



Course Information Letter ---- CT422

CONCEPTS OF COMBUSTION TURBINE CONTROLS CT422

"Concepts of Combustion Turbine Controls" is a course designed to provide a working knowledge of combustion turbines and their associated control and protection equipment. Although not the focus of the course, attendees will gain a solid understanding of how power is generated. Turbine controls system design concepts are the primary focus. Included in these discussions are Start Up Sequencing, Speed/Load Control, Temperature Control, Emission Controls and CT Protection. All discussions are conceptual. It is our intention that the participant understand these topics well enough (conceptually) that they can be readily applied to any combustion turbine operating unit.

Topical Outline includes: Review of Combustion Turbine Fundamentals, Fuel Flow Considerations, Start Up Sequencing, Speed/Load Control, Temperature Control, Emissions, Protective Circuits.

Recommended for Engineers and E&I Technicians.

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

1. Describe considerations for determining the combustion turbine start sequence.
2. Describe how combustion turbine controls function off-line.
3. Describe how combustion turbine controls function on-line and being responsive to grid conditions.
4. Describe how combustion turbine controls function in temperature control.
5. Describe emission concerns and differences in approach to minimize emissions.
6. Describe considerations in determining fuel flow (demand for inlet valve positions).
7. Describe operation of typical servomechanisms such as the Abex and Moog servo-valves.
8. Describe typical operational exercises.
9. Describe typical routine preventive maintenance activities.

COURSE DATES/LOCATION/FEE

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

COURSE OUTLINE

- I. **Combustion Turbine Fundamentals**
- II. **Fuel Flow:** Gas, Fuel Oil, Split Fuel Operations, Feedback, Servo Mechanisms
- III. **Start Up / Shutdown Sequence:** Validation of systems, Cranking, Fire Circuits, Speed Circuits, Shutdown
- IV. **Speed Load Control:** Speed Command, Speed Feedback, Adjustment of Fuel Flow, Load Demand, Auto Synchronizing
- V. **Temperature Control:** Definition of terms, Exhaust Temperature Setpoint, Exhaust Temperature Feedback
- VI. **Emissions:** Water Injection, Steam Injection, DLN
- VII. **Protective Circuits:** Overspeed, Over Temperature, Loss of Flame, Auxiliaries

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? No, this course book is not for sale.
- 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 perform a functional checkout and calibration of your control system during the upcoming outage OR provide troubleshooting support should it be required? 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, Concepts of Combustion Turbine Controls, as written by Harold Parker.
2. A "Certificate of Completion" with 1.3 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

COMBUSTION TURBINE I&C AND FIELD ENGINEERING MAINTENANCE 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.)

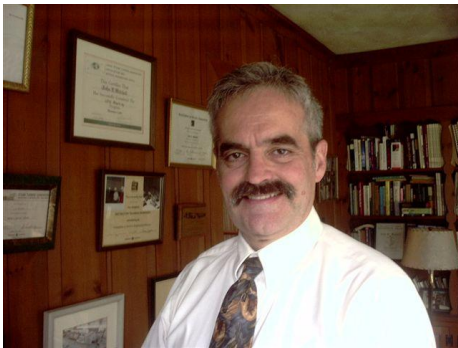
Consult HPC's website, www.hpcnet.com, for detail on this certification program.

INSTRUCTOR/CONSULTANT (S):



Harold Parker is the founder & President of H Parker & Company, Inc. Mr. Parker was the developer of the GE EHC Mk-I training program used by GE for the "advanced" training of their field engineering force. Mr. Parker has worked in the "Power Generation" industry for 36 years, 14-years with GE as a Field Engineer, Start-Up Engineer, Technical Training Specialist and Manager. In 1983 Mr. Parker resigned from GE and started a training company, Schenectady Learning Systems, in Schenectady NY, which evolved into H Parker & Company, Inc. today. During this post-GE period, Mr. Parker was briefly employed as Manager Turbine-Generator Services with General Physics (2-years) and as a Field Engineer with Mechanical Dynamics & Analysis (2-years). Mr. Parker is the primary contributor to the development of the text used in this course presentation. Mr. Parker holds a BSME ('69 from Lawrence Institute of Technology), a MBA ('81 from the State University of New York @ Albany) and is a member of ASME and ASTD.

Robert Johndrow. Bob Johndrow hired into GE as a field engineer in 1969. Since that date, Bob Johndrow has been a GE Field Engineer specializing in many disciplines including Generator Maintenance and Testing. Bob completed GE's Generator Specialist Training Program early in his career. Since then he has been involved in the commissioning of several steam turbine generators where he was responsible for the turbine controls, auxiliaries, startup sequence and the generator. Bob earned a BS in Industrial Distribution from Clarkson University in Potsdam NY and also has GE Six Sigma Green Belt Certification. Bob accepted an early retirement package late 2003 and has worked as an independent as well as being associated with HPC Technical Services since then. He resides in Connecticut.



John Mitchell. John Mitchell is a multi-talented leader with over 33 years management, engineering, installation and maintenance experience in thermoelectric power plants. He is especially an expert in steam turbines, generators and their controls. Prior to June 2003 (when he accepted an early retirement package from GE), John was a Customer Training Specialist with the GE International Department. Other past responsibilities included being Manager, Engineering Services, Senior Application Engineer, Senior Service Engineer, Lead Training Specialist, Program Support Engineer, Instructor Technical Training, and Field Engineer. All of this on operation & maintenance of steam turbine generator hardware and controls. John resides in Schenectady NY.

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 #: _____

HOW DID YOU LEARN OF THIS COURSE?

Attended HPC courses before
 Received a fax
 Received an email
 Received mailing advertisement
 Internet search
 Other: _____