



Course Information Letter ---- TG507

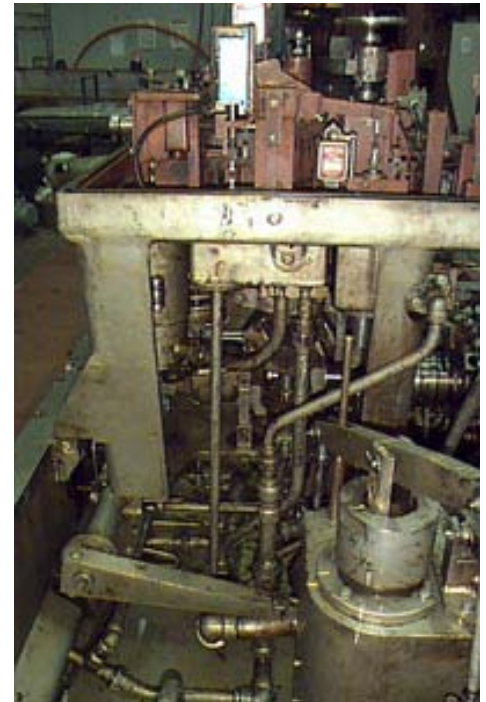
(GE) STEAM TURBINE MECHANICAL HYDRAULIC CONTROLS TG507

Note: Course is applicable to GE units as well as non-USA manufacturers (Hitachi) of GE designed steam turbines with mechanical hydraulic controls.

The Mechanical Hydraulic Control System supplied with GE Steam Turbines has many hundreds of thousands of reliable operating hours. It has been a very effective means of controlling steam turbine speed and load. It has provided years of trouble free operation and will continue to provide reliable service, if it is properly adjusted and maintained. If not maintained properly, it can be the leading cause of forced outages for the steam turbine. This one-week course was developed to provide the attendee with a thorough understanding of the design, operation, and maintenance of the GE MHC System. Steam turbine-generator facility supervisors, mechanics, engineers, and all other plant personnel who are concerned with proper operation and maintenance of the GE MHC System should attend.

- "Great Class. The class met my expectations, gave me a much better understanding and working knowledge." Aug'02.
- "Instructor was excellent. Course was very smooth and paced appropriately." Aug'02.
- "Helped with better understanding what was going on with this system." Aug'02.
- "Instructor was knowledgeable about factory and field conditions." Sep'03.
- "This training is exactly what TGS had in mind when we identified the knowledge deficiency. Experience along with this training will improve our performance on U-1 turbine controls and lower our almost total dependency on the OEM for MHC work. Goal was to get enough knowledge to supervise the OEM and know why we are doing the things in the calibration procedure." Sep'03.

Typical Topics: System Overview, MHC Amplifiers and Related Components, Oil System, Overview of Steam Turbine Controls, Speed/Load Control, Reheat Controls, Pressure Control (includes BWR and/or automatic extraction, depending upon participants), Protective and Overspeed Systems, Lever Diagrams and Setting Instructions, Troubleshooting.



RECENTLY SATISFIED CLIENTS:

Alabama Power, Alstom Power, AmerenUE, AmerGen (Oyster Creek Nuclear Station), ATCO Electric (Battle River), Carolina Power & Light, Commonwealth Edison, Constellation Nuclear (9 Mile Point), Consumers Energy, Detroit Edison, Dominion Resources, Dynegy Energy, Electric Energy (Joppa Station), Entergy Arkansas (Lake Catherine Plant), Entergy Nuclear Generation (Pilgrim Nuclear Station), Exelon Corp (Oyster Creek Nuclear Plant), Florida Power Corporation, Florida Power & Light, Ford Motor Company, Georgia Power, Great River Energy, GPU/Nuclear, Mechanical Dynamics & Analysis, Metropolitan Edison, MidAmerican Energy, Minnkota Power, Mirant Corporation, New York State Electric & Gas, Niagara Mohawk Power, NRG Energy, Nuclear Management Corporation (Monticello Nuclear Plant), Nuclenor (Spain), Ontario Hydro (Lennox and Lambton Stations), PacifiCorp, Potomac Electric Power, PP&L, PSI Energy, Progress Energy, PSE&G, Reliant Energy (Portland and Shawville Stations), Renewal Parts Maintenance, Salt River Project, Tennessee Valley Authority (Kingston and Paradise Plants), United Power Associates, Vermont Yankee Nuclear Power, Westinghouse Electric.

COURSE DATES/LOCATION/FEE

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

OBJECTIVES:

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

1. Describe the purpose or function of the entire Hydraulic Control System and the features it must have to safely control turbine operation.
2. Name the major components and sub-systems.
3. Describe the purpose of each major component and /or sub-system.
4. Describe how each major component functions within the control system and/or sub-system.
5. Name and describe the kinds of tools, instructions, drawings, etc. that are required to maintain a particular system.
6. Describe the general methods and techniques for inspecting, testing, adjusting, and troubleshooting the hydraulic control systems.
7. Participants will be able to demonstrate the knowledge needed to evaluate the OEM Line-Up procedures to evaluate and recalibrate the various systems.

COURSE OUTLINE

Monday

MHC System Overview: Control Fundamentals including the Control Loop, Low Value Gate, and Fail Safe Operation. Steam Turbine MHC System including System Function/ Description and Design Considerations

MