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Course Information Letter ---- CT516

(GE) MK-V GAS TURBINE CONTROLS

CT516

This course targets the need for technicians/engineers to operate, maintain, calibrate and troubleshoot control systems such that availability and reliability can be maximized. This is accomplished by thoroughly understanding concepts of gas turbine control systems and how to use maintenance screens to quickly determine problems. We begin by studying Mk-V hardware; proceed to understanding Mk-V documentation, then the development of control signals. Throughout the presentation, case studies are to enhance understanding of the concepts instructed. On the GE Mk-V gas turbine controls we cannot emphasize enough, the importance of proper use of documentation.

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

1. Demonstrate the ability to use OEM provided documentation that will include the Control Specifications, Control Sequence Program, I/O Configuration, CSP Cross Reference, Alarm Drop List, Application Manual, and P&IDs.
2. Demonstrate the understanding of the Mk-V hardware components, how they are accessed, and how they communicate.
3. Demonstrate the ability to troubleshoot an equipment alarm, given an Alarm Drop Number.
4. Demonstrate the ability to interpret the more routine diagnostic alarms and recognize appropriate actions.
5. Demonstrate the ability to follow the major "control signal path" through a Control Sequence Program.
6. Demonstrate the ability to trace the derivation of a command signal to the servomechanisms.
7. Demonstrate the knowledge necessary to calibrate turbine valve mechanisms.
8. Demonstrate the ability (or knowledge -- based upon equipment availability) to more efficiently use the Mk-V <I>/<HMI> screens for evaluating/calibrating systems.
9. Demonstrate the knowledge (or ability -- based upon equipment availability) to force logic to facilitate calibration.
10. Given plant drawings, trace a signal to/from a field device through appropriate terminal boards, through circuit boards, to a digital "signal name".
11. Demonstrate the ability to follow signal flow to/from the <P> core to trip/reset the machine.
12. Describe differences between a <Q> trip and a <P> trip.
13. Demonstrate an understanding of on-line and off-line test sequences.

COURSE OUTLINE

Monday

Introduction
Mk-V Hardware Familiarization
Operator Interface: <I> or <HMI>, <BOI>

Tuesday

Documentation
Big Block Language
FSR_SU/_ACC/_SD: Description, Algorithm, Simulation, Calibration, and Troubleshooting

Wednesday

FSRN: Function, Algorithm, Simulation, Alarms/Trips, Calibration, and Troubleshooting
FSRT: Function, Algorithm, Simulation, Alarms/Trips, Combustion Monitor, Calibration, and Troubleshooting

Thursday

Fuel Control: Servo Mechanisms, Gas Control Valve, Liquid Control Valve, Fuel Splitter, and DLN Splitter; Function, Algorithms, Calibration, and Troubleshooting
Emissions Control: Water Injection, Dry Low NOx, Calibration, and Troubleshooting
Variable Inlet Guide Vane: Function, Algorithm, Alarms/Trips, Combustion Monitor, Calibration, and Troubleshooting

Friday

Protective Circuits: L4, Overspeed Trip, Emergency Overspeed Trip, Overtemperature Trip, Vibration, 20FG/20FL (including Circuit cards), Simulation, and Troubleshooting

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? Yes. $195 + 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.

RECENT SATISFIED CLIENTS:

Anchorage Municipal Power & Light, ATCO Electric, Cory Cogeneration, Doosan Heavy Industries, Enron, Entegra Power, Florida Power Corporation, Great River Energy, Korea East-West Power, Korea Plant Services & Engineering, Korea Western Electric Company, MidAmerican Energy, Mirant Corporation, Northern Star Generation, Phosphate Corporation of Saskatchewan, Progress Energy**, Reliant Energy, SaskPower International, Texas Independent Energy, Valero Refinery, Vectren.

WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, (GE) Mk-V Gas Turbine Controls, a $195 value, as written by Harold Parker. It is a valuable desktop reference in addition to being able to enhance the learning process. (This valuable text is available for purchase if you cannot attend – US$195).
2. A "Certificate of Completion" with 2.9 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

GAS TURBINE I&C CERTIFICATION:

There are two levels of certification (Both levels require this course):

1. Engineer
2. I&C Technician

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 (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, along with Stephen Parker, are the primary contributors 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.

Duane Jelly holds a BS in Marine Engineering, and is an ex-GE Service Engineer (1999-2006) who was responsible for gas and steam turbine control system installation, calibration and troubleshooting. These systems included the GE Mk-III+, Mk-IV, Mk-V and Mk-VI systems. He was involved in commissioning gas and steam turbines, involved in gas turbine liquid fuel system conversions, and dry low NOx (DLN) tuning on the DLN-1, -2 and -2.6 versions.

Bill Lynn 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 4-years ago and has worked as an independent as well as with HPC Technical Services. Bill resides in the Fort Pierce FL area.

Jorge Morel holds a Bachelor Science – Electrical Engineering, and is an ex-GE Service Engineer (1976-2000) who specialized in advising and resolving engineering issues in the electrical generation industry, mainly in the commissioning and startup of gas turbines and steam turbines. While employed by GE, Mr. Morel was a recognized specialist on the Mk-V turbine control systems. He been involved in the design and maintenance of these Mk-V control systems as well as Bently-Nevada, Woodward, and Honeywell systems. Since departing GE in 2000, Mr. Morel has worked as an independent providing technical support in troubleshooting control system related problems, as a project manager for new installations and outages, and has provided training services as needed. Jorge speaks and writes proficiently in Spanish and has capability if Italian, French, and German.

Robert Johndrow has 35+ years experience as a Field Engineer working on steam turbine generators. His experience includes steam turbine generator maintenance and testing, as well as considerable work on the steam turbine controls. He has worked on Mk-II, Mk-III, Mk-III+, Mk-IV, Mk-V and Mk-VI units as well as some of the Woodward controls. 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 Rhode Island.

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
- ☐ Internet Search
- ☐ Received mailing
- ☐ Other: _____