ULTRA SUPERCritical STEAM POWER PLANTS

29 – 31 OCTOBER 2019, KUALA LUMPUR, MALAYSIA

TOPICS COVERED

Ultra Supercritical Power Plants
Benefits

Design and Configuration

Turbines and Auxiliaries
Operation

Fuels

Instrumentation and Control Systems

Governing Systems

Capture and Storage Technology

Turbine Material and Coatings

Expert Course Faculty Leader

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

This seminar will cover all aspects of ultra supercritical steam power plants and advanced ultra supercritical power plants. These plants have achieved a net electrical efficiency of 50%. This efficiency is significantly higher than the efficiency of conventional power plants which is around 33%. This indicates that ultra supercritical power plants burn 50% less fuel than conventional power plants to produce the same amount of power. The ultra supercritical power plants burn coal and biomass. The environmental emissions of these plants are negligible. Some ultra supercritical power plants employ carbon capture technology. This makes them more environmentally friendly than any other type of power plants. They also have higher reliability and lower capital, operation and maintenance cost than conventional power plants. Large number of ultra supercritical power plants are being built around the world today. China will be installing more than 100,000 MW of ultra supercritical power plants and advanced ultra supercritical power plants during this decade. Several countries around the world have embarked on a program to replace their conventional coal power plants with ultra supercritical power plants due to their high efficiency, and reliability and low capital, operation and maintenance cost. Ultra supercritical power plants provide significant economical and environmental advantage over any other type of conventional power plants.

This seminar will cover in detail all the components of ultra supercritical steam power plants including steam turbines, boilers, furnace, burners, steam generators, reheaters, superheaters, feedwater heaters, valves, carbon capture equipment, instrumentation, control systems, fuel handling systems and generators. This seminar will also cover the design, selection considerations, operation, common problems and solutions, maintenance, pay-back period, and economics of ultra supercritical and advanced ultra supercritical power plants in detail. This seminar will provide in-depth coverage of the emission control methods, carbon capture technology, reliability, economics, monitoring and governing systems of ultra supercritical and advanced ultra supercritical power plants. This seminar will cover up-dated information in respect to all the significant improvements that have been made to these power generating plants during the last decade.

Who Should Attend

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

Seminar Outcome

- **Ultra Supercritical Power Plant Equipment**: Learn about various ultra supercritical power plant equipment including: steam turbines, furnace, burners, boilers, economizers, superheaters, reheaters, valves, emission control equipment, governing systems, deaerators, feed water heaters and auxiliaries.

- **Ultra Supercritical Power Plants Economics**: Examine the advantages, applications, performance and economics of ultra supercritical power plants and advanced ultra supercritical power generating plants.

- **Ultra Supercritical Power Plant Maintenance**: Learn all common problems and solutions of ultra supercritical power plants and all maintenance activities required for ultra supercritical power plants and advanced ultra supercritical power generating plants to minimize their operating cost and maximize their efficiency, reliability, and longevity.

- **Ultra Supercritical Power Plant Environmental Emissions**: Learn about the monitoring and control of environmental emissions from ultra supercritical and advanced ultra supercritical power plants.

- **Ultra Supercritical Power Plant Instrumentation and Control Systems**: Learn about the latest instrumentation and control systems of ultra supercritical power plants and advanced ultra supercritical power generating plants.
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.

- **Ultra Supercritical Power Plant Reliability and Testing**: Increase your knowledge of ultra supercritical and advanced ultra supercritical power plant predictive and preventive maintenance, reliability and testing.
- **Ultra Supercritical Power Plant Design, Selection and Applications**: Gain a detailed understanding of the design, selection considerations and applications of ultra supercritical power plants and advanced ultra supercritical power generating plants.
- **Ultra Supercritical Power Plant Profitability**: Learn about the reliability, life cycle cost, profitability, refurbishment, and life extension methods for all types of ultra supercritical power plants and advanced ultra supercritical power generating plants.
Your Expert Faculty

The trainer has been a teacher at University of Toronto and Dalhousie University, Canada for more than 25 years. In addition, he has taught courses and seminars to more than four thousand working engineers and professionals around the world, specifically Europe and North America. He has been consistently ranked as "Excellent" or "Very Good" by the delegates who attended his seminars and lectures.

