COAL POWER PLANT OPERATION AND MAINTENANCE

15 - 17 MAY 2018, MANILA, PHILIPPINES

Expert Course Faculty Leader

Philip Kiameh

Has more than 32 years of practical engineering experience with Ontario Power Generation as an Engineering Supervisor and Training Manager, has conducted courses and seminars, to more than 4,000 working engineers and professionals who consistently ranked him as "Excellent" or "Very Good". Philip has also written 5 books for working engineers from which three have been published by McGraw-Hill, New York.

Topics Covered

Review of Coal Power Plants
Thermodynamics

Layout of Steam Power Plants

Efficiency Loss in Coal Power Plants

Factors Influencing Power Plant Efficiency

Reliability, Safety and Emissions

Steam Turbine Maintenance

Degradation of Boiler Components

Electric Generator Operation and Maintenance

3 for 2 Bundle Offer. SGD 2036 each for Team of 3!
Introduction

This seminar provides detailed description of coal power plant operation and maintenance. All the methods and procedures used to operate and perform maintenance and refurbishment activities in coal power plants will be covered in detail. All the techniques used to monitor the performance and efficiency of pulverized coal and circulating fluidized bed coal power plants and improve their heat rate (increase the efficiency) will be covered. All the processes, operational and maintenance activities, capital projects, technical options, potential initiatives and incentives to implement upgrades/repairs for increasing the plant efficiency, reliability and safety will be covered in detail. This seminar will also provide in-depth explanation of all the equipment and systems used in coal power plants. This includes, boilers, superheaters, reheaters, turbines, condensers, feedwater heaters, deaerators, pumps, compressors, fans, coal handling system, ash handling system, transformers, electric generators, instrumentation and control systems, and governing systems, etc. All the factors which affect power plant performance, efficiency, reliability, safety and emissions will be explained thoroughly. All the areas in pulverized coal and circulating fluidized bed power plants where efficiency loss can occur will be explained. This seminar will also provide up-dated information in respect to the following topics:

- Performing Boiler Maintenance and Refurbishment
- Performing Steam Turbine Maintenance and Refurbishment
- Improving Coal Power Plant Heat Rate, Capacity Factor, Reliability and Safety
- Performing Transformer and Generator Maintenance and Refurbishment

Seminar Outcomes

- **Coal Power Plant Operation**: Understand how all the equipment and systems used in coal power plants operate
- **Coal Power Plant Maintenance**: Gain a thorough understanding of all the maintenance methods and refurbishment procedures of every equipment and system used in coal power plants
- **Coal Power Plants Performance and Efficiency**: Learn all the techniques used to monitor coal power plant performance and efficiency
- **Calculating the Heat Rate of Coal Power Plants**: Learn all the methods used to calculate the heat rate of coal power plants
- **Coal Power Plant Tests**: Discover all the tests required for all the equipment and systems of coal power plants
- **Coal Power Plant Reliability and Safety**: Understand all the methods used to enhance the reliability and safety of coal power plants
- **Processes, Operational and Maintenance Activities**: Discover all the processes, operational and maintenance activities used to improve the heat rate, reliability and safety of coal power plants
- **Potential Initiatives and Incentives to Implement Upgrades/Repairs for Improving the Heat Rate**: Discover all the potential initiatives and incentives to implement upgrades/repairs for improving the heat rate, reliability and safety of coal power plants
- **Factors Affecting Coal Power Plant Efficiency, Reliability, Safety and Emissions**: Learn about all the factors which affect coal power plants efficiency, reliability, safety and emissions
- **Areas in Pulverized Coal and Circulating Fluidized Bed Power Plants where Efficiency Loss Can Occur**: Discover all the areas in pulverized coal and circulating fluidized bed power plants where efficiency loss can occur
- **Optimize the Operation of Coal Power Plant Equipment and Systems to Improve the Plant Heat Rate, Reliability and Safety**: Understand all the techniques and methods used to optimize the operation of coal power plant equipment and systems to improve the plant heat rate, reliability and safety
- **Coal Power Plant Equipment and Systems**: Gain a thorough understanding of various coal power plant equipment and systems including: boilers, superheaters, reheaters, steam turbines, governing systems, deaerators, feedwater heaters, coal-handling equipment, transformers, generators and auxiliaries
Who Should Attend

- Engineers of all disciplines
- Managers
- Technicians
- Maintenance personnel
- Other technical individuals

Training Methodology

The instructor relies on a highly interactive training method to enhance the learning process. This method ensures that all the delegates gain a complete understanding of all the topics covered. The training environment is highly stimulating, challenging, and effective because the participants will learn by case studies which will allow them to apply the material taught to their own organization.

Your Expert Faculty

Philip Kiameh, M.A.Sc., B.Eng., D.Eng., P.Eng. (Canada) has been a teacher at University of Toronto and Dalhousie University, Canada for more than 25 years. In addition, Prof Kiameh has taught courses and seminars to more than four thousand working engineers and professionals around the world, specifically Europe and North America. Prof Kiameh has been consistently ranked as "Excellent" or "Very Good" by the delegates who attended his seminars and lectures.

Prof Kiameh wrote 5 books for working engineers from which three have been published by McGraw-Hill, New York. Below is a list of the books authored by Prof Kiameh:

5. Industrial Equipment (600 pages), Custom Publishing, University of Toronto, University of Toronto, University of Toronto Custom Publishing (1999).

Prof. Kiameh has received the following awards:

1. The first "Excellence in Teaching" award offered by Poweredge Asia Training center, Singapore, December 2016
2. The first "Excellence in Teaching" award offered by the Professional Development Center at University of Toronto (May, 1996).
3. The "Excellence in Teaching Award" in April 2007 offered by TUV Akademie (TUV Akademie is one of the largest Professional Development centre in world, it is based in Germany and the United Arab Emirates, and provides engineering training to engineers and managers across Europe and the Middle East).
4. Awarded graduation “With Distinction” from Dalhousie University when completed Bachelor of Engineering degree (1983).

Prof. Kiameh performed research on power generation equipment with Atomic Energy of Canada Limited at their Chalk River and Whiteshell Nuclear Research Laboratories. He also has more than 32 years of practical engineering experience with Ontario Power Generation (OPG - formerly, Ontario Hydro - the largest electric utility in North America). Prof. Kiameh retired from OPG in November 2016.

While working at Ontario Hydro, Prof. Kiameh acted as a Training Manager, Engineering Supervisor, System Responsible Engineer and Design Engineer. During the period of time that Prof Kiameh worked as a Field Engineer and Design Engineer, he was responsible for the operation, maintenance, diagnostics, and testing of gas turbines, steam turbines, generators, motors, transformers, inverters, valves, pumps, compressors, instrumentation and control systems. Further, his responsibilities included designing, engineering, diagnosing equipment problems and recommending solutions to repair deficiencies and improve system performance, supervising engineers, setting up preventive maintenance programs, writing Operating and Design Manuals, and commissioning new equipment.

Later, Prof Kiameh worked as the manager of a section dedicated to providing training for the staff at the power stations. The training provided by Prof Kiameh covered in detail the various equipment and systems used in power stations.

Professor Philip Kiameh was awarded his Bachelor of Engineering Degree "with distinction" from Dalhousie University, Halifax, Nova Scotia, Canada. He also received a Master of Applied Science in Engineering (M.A.Sc.) from the University of Ottawa, Canada. He is also a member of the Association of Professional Engineers in the province of Ontario, Canada.
3 Day Course Outline

Day 1 – Coal Power Plants, Steam Generators, Steam Turbines, Steam Turbine Auxiliaries
- Review of Coal Power Plants Thermodynamics
- Layout of Steam Power Plants
- Steam Generators
- Steam Turbines
- Reheaters
- Condensers
- Feedwater Heaters
- Efficiency and Heat Rate
- Supercritical Plants
- The Fire-Tube Boiler
- The Water-Tube Boiler
- The Steam Drum
- Superheaters and Reheaters
- Once-Through Boilers
- Economizers
- Fans
- Coal Handling System
- Ash Handling System
- Draught System
- The Stack
- Feedwater Treatment Plant
- Steam Generator Control
- Feedwater and Drum-Level Control
- Steam-Pressure Control
- Steam-Temperature Control
- Mechanisms of Energy Conversion in a Steam Turbine
- Turbine components
- Rotating and Stationary blades
- Thrust bearings
- Labyrinth seals
- Turbine controls
- Testing of Turbine blades
- Quality Assurance of Turbine Generator Components
- Assembly and testing of turbine components
- Turbine Types
- Compound Turbines
- Turbine Control Systems
- Steam Turbine Maintenance
- Steam Generators, Heat Exchangers, and Condensers
- Power Station Performance Monitoring
- The Turbine Governing Systems
- Steam Chests and Valves
- Turbine Protective Devices
- Turbine Instrumentation
- Lubrication Systems

- Major Components of Pulverized Coal and Circulating Fluidized Bed Power Plants
- Pulverized Coal Fired Power Plant Performance
- Circulating Fluidized Bed Power Plant Performance
- Net Power Generation Capacity
- Steam Cycle Heat Rate
- Design Parameters that Affect the Steam Cycle Heat Rate
- Boiler (Steam Generator) Efficiency
- Coal Composition
- Flue Gas Exit Temperature
- Energy Content or Heating Value
- Penalty for Stack Gas Reheat
- Flue Gas Desulfurization (FGD) Systems
- Power Consumption of the Auxiliary Equipment (Allowance for Auxiliaries)
- Power Plant Availability
- Average Load Factor
- Annual Coal Consumption
- Annual Ash and SO2 Generation
- Coal Transportation, Unloading and Storage
- Coal Storage and Reclamation
- Environmental Issues Related with Coal Based Energy Conversion

