairing boilers and steam plant are explained
		3.5	Requirements to report defects in pressurised components of boilers are identified
4	**Explain methods of auxiliary steam plant operation and control under variable conditions**	4.1	Methods of steam pressure control while manoeuvring and possible adverse impacts are analysed
		4.2	How dew point can be reached when operating at reduced power is examined
		4.3	How low powers can limit steam production by exceeding pinch point is explained
5	**Outline procedures surveying for boilers**	5.1	Procedure for preparing a boiler for survey is documented and explained
		5.2	Boiler inspection procedure that would cover all possible problem areas is planned
		5.3	Purpose and procedure for carrying out hydrostatic/hydraulic pressure tests and non destructive tests on auxiliary boilers are explained
6	**Analyse procedures for protecting steam plant during off load conditions**	6.1	Procedures for decommissioning and laying up a boiler for short and long intervals are compared
		6.2	Processes for cleaning boilers are evaluated
		6.3	Procedures for re-commissioning steam plant are explained

	6.4	Chief Engineer responsibilities for setting lifting pressure of safety valves are outlined
7 Assess hazards of operating steam plant under adverse or faulty operating conditions	7.1	Potential hazards of boiler operation with contaminated feed water are assessed
	7.2	Procedure for continuing boiler operation when contamination has exceeded acceptable limits is explained
	7.3	Effects of operating boiler with insufficient water level are explained and actions to be taken under loss of water conditions are identified
	7.4	Causes, consequences and relevant preventative measures associated with furnace explosions are analysed
	7.5	Operating conditions that can lead to an economiser fire and actions that can be taken to prevent and control such fires are evaluated
	7.6	Alternative methods for maintaining heating if a boiler or economiser has to be shut down are determined
8 Explain operation and maintenance of heat transfer oil systems	8.1	Operating procedures of heat transfer oil systems are explained
	8.2	Hazards associated with heat transfer oil systems are analysed
	8.3	Routine maintenance procedures associated with heat oil transfer systems are outlined

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Causes of loss of steam plant efficiency include	• conduction-heat loss (such as fouled tubes) • high flue-gas temperature

one or more of the following:	• low combustion-air supply temperature • low feed-water supply temperature • low quality fuel • operation at low or cyclic loads • poor: • combustion • controls/instrumentation • water treatment • radiant-heat loss • too much excess air (i.e. high oxygen [O2])
Boilers and steam plant include one or more of the following:	• condensers • economiser • feed pumps • fired • high pressure • low pressure • medium pressure • steam – steam generators • unfired
Failures include one or more of the following :	• acid dew point corrosion • caustic gouging • corrosion fatigue • distortion • erosion • fatigue • hydrogen damage • maintenance damage • material flaws • over temperature • pitting • stress: • corrosion cracking • rupture • thermal fatigue • vibration • welding flaws
Constraints include one or more of the following:	• class requirements • location • reliability • time • type of materials

Safety valves include one or more of the following:	• boiler drum • economiser • superheater • WHU

Unit Mapping Information

This unit replaces and is equivalent to MARL6017A Demonstrate advanced knowledge of marine auxiliary boilers.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=772efb7b-4cce-47fe-9bbd-ee3b1d1eb4c2