The trainer 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 him:

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

The trainer 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).
3 Day Course Outline


- Review of Thermodynamics Principles, benefits of ultra supercritical power plants, Ultra Supercritical Power Plant Technology, configuration of ultra supercritical power plant, schematic of ultra supercritical power plants with double reheat, effects of co-firing coal and biomass, creep strength of material and targets, superalloys, comparison of different boiler designs, design criteria for HP turbine, HP turbine materials, design criteria for IP turbine, IP turbine materials, design criteria of LP turbine, LP turbine materials, LP turbine features, layout—detailed view, boiler design

- Design and Operation of Ultra Supercritical Steam Power Plants: efficiency improvements, protection of the environment, emission limits, ultra supercritical power plant design, state-of-the-art technology, plant layout, turbine-generator, high-energy piping, steam generator, water and steam cycle, thermodynamic performance, frequency control – condensate throttling, project execution

- Ultra Supercritical Steam Turbine Technology: ultra supercritical steam turbine design, cycle overview, steam turbine configuration, evaluation of ultra supercritical technology, high and intermediate pressure turbine design, section design, high-pressure steam path, intermediate pressure section, steam path design, aerodynamic design, advanced aero design, high pressure 1st stage, high pressure and intermediate pressure cooling, low pressure turbine design technology, wheel and diaphragm configuration structure, exhaust hood design, three-dimensional (3D) solid model analysis, LP inlet design, advanced seal design technology, elliptical clearance packing, variable clearance positive pressure packing, brush seals, conclusions

- Ultra Supercritical Power Plant Cycle Overview, furnace exit temperature, ash slagging, fouling and deposition, selection of the furnace exit temperature, materials of ultra supercritical pulverized fuel plants, advantages of ultra supercritical power plants

- Impact of Steam Condition on Plant Material and Operation in Ultra Supercritical Power Plants: ultra supercritical power plant steam cycle configuration, effects of steam condition on plant heat rate, effects of dissolved solids and gases, all-volatile treatment (AVT), oxygenated treatment (OT), selection of ultra supercritical steam turbines, rotors, blades, casings and valve chests, bolts, valve and nozzles, selection of ultra supercritical steam power plant boilers, furnace membrane wall operating conditions, superheater conditions, exfoliation inside superheater and reheater tubes, corrosion, weld overlay, thermal spray coatings, headers and pipes, constructability and installation considerations, metallurgy, welding considerations, codes and standards, future trends, Advanced ultra supercritical power plants

- Fuel consideration and Burner Design for Ultra Supercritical Power Plants: Fuel quality considerations, influence of coal properties on utility boiler design, impact of coal quality on operation and performance, coal heating value, moisture content, volatile matter content, ash content and composition, sulfur content, nitrogen content, ash fusibility and sintering, grindability, impact of coal quality on categories of performance, coal handling, storage, processing, and preparation, burner design, future trends in ultra supercritical power plants

- Materials for Ultra Supercritical Power Plant Boilers: classification of supercritical boilers, materials selection for ultra supercritical boilers, low-alloy ferritic steels, creep-strength enhanced ferritic steels, austenitic and advanced austenitic stainless steel, nickel-based alloys, cost of alloys and effect on material selection, furnace water walls, superheat and reheat tubing, fire-side corrosion, steam-side oxidation, water treatment, high-temperature materials, Cool Earth Innovative Energy Technology Program, Advanced Boiler Materials Program

- Advantages of Ultra Supercritical Power Plants
- Ultra Supercritical Power Plants environmental emissions
- Recent advances in Ultra Supercritical Power Plants

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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Ultra Supercritical Power Plants Boilers, Economics, Instrumentation and Control Systems, Governing Systems, Performance Monitoring, Maintenance, Emissions and Pollution Control Methods, CO₂ Capture and Storage Technology, Turbine Material and Coatings, and Generators