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CPD
Approved Training Provider
- Air Pollution
- Sulfur Containing Compounds (SO\textsubscript{x})
- Nitrogen Containing Compounds (NO\textsubscript{x})
- Carbon Monoxide (CO) and Carbon Dioxide (CO\textsubscript{2})
- Particulate Matter
- Environmental Control Systems
- Control Technologies for SO\textsubscript{x}, NO\textsubscript{x}, and Particulates
- Electrostatic Precipitators (ESP’s)
- Ash and Flue Gas Desulfurization (FGD) Sludge Disposal Systems
- Differences in Reported Efficiency Values
- Energy and Efficiency Losses
- Impact of Condenser-Operating Conditions on Efficiency
- Heat and Power Equivalence
- Efficiency Performance Assessment Periods
- Efficiency Standards and Monitoring
- Reporting Bases for Whole Plant efficiency
- CO\textsubscript{2} Emission Reporting
- Generic Reconciliation Methodology
- Efficiency Outlook for Power Generation from Coal
- International Energy Agency (IEA) Recommendations for Improving the Heat Rate in Coal Power Plants
- Rate in Coal Power Plants

Day 3 – Efficiency Loss in Coal Power Plants, Steam Turbine Steam Path Modifications; Processes, Operational and Maintenance Activities Used to Increase the Plant Efficiency, Reliability and Safety, Steam Turbine Maintenance, Failure or Degradation of Boiler Components, Boiler Maintenance, Transformer Maintenance, Electric Generator Operation and Maintenance

- Areas of a Pulverized Coal Plant where Efficiency Loss Can Occur
- Areas of a Circulating Fluidized Bed Coal Plant where Efficiency Loss Can Occur
- Assessing the Range and Applicability of Heat Rate Improvements
- Heat Rate Improvement
- Steam Turbine Steam Path Modifications
- Steam Turbine Maintenance
- Major Operating Problems in Coal Power Plants

- Failure or Degradation of Boiler Components
- Reduced Performance of the Whole Plant or Specific Components
- Erosion in the Boilers
- Fuel: Composition, Shape, Size, Hardness, Ash Content
- Operating Conditions
- Tube Properties: Composition and Morphology of Tube Metal
- Design and Construction of the Boiler
- Wall Tubes
- Corrosion Inside the Boilers
- Fireside Corrosion Fatigue
- Fireside Ash Corrosion of Superheater
- Chemistry of Fire-Side Corrosion
- Sulfate Corrosion
- Sulfide Corrosion
- Chlorine Corrosion
- Fouling and Deposit Formation Inside the Boiler
- Prevention of High Temperature Corrosion
- Low Oxygen Combustion
- Uniform Distribution of Combustion Air
- Uniform Distribution of Fuel in the Combustion Chamber
- Use of Additives to Prevent High-Temperature Corrosion in the Boiler
- Reduction of Flue Gas Temperature at the Furnace Outlet
- Use of Corrosion Resisting Alloys
- Avoidance of Simultaneous Occurrence of High Gas Temperature and High Wall Temperature
- Avoidance of Contact of High Wall Temperature and Corrosion Agents
- Refractory Failure
- Maintenance Issues
- Design Audit
- Material Audit
- Preventive and Remedial Measures for Fireside Corrosion
- Preventive Maintenance for Refractory
- Operating and Safety Issues
- Combustion Start-up
- Cold Start-up
- Warm Start-up

This training course has a limited attendance for up to 20 participants only.

Sessions commence at 9am on all days, with short intervals at 10.30am and 3.30pm respectively. Refreshments will be provided in the short intervals. Lunch will be provided at 12:30pm for 1 hour. Sessions will end at 5pm on all days.
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**ATTENDEE DETAILS**

Name ................................................................. Job title .................................................................
Tel ........................................... Department ................................................................. Email .................................
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**COMPANY DETAILS**

Organisation name ................................................................. Industry .................................................................
Address ...................................................................................................................
Postcode ................................................................................................................................. Country .................................................................
Tel ................................................................. Fax .................................................................

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**PER PARTICIPANT**

3 Day Programme SGD 3,053 Per Participant (*GST Exclusive)

**2 PARTICIPANTS OR MORE**

SGD 2,853 Per Participant (*GST Exclusive)

**IN-HOUSE TRAINING**

Guaranteed Minimum 40% Off Normal Price

**4 ways to Register**

- Online Web Registration
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  (65) 6741 9927

**RELATED TRAINING**

- EPC Contract Management for Power & Utilities
- Electrical Generators & Excitation Systems
- Ultra Supercritical Power Plants
- The 4 Pillars of Transformer Condition Monitoring

**ON SITE TRAINING**

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