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Course Information Letter ---- CT300

COMBUSTION TURBINE GENERATOR FUNDAMENTALS

CT300

In today's market, Combustion Turbines are an essential component in power production. A combustion turbine is a simple, but yet a complex machine. It is simple in terms of its theory of operation. It is complex in terms its size, its risk to mis-operation, and the need to provide complex support and/or protection schemes. Combustion Turbines are used in various applications including, simple cycle peaking plants, or combined cycle operations. Understanding the fundamentals, components, and support systems is essential in safe and efficient operation. This course is intended to begin this learning process.

Topical outline includes: Thermodynamic principles as they apply to a combustion turbine, Descriptions of types of combustion turbines, Application, Major Gas Path Components, Major Auxiliary Systems, Starting Systems, Combustion Turbine Controls Overview, Generator Principles of Operation, Generator Components.

This course is intended for new combustion turbine operators, supervisors, and management and also for experienced operators that haven't had any formal training on Combustion Turbines.

OBJECTIVES:

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

1. Describe the thermodynamic principles associated with the combustion turbine.
2. Describe the basic cycles used for different types of combustion engines.
3. List the major components of any combustion turbine and describe their function.
4. Discuss the various ways in which efficiency of a combustion turbine can be changed.
5. Describe the flow through the combustion turbine including any extraction points.
6. Identify and state the function of a given auxiliary system and describe its operation.
7. Describe the effects that humidity, ambient temperature, compressor ratio, firing temperature, exhaust temperature, and exhaust pressure have on turbine performance.
8. Describe the ability to determine turbine output and heat rate.

COURSE OUTLINE

I. Introduction
II. **Thermodynamic Principles**: Energy, Energy Conversion, Heat Transfer, Combustion Theory
III. **Combustion Turbine Fundamentals**: Design Considerations, Classifications of Combustion Turbines, Characteristics of Combustion Turbines, Advanced Combustion Turbine Designs
IV. **Combustion Turbine Components**: Turbine Main Components, Combustion Section, Turbine Section, Exhaust Section, Gears and Couplings, Turbine Base and Supports, Unit Enclosures
V. **Combustion Turbine Support Systems**: Electrical System, Inlet and Exhaust System, Starting Systems, Fuel and Fuel Treatment Systems, Lubricating Oil Systems, Cooling Water/Air Systems, Water Wash Systems, Fire Protection Systems
VI. Turbine Controls Overview
VII. **Generator**: Generator Major Components, AC Power Generation, Generator Auxiliary Systems

COURSE DATES/LOCATION/FEE

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

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? Soon to be available.
- 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, CT300, Combustion Turbine Generator Fundamentals. It is a valuable desktop reference in addition to being able to enhance the learning process.
2. A "Certificate of Completion" with 1.3 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

GAS TURBINE CERTIFICATION:

There are three levels of certification (All three levels require this course):

1. Field Engineer
2. Mechanical Maintenance Technician
3. Control Room Operator

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.

RECENT SATISFIED CLIENTS: ABB, AEP, Alabama Power, American National Power, AMOCO Oil, Aquila Energies, Associated Electric Cooperative, ATCO Electric, Atlanta Group, Benton Public Utilities, Boston Edison, CalEnergy, Canada Utilities, Carolina Power & Light, Cardinal Power of Canada, Central Iowa Power, CNA Insurance, Cogentrix, Commonwealth Edison, Conmec, Cory Cogeneration, Covert Generating, Denver Energy Association, Dominion Energy, Duke Energy, Dynegy Northeast, Entergy Operations, Falcon Operating Company, Florida Natural Growers, FPL, Florida Power Corp, Foster Wheeler, Gaylord California Mill, GE Contractual Services, GE Global O&M, Gordonsville Energy, Hitachi America, Hutchinson Utilities, MidAmerican Energy, Nevada Cogeneration Association, New Central Energies, North America Energy Services, Northern Star Generation, Ocean State Power, Panda Energy, Panda Rosemary Cogen, Pasco Cogeneration, PPL, Prime Energy, Progress Energy, PSEG, PS New Mexico, Puerto Rico Power Electric Authority, Santee Cooper, Sithe Energies, South Carolina Electric & Gas, Southern Company, TECO Power Services, Tenaska, Tractebel Power, Trans Canada, Trigen Energy, University of Texas @ Austin, US Borax, UtiliCorp, Vero Beach Municipal Utilities, WE Energies, Western Farmers Electric Cooperative, Wood Group, Woodward Governor, Yuma Co-Generation.

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.

Brendan Bennett has over 20 years hands on experience in all areas of power generation as a field engineer, generator specialist, and project manager. His employment history includes General Electric, Trans Alta Utilities and Manitoba Hydro. At General Electric, he provided technical direction on the repair and overhaul of gas turbines, steam turbines and generators, including generator rewinds ranging in size of 30 to 1200 megawatts. His experience includes GE Frame 5, 6, 7 and 9 gas turbines, D-11 steam turbines, and Alstom and Hitachi generators. As a project manager at Trans Alta, he was responsible for managing capital projects for three large thermal generating stations. This included tracking costs, developing and monitoring work progress and coordination of schedule conflicts. He has also performed risk analysis and investigated equipment performance issues.

Sal Paolucci has over 28 years of, (GE frame 3, 5, 6, & 7) Gas Turbine Operation, Maintenance, Installation, Start-up, and troubleshooting Gas Turbine Controls; MK2, MK4, & MK5. 10 years of experience in Combine Cycle Plant, Outage Planning, Plant Spare parts, and Plant Performance (Heat Rate). BSME Cleveland State University, Cleveland OH. Career includes approximately 15-years as a GE field engineer servicing clientele in the USA as well as internationally. He also worked for 10-years (5 in operations and 5 in maintenance) for Mass Power, in Massachusetts. He currently resides in the Boston MA area.

HPC TECHNICAL SERVICES
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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:_____