LESSON PLAN

PROGRAM TITLE:
Steam Boiler Operator Essentials: Fundamentals, Safety, and Control

OVERVIEW:

This training course will help participant to gain a high-level understanding of **Steam Boiler Operator Essentials: Fundamentals, Safety, and Control** and potential advantages, including improved occupational health and safety performance and governance, reduced risks, and enhanced legal compliance. The **Boiler Operator Essentials: Fundamentals, Safety, and Control** course is specially developed to upgrade theoretical and operational skills in handling steam boilers for the current workforce.

In addition, it will give participant sufficient knowledge to engage with colleagues or external professionals who are operating, implementing, or auditing health and safety management systems that are aligned to Steam Boiler requirements under OSHA 2022; OCCUPATIONAL SAFETY AND HEALTH (PLANT REQUIRING CERTIFICATE OF FITNESS) REGULATIONS 2024; P.U (A) 99

SPEAKER: Ir.Mohamad Hatta Bin Abu Bakar, Ir.Dr Suhaimi Hassan

LEARNING OUTCOMES

The **Boiler Operator Essentials: Fundamentals, Safety, and Control** course is specially developed to upgrade theoretical and operational skills in handling steam boilers for the current workforce.

Upon Completion of the training program, the participants will be able to:

1) State the purpose of and basic operating principles of a steam boiler
2) Differentiate between common steam boiler types
3) Recognize common industry terminology related to steam boiler
4) Identify the main functional groups of steam boiler components
5) Explain the function of critical components like the burner, drum, and superheater.
6) Locate and describe the function of key safety fittings.
7) List the necessary pre-start checks to ensure safe operation
8) Follow the step-by-step procedure for a safe boiler light-off.
9) Interpret basic steam boiler control panel indicators and alarms
10) Execute a safe, controlled normal shutdown procedure.
11) Identify the symptoms of key operating problems and initiate corrective action.
12) Explain the function of all major safety and protection devices.
13) Identify the contaminants in boiler feedwater and their negative effects
14) Explain the purpose of both external and internal water treatment
15) Interpret basic water test results and adjust blowdown accordingly

DURATION: 2 DAYS

TARGET PARTICIPANTS:

Plant Manager, Mill Manager, Maintenance Manager,Steam Boiler Engineer Grade 1 and 2, Steam, Boiler Operator Grade1 and 2, Safety and Health Officer, Plant Superintendent and Plant Supervisor

Kunang ACE ENERGY SDN BHD	**LESSON PLAN** **PROGRAM TITLE:** **Steam Boiler Operator Essentials: Fundamentals, Safety, and Control**

COURSE CONTENT/ DETAILS

MODULE 1 – INTRODUCTION TO STEAM BOILER

Boiler Fundamentals & Purpose - Heat transfer and steam generation.
Basic Principles - Pressure, temperature, and phase change.
Types of Boilers - Firetube vs. Watertube (advantages/disadvantages).
Energy Cycle - Overview of energy conversion (chemical to thermal).

MODULE 2 – STEAM BOILER COMPONENTS & PARTS

Boiler Shell/Drum - Circulation, separation.
Heat Transfer Surfaces - Tubes, furnace, economizer.
Combustion System - Burner, air damper, fuel supply, stack.
Fittings & Mountings - Safety valves, water gauge glass, pressure gauges, steam stop valve.

MODULE 3 – STEAM BOILER START UP

Pre-Start Checklist - Water level, fuel supply, interlocks, venting.
Safety Interlocks Check - Confirming low water cut-offs are functioning.
Purge Cycle - Explaining minimum volume and timing for safety.
Light-Off Sequence - Ignition, flame establishment, and smooth firing rate control.

MODULE 4 – STEAM BOILER CONTROL

Normal Shutdown - Procedure for taking the boiler offline
Emergency Shutdown - Immediate steps for critical failures (loss of flame, tube failure).
Protection Devices - Detailed focus on safety valves, high-pressure/temperature cut-outs, and low water cut-offs.
Troubleshooting - High water level, unstable pressure, nuisance burner trips

MODULE 5 – STEAM BOILER SHUTDOWN & PROTECTION

Normal Shutdown - Procedure for taking the boiler offline
Emergency Shutdown - Immediate steps for critical failures (loss of flame, tube failure).
Protection Devices - Detailed focus on safety valves, high-pressure/temperature cut-outs, and low water cut-offs.
Troubleshooting - High water level, unstable pressure, nuisance burner trips.

MODULE 6 – STEAM BOILER SHUTDOWN & PROTECTION

Contaminant Effects - Scale, corrosion, carryover, foaming
External Treatment - Softening (Ion Exchange) and its limitations.
Internal Treatment - Oxygen scavengers, sludge conditioners/polymers, and alkalinity control.
Blowdown Management - Purpose and procedures for manual and continuous blowdown to control Total Dissolved Solids (TDS).
Water Testing - Key Parameters (TDS, pH, Hardness) and recommended ranges

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LEARNING METHODOLOGY

- Slide Presentation
- Picture /Video
- Model/Parts Assembly

TRAINING SCHEDULE

	TIME	DESCRIPTION
DAY 1	8.30-8.45	REGISTRATION DAY 1
	8.45-9.00	INTRODUCTION AND ICE BREAKING
	9.00-10.30	MODULE 1
	10.30-11.00	TEA BREAK
	11.00-12.30	MODULE 2
	12.30-14.00	LUNCH AND ZOHOR PRAYER BREAK
	14.00-15.30	MODULE 3
	15.30-15.45	TEA BREAK
	15.45-17.15	MODULE 4
	17.15	ADJOURN DAY 1
DAY 2	8.30-8.45	REGISTRATION DAY 2
	8.45-9.00	RECAP OF PREVIOUS DAY LESSONS
	9.00-10.30	MODULE 5
	10.30-11.00	TEA BREAK
	11.00-12.30	MODULE 5
	12.30-14.00	LUNCH AND ZOHOR PRAYER BREAK
	14.00-15.30	MODULE 6
	15.30-15.45	TEA BREAK
	15.45-17.15	MODULE 6
	17.15	END OF COURSE