- Boiler Design for Ultra Supercritical Power Plants: boiler types and structures, classification on the basis of steam parameters, classification on the basis of steam-water circulation, classification on the basis of combustion method, classification on the basis of design configuration, heat transfer calculations for boilers, heat transfer mechanisms, heat transfer calculations, comparison of supercritical and subcritical boilers, water-cooled walls, superheaters and reheaters, economizers and air heaters, economizer, air heaters, conclusion and future trends
- Co-Firing Coal and Biomass Fuel in Ultra supercritical Power plants
- Economics of Ultra Supercritical Power Plants
- Ultra Supercritical Power Plant Instrumentation and Control Systems
- Ultra Supercritical Power Plant Maintenance
- Ultra Supercritical Power Station Performance Monitoring
- Ultra Supercritical Power Plant Turbine Governing Systems
- Frequently Asked Questions about Ultra Supercritical Power Plant Turbine-Generator Balancing, Vibration Analysis and Maintenance
- Features Enhancing The Reliability and Maintainability of Ultra Supercritical Power Plants
- Emissions from Ultra Supercritical Power Plants and Pollution Control Methods: emission regulations, pollutants, fluegas processing, modern pollution control techniques, sulphur oxides (SO₂), nitrogen oxides (NOₓ), control of NOₓ emissions, particulates, particulate removal, heavy metals and trace elements, the leaching of ash constituents, other pollutants, Persistent Organic Pollutants (PAH), dioxins, conclusion and future trends
- CO₂ Capture-Ready Ultra Supercritical Coal Power Plants: carbon capture and storage, and CO₂ capture-ready plants, rationales for implementing carbon capture and storage technologies in ultra-supercritical coal plants, overview of CO₂ capture technologies for power generation, drivers for CO₂ capture-ready power plants, development of the concept of CO₂ capture-ready plants, post-combustion CO₂ capture technologies and their integration in ultra supercritical plants, general principles for the design of capture-ready coal plants for post-combustion capture, steam turbine options for steam extraction retrofits, throttled LP turbine, floating IP/LP crossover pressure, elevated crossover pressure with a possible retrofit with a back-pressure turbines, an alternative option to steam extraction: additional plant retrofits, separate CHP power cycle for power matched retrofit, comparison to the ideal principles of capture-ready designs, conclusions

- Advanced Ultra Supercritical Steam Turbine Materials: design of ultra supercritical steam turbines, steam oxidation, creep resistance, rupture ductility, nickel-based alloys, creep curves of different steam turbine materials, yield strength of different steam turbine materials, temperature capabilities of nickel-based superalloys for high pressure and intermediate pressure steam turbines, composition of various high-temperature superalloys considered for advanced ultra supercritical steam turbines, advanced ultra supercritical turbine designs using nickel-based superalloys
- Advanced Steam Turbine Design, Materials, and Coatings: materials used in advanced steam turbines, design and materials used in high pressure steam turbine rotors, intermediate pressure rotors, steam turbine casings, and bolting, rotor materials – advanced processing of current alloys, nickel-base rotors, welding of udimet 720 and Inconel 617, isothermally forged nickel-base rotors, high temperature disc materials, rotor blade materials – advanced processing of current alloys, erosion resistant coatings, casing materials and large scale nickel castings, bolting – high temperatures bolt alloy, high strength pipe materials, efficiency improvement of steam turbines, characteristics of 50 and 60-inch last stage blades, fluid performance design, development of supersonic turbine blades, structural reliability design, vibration design, conclusions
- Electrical Generators used in Ultra Supercritical Power Plants: characteristics of generators used in ultra supercritical power plants, specifications for generators used in ultra supercritical power plants, cooling methods, rotor structure, stator structure, global VPI insulation technology, analysis technology, ventilation analysis, strength analysis, related equipment
- Economic and Engineering Analysis of a 700 °C Advanced Ultra Supercritical Pulverized Coal Power Plant: design criteria for the study, performance and economic results for the study, potential to improve process and economic performance, cost associated with CO₂ emissions and capture, higher efficiency decreases CO₂ capture cost, extending the study, fulfilling the ulrigen objective, impact of different coal types on thermal and economic performance, conclusion
ULTRA SUPERCritical STEAM POWER PLANTS
29 – 31 October 2019, Kuala Lumpur, Malaysia

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<tr>
<th>PER PARTICIPANT</th>
<th>2 PARTICIPANTS OR MORE</th>
<th>IN-HOUSE TRAINING</th>
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<tr>
<td>3 Day Programme</td>
<td>SGD 3,055 Per Participant</td>
<td>SGD 2,855 Per Participant</td>
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ATTENDEE DETAILS

Name .............................................................................................................. Job title .................................................................
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COMPANY DETAILS

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

PAYMENT METHODS

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