500 Tallevast Road • Suite 101
Sarasota, FL 34243 USA
Tel: 941-747-7733 • Fax: 941-746-5374
www.hpcnet.com

Course Information Letter ---- CT316

GAS TURBINE MK-V FOR OPERATORS

CT316

The course combines good overall operational practices with specifics of the Mk-V control system. The Mk-V portion of the course is adjusted to specifically deal with level required by Operations personnel. To operate a machine safely and for the long-term, we need to have a good understanding of the basic theory, we need to know how different components might be placed at risk, we need to understand how the Mk-V control system "thinks", how the Mk-V system files are utilized to an operators advantage, we need to know how and when the protective systems should react, and we need to know the importance of proper operation of the auxiliary systems. With respect to the protective systems, we need to understand the symptoms of some of the common problems, what actions the operator should (or should not) take, what actions protective systems should take, and when. This course discusses all of this in a generic fashion (that is not necessary specific to any given machine). A good big-picture is required to become a "skilled operator" and this course takes us down that path.

A **topical outline** includes: Review of Gas Turbine Theory, Review of Gas Turbine Construction & Operating Principles, Intoduction to Mk-V Hardware, Documentation, How to Read Logic Diagrams, Alarm Drops, Auxiliary Systems, Start Up Sequencing, Speed Control, Temperature Control, NOx, Servo Valve Drive Systems, Overspeed / Over Temperature, Protective Circuits, Abnormal Conditions and Response.

COURSE DATES/LOCATION/FEE

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

WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, Gas Turbine Mk-V for Operators, as written by Harold Parker. It is a valuable desktop reference in addition to being able to enhance the learning process.
2. A "Certificate of Completion" with 2.9 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

GAS TURBINE 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.

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

1. Describe the relationship of the various turbine components and how they may be at risk during operations.
2. Describe the different fuel systems used in gas turbine operations.
3. Identify and describe the purpose of major hardware devices found in the Mk-V system.
4. Demonstrate the ability to use that Mk-V Documentation that is pertinent to the operator.
5. Demonstrate the ability to navigate the print/file system to trace an alarm drop to the device initiating that alarm.
6. For each of the gas turbine auxiliary systems (cooling & sealing air, lube oil systems, fuel forwarding, control and hydraulic oil) describe the systems' purpose, normal operations, and abnormal conditions.
7. Given a gas turbine control system block diagram, sequence the turbine through a start up, load changes, shutdown, and emergency conditions.
8. Demonstrate the ability to navigate the control sequence program sufficiently to trace an alarm drop to the initiating algroithym.
9. Given an alarm, describe how the unit may be at risk.
10. Given an alarm, describe what are the most proper actions to take.

COURSE OUTLINE

Day One

Review of Gas Turbine Theory

Review of Gas Turbine Construction & Operating Principles: Air Inlet Guide Vane & Casing, Compressor Stator, Compressor Rotor, Combustion Section, Turbine Stator, Turbine Rotor, Exhaust Section, Bearings

Day Two

Mk-V Hardware: Primary Operating Interface, BOI, Control Panel Configurations, Overview of Networks
Mk-V Documentation: Control Specs, Internal Power, Control Sequence Program (CSP), Inputs/Outputs,
Understanding the CSP: Signal Names, Logic, And/Or, Math Functions, Comparators
Tracing an Alarm Drop: Alarm Drop Number, CSP Cross Reference, CSP, Field Device

Day Three

Auxiliary Systems, Schematic Piping Diagrams, Device Summary, Lube Oil and Hydraulic Supply, Trip Oil and Control Oil, Cooling and Sealing Air, Cooling Water
Start Up Sequencing: Overview, CSP Block Diagram, Alarms
Speed Control: Overview, CSP Block Diagram, Alarms

Day Four

Temperature Control: Overview, CSP Block Diagram, Alarms, Combustion Monitor
NOx: Overview, CSP Block Diagram, Alarms
Control Valve Positioning: Servo Mechanisms, Gas Control Valve, Liquid Control Valve, Fuel Splitter, and DLN Splitter; Function, CSP Block Diagram, Alarms
Protective Systems: L4, Overspeed Trip, Emergency Overspeed Trip, Overtemperature Trip, Vibration, 20FG/20FL

Day Five

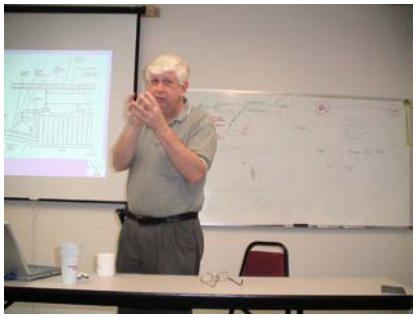
Abnormal Conditions and Response: Review of Alarm Functions and Discussion of Miscellaneous Alarms (those not covered in materials above)
Certification Examination for those who are interested.

RECENT CLIENTS: Albian Sands Energy, ATCO Electric, Cory Cogeneration, Florida Power Corporation, Progress Energy, and SaskPower International

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? Yes. $189 + S&H.
- 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.

INSTRUCTOR (S):



HAROLD PARKER is the founder & President of H Parker & Company, Inc. 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, ASTD and IEEE. He resides in Bradenton FL.

BOB JOHNDROW. Bob Johndrow hired into GE as a field engineer on the same day as HPC's founder, Harold Parker. That was 36-syears ago. 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 combined cycle plants 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. Bob resides near Hartford CT.

BILL LYNN. Bill has 35+ years experience, almost all on gas turbine generators and the control systems. Bill "cut his teeth" on the Fuel Regulator Controls and the Mk-I system. Bill continued to develop experience on the Mk-II, -IV, -V, and the –VI systems. Installation, calibration, control checkout, application engineering, troubleshooting, and problem resolution are Bill's expertise. He worked for the GE international department, GE's Detroit District Office, and later the Gas Turbine Department. Bill accepted an early retirement about some years ago and has since worked as an independent as well as with HPC Technical Services. Bill resides in the Fort Pierce FL area.

HPC TECHNICAL SERVICES
500 Tallevast Road, Suite 101, Sarasota, FL 34243
Telephone: 941-747-7733 .... FAX: 941-746-5374
Website: www.hpcnet.com

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: _____ Email: _____

Student #2: _____ Email: _____

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

Student #3: _____ Email: _____

ENROLLED BY: _____Email: _____

Date: _____

METHOD OF PAYMENT

☐ Check to Follow:_____
☐ Check Enclosed #: _____
☐ MC/Visa/AMEX #:_____
Expiration Date: _____ CV Code: _____
Purchase Order #:_____

How did you find out about this course initially?

- o Website search
- o Fax advertisement
- o Magazine advertisement
- o Familiar with HPC
- o HPC mailing
- o Other:_____