COURSE TITLE

Heat Recovery Steam Generator (HRSG) Technology Course

Training Date:	As per schedule	**Training Venue:**	Kuala Lumpur, Malaysia.
Basic Fee:	RM3,450.00 + SST (this includes course materials, meals, refreshment and attendance certificate)		

DURATION

21 hours (Three (3) days)

TARGET GROUP

- Engineering and Procurement engineers
- Project execution engineers
- Plant Operation engineers and senior technicians
- Maintenance Engineers
- EPCC contracting engineers

TARGETED INDUSTRY/INDUSTRIES

Oil & Gas, Petrochemicals, Power Plant, Renewal Energy Plant, Co-Generation Plant and Refineries Plant and other industries that using HRSG for steam generation.

CERTIFICATION

N/A

COURSE OVERVIEW

Natural gas and other clean liquid fuels are widely used in gas turbines (GTs) for process and power generation application. While this has proved to be a boon for pollution control, ease of operation, flexibility and reliability, the biggest issue with GTs is their poor efficiency. A typical GT operates at about 37% efficiency. The remaining about 63% energy rejected by the system provides an opportunity for recovery and improving the overall cycle efficiency. This important job is accomplished by boilers designed to capture the heat being wasted to atmosphere and produce useful steam. Such boilers are called waste heat boilers (WHBs) or heat recovery steam generators (HRSGs).

HRSGs work on concepts that are a little different from those applied to fired auxiliary boilers. An HRSG is a slave of the GT that it is coupled to, making it less flexible for the steam user. This limitation is overcome to a great extent by supplementing the waste heat by firing fuel in the HRSG. Supplementary firing reduces dependence of the steam quality on the GT operating point. That makes the HRSGs more fit-for-purpose, because while the GT is operating at high loads they deliver “free” steam and in situations when the GT operates on low loads, they maintain on-spec steam delivery using supplementary fuel firing at fuel cost that is lower than a conventional fired auxiliary boiler.

COURSE OBJECTIVE

This course on HRSG Fundamentals is intended for those who want to know about the HRSG and its use in combined cycle and cogeneration plants. Topics to be covered include types of HRSGs, heat exchangers, boiler circulation systems, components, heat management, controls, emission controls, associated equipment, and fabrication/ construction. Key features include heat transfer, surface arrangements; design/operating considerations, and integration with combined cycles and cogeneration equipment. Steam conditions will also be discussed.

COURSE OUTCOMES

At the end of the training, the participants will be able to: -

- Explain the concept of waste heat contained in gas turbines exhaust gases and its recovery by HRSG
- Heat transfer and flow within HRSG
- Describe the function of the economizer, evaporator, superheater, reheater, and steam drum components
- Discuss saturated and superheated steam fundamentals, temperature and superheater controls
- Identify purpose of drains, vents, and safety valves
- Outline HRSG controls and protective trips
- Review HRGS construction
- Understand HRSG commissioning, operations, trouble-shooting, inspections, repairs and maintenance processes.

COURSE CONTENTS

Gas Turbine - Based Power Plant

- Advantages
- History
- Outlook

Thermodynamic of Steam

- Thermodynamics
  - Saturated and Superheated Steam
  - Enthalpy

Heat Recovery Steam Generator (HRSG)

- Role of HRSG in Power Plant
- Characteristic
- Types of HRSG

The Central Role of HRSGs in Combined Cycle Design

- Pressure Levels
- Reheat
- Other Decisions Affecting Heat Recovery

Power Cycle Variations that Use HRSGs

- Cogeneration

Thermal Design

- Energy balance
- Supplementary firing
- Circulation Systems
  - Natural Circulation
  - Forced Circulation
- Design concepts
  - Approach
  - Pinch
  - Superheater and economizer behaviour
- Steam Drum
- Economizer
- Superheater and reheater
- Split superheater

HRSG Operation & Preservation

- Start-up
- Shutdown and trips
- Load changes
- Lay-up

Controls

- Steam Pressure Control
- Drum level control
  - Single-element control
  - Three-element control
- Steam temperature control

Deaerator

Mechanical design

Materials, Corrosion, Creep

Water Chemistry

- Requirements
- Water Treatment
- Potential for Internal Corrosion

Inspection, Repair and Maintenance – An Overview

ABOUT THE INSTRUCTOR



Mr. Sanjay Jumde has been with the steam generator industry for 4 decades with seamless experience in engineering, commissioning, operation, trouble-shooting and improvement of boilers and HRSGs.

Throughout his career with best-in-industry boiler OEMs he has been an acclaimed trainer, coach and mentor for engineers and managers associated with steam generation & distribution. His training sessions are based on his own hands-on problem solving experiences not found in routine course books. He has delivered several lectures, seminars and webinars in the Asia Pacific region.

Broad Experience Profile:
Since graduation in engineering in 1981, he has accumulated hands-on field experience with top-in-industry organization viz; Bharat Heavy Electricals Ltd (India), Thermax Babcock & Wilcox Ltd (India), PETRONAS (Malaysia) and General Electric (Malaysia). His career began with engineering, commissioning, stabilization of large power utility and industrial boilers. Later he established a niche business of developing troubleshooting and improvisation solutions for steam generators of various capacities and configurations. Several boiler users in India and SE asia benefitted from this very specialised service.

Accreditations, Recognitions:
- Corporate Member of The Institution of Engineers (India)
- Chartered Engineer certified by The Institution of Engineers (India)
- Advisor Member of Boiler Community of Practice at PETRONAS (Malaysia)
- Member of Energy Loss Management and Value Improvement Program at PETRONAS
- Coach at Accelerated Career Development program for O&M staff at PETRONAS
- Technical guide for pre-acquisition co-ordination with APAC regional customers at GE

A few select papers authored & presented in seminars and webinars:
- 2-day online Webinar from India for Institution of Engineers (Malaysia) on “Fuels and Fuel Burners for Steam Generators” – Jul 2021
- 10-day GE customer training in boiler O&M to Cambodia Energy Ltd – May-June 2019
- Guest speaker on “Evolution of Ultra-Supercritical (USC) Steam Technology” at the Conference of the Electric Power Supply Industry (CEPSI) at Kuala Lumpur - Sep 2018
- Training programs on boilers at Doha (Qatar) for O&G companies in Qatar – 2011-2012
- Guest Speaker - “Best Practices in Plant Operation” held by PETRONAS - Feb 2010
- “Steam System Management & Improvement” for PETRONAS O&M - June 2008
- “Steam System Performance Monitoring in Complex Utility Plants” in PETRONAS Plant Managers’ Forum – April 2008
- “Superheater metal temperature balancing in large boilers - a case study” - June 2007
- “Fuel Firing System R&M in Steam Generators” Energy Conservation Conference, Mumbai Dec 2000. Awarded first prize and cash award based on audience rating
- “Steam Generator R&M Technology” at Boiler Congress 2001 at Chennai (India)
- “Steam Generator Renovation as a Business Proposition” at Boiler Engineering Technology (BET) Seminar at Cochin (India) - Nov 2004
- Lecture on boiler R&M at National Power Training Institute, Nagpur (India) – Nov 2003
- Speaker on “PIP- the answer to Asia’s Capital Cost/ Inefficiency Problems” at PowerGen Asia – Sept 1999 at Singapore