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Course Information Letter ---- B301

BOILER O&M B301

In this course we will climb inside the boiler (not literally) to better understand the how's and whys of boiler operation and maintenance. Understanding of the results of O&M decisions can improve boiler efficiency and reliability: two important variables needed to compete in today's marketplace. Proper boiler operating decisions are imperative to an efficient operating plant. Proper boiler maintenance decisions are imperative to an efficient and reliable operating plant. In this 4-day Boiler O&M class you will learn to make informed O&M decisions. Learn the benefits of various corrective actions that may be taken to repair a boiler and associated equipment. Learn more regarding O&M of the various components supporting boiler operation. Learn why a component is failing or has failed. Proper maintenance and operation can increase availability and reliability.

This 4-day course is designed for all maintenance and operations personnel involved in the daily use of steam boilers.

OBJECTIVES: At the completion of this course the participant will be able to:

1. Describe the natural circulation in a drum style boiler.
2. Describe the basic thermodynamics process that occurs in the steam generator.
3. Describe the various factors that determine proper combustion in the steam generator.
4. List the major components of a steam generator.
5. Describe the relationship of the major components of a steam generator.
6. Describe practical burner design with specific attention given to low NOx burners.
7. Describe the fundamental means for conducting efficiency testing on a steam generator.
8. List and describe a minimum of three ways one can improve steam generator efficiency.
9. Provide a basic description of the basic boiler metallurgy.
10. Given a fan characteristic curve, describe its use.
11. Describe the areas involved in a utility boiler inspection.
12. Given specific failure modes of a fossil-power plant boiler, describe the cause, how this failure might be prevented and routine repair procedures that might be applied.
13. Describe the most typical failure modes for boiler tubes.
14. Describe typical repair modes of failed boiler tubes.
15. Describe the major components of centrifugal pumps.

COURSE DATES/LOCATION/FEE

For current dates / locations / prices, please see HPC's website, www.hpcnet.com.

Boiler Operation and Maintenance

www.hpcnet.com

COURSE OUTLINE

1. **Water and Steam:** Properties of Water, Steam Tables, Water and Steam at Work
2. **Heat Transfer:** Conduction, Convection, Radiation, Using the Heat Transfer Equation
3. **Steam Generators:** Steam Generator Theory, Heat Transfer in the Boiler
4. **Component Design and Construction:** Pressure Boundary Parts, Fuel Considerations, Furnace and Waterwall, Steam Drum Internals, Superheaters, Reheaters, Desuperheaters, Economizers, Auxiliary Equipment
5. **Combustion Theory:** Fuel Analysis, Combustion Products, Combustion Calculations, Combustion Equipment
6. **Steam Generator Efficiency Testing:** Heat Loss Method, Efficiency Calculation, Input/Output Method, Air Heater Testing
7. **Steam Generator Efficiency Improvements:** Definition of Operating Efficiently, Excess Air, Operational Checks, Monitoring
8. **Basic Metallurgy:** Atomic Structure of Iron, Physical Metallurgy of Steel, Microscopic Examination, Specific Effect of Alloying Elements, Heat-Treating Practices, Mechanical Working of Steel, Methods of Hot-Working, Mechanical Properties of Steel, High Temperature Properties of Steel, Some Factors Affecting Creep, Steels Used In Boiler Construction
9. **Burners:** Practical Burner Design, Low NOx Burners
10. **Igniters:** Ignition Energy, Systems for Tangential Firing, IFM Igniter, HEA Igniter
11. **Power Plant Fans:** Forced-Draft Fans, Primary-Air Fans, Induced-Draft Fans, Gas-Recirculation Fans, How Fans Work, Types of Fans, Fan Characteristics, Fan Control, Fan Speed, Fan Selection, Fan Size Scale-Up
12. **Inspection of the Boiler**
13. **Introduction to Boilers and How to Think Out a Boiler Repair Project:** Steam and Water Flow, How are Boilers Erected and How does the Erection Process Differ from the Repair Process, What are Some of the Common Boiler Repair Problems
14. **Supplementary Information Concerning Detection, Causes, Prevention and Repair of Failures in Fossil-Power Boilers:** Hydrogen Damage, Caustic Gouging, Stress-Induced Corrosion (SIC), Long Term Overheating, Fireside Corrosion, Transition Weld Failures, Graphitization
15. **Boiler Tube Failure Modes and Possible Repairs:** Corrosion, Erosion, Superheater and Reheater Tubes, Exfoliation of External High Temperature Surfaces, Exfoliation of Internal High Temperature Surfaces
16. **Air Heaters**
17. **Regenerative Air Heaters**

FREQUENTLY ASKED QUESTIONS

- Will HPC Technical Services bring this course to our location for our personnel only? YES, call or email Stephen Parker, stparker@hpcnet.com for a price quotation.
- Will HPC Technical Services customize the presentation at our site to suit our particular needs? Yes.
- Is HPC Technical Services' textbook available for purchase as a reference document? Coming Soon
- What is the cost for HPC Technical Service to deliver this course at our location? Well, of course that can vary, but generally speaking, if you're planning on having 6+ attend, when considering your T&L, it is to your advantage to perform the course at your plant (office). You gain from the customization and price.
- Can HPC Technical Services provide "Technical Assistance" in conducting functional checkouts or troubleshooting problems? Yes we can. Call or contact Harold Parker, hparker@hpcnet.com for our rate sheets and any further information required.

WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, Boiler Operations and Maintenance. It is a valuable desktop reference in addition to being able to enhance the learning process.
2. A "Certificate of Completion" with 2.6 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

POWER PLANT OPERATOR CERTIFICATION:

This course is a requirement for Power Plant Operator Certification. Those who attend this course are automatically qualified to take HPC Technical Services' Certification Examination. This examination is offered at no additional expense to the participant. An 80% passing grade is required. The examination length will not exceed 2-hours. Those who complete this examination will receive a revised "certificate of completion" that recognizes this accomplishment along with two-copies of a "To Whom It May Concern" letter that states their accomplishment. (Two copies are provided, one for the participants' employer and one for the participants' personal file.)

Consult HPC's website, www.hpcnet.com, for detail on this certification program.

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INSTRUCTOR (S):



Dan Anderson is the primary instructor for this course. Dan started his career in the US Navy as a Boiler Technician. After his discharge Dan was a civilian instructor for the US Navy at Great Lakes Naval Training Center. While there Dan instructed Navy personnel in the four-phase steam cycle including balance of plant equipment. In 1990 Dan returned to Minnesota and received his Minnesota State Chief A Engineers license. After a few years in the position as Chief Boiler Engineer For Green Giant Co. and Maintenance Manager for Minnesota Energy, Dan went to work for Hutchinson Utilities Commission in Hutchinson, Minnesota. His position there was Operator 1. His operational responsibilities included GE LM 6000 Combined Cycle, GE Frame 5 Simple Cycle, and a GE Frame 3 Combined Cycle. He also had operations of 6 Diesel Engines for power production. Dan joined HPC Technical Services, June 2001. His main area of instruction is Gas Turbine/Combine Cycle Fundamental, Steam Turbine/Generator Fundamentals, Mechanical Maintenance Courses, and The Boiler Training. Dan currently holds a Chief A Engineers License for Minnesota, A Chief NIULPE Certificate, NIULPE Instructor and Examiners Certificate, Chief ASOPE Certificate, and is a Member of ASME.

Elrod, Dana: Mr. Elrod has near 30-years experience in operating large electrical power plant facilities. From 1979 thru 2000, MidAmerican Energy Company in Council Bluffs IA employed Dana. Positions held include that of Operations Superintendent, Shift Supervisor, Training & Safety Supervisor and Environmental Specialist. From 1974 thru 1979 Mr. Elrod was employed as an Environmental Specialist for the State of Iowa Department of Environmental Quality. Mr. Elrod holds a BS in Management from Drake University, 1985.

Hayes, Robert: Mr. Hayes instructs HPC's Balance-of-Plant O&M courses as well as our popular "Power Plant Blackout Preparedness" course. Mr. Hayes, prior to early retirement, held several positions during his long tenure at Illinois Power: (1) Results Engineer, Results Supervisor. Mr. Hayes had responsibilities, which included equipment performance testing, and rotating machinery vibration analysis and correction. (2) Supervisor Plant Operations. Mr. Hayes had responsibilities which included startup and checkout of new equipment, supervision of four operating shifts, and coal receiving and handling group. (3) Power Plant Operations Specialist. Mr. Hayes had responsibilities, which included frequent visits to all five fossil power stations, participation in control replacement projects, participation in development and implementation of clean air compliance plans, and served as an internal consultant for fossil power generation operations. He led several technical teams that identified and recommended protective system improvements to the large generating units. He conducted root cause analysis of several major equipment failures.

RECENT SATISFIED CLIENTS:

Alliant Energy, American Bituminous, Associated Electric, ATCO Electric, Austin (TX) Electric Department, BSN Medical (Mexico), Daishowa-Marubeni International, Dominion Energy, Gerber Foods, Hovensa Oil Refinery, Korea Midland Power Company, Korea Plant Services & Engineering, SaskPower, Springfield (MO) City Utilities, Thelsch Engineering, US Power Gen, US Sugar

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REGISTRATION FORM

Company: _____

Plant: _____

Address: _____

City/State/Zip: _____

Telephone: _____ FAX: _____

Course Number/Title: _____

Course Dates: ____/____/____ Thru ____/____/____

Course Location: _____ Course Fee: _____

Please enroll the following individual(s) listed below:

Student #1: _____

Student #2: _____

Taking advantage of HPC's 3-4-2 Policy: Send 3, Pay for 2 when paying in advance.

Student #3: _____

Enrolled by: _____

Date: _____

METHOD OF PAYMENT

Check to Follow: _____

Check Enclosed #: _____

MC/Visa/AMEX #: _____

Expiration Date: _____ CV Code: _____

Purchase Order #: _____

Please advise how you found out about this course initially:

Website search.

Fax Advertisement

Magazine Advertisement

Familiar with HPC

HPC Mailing

Other: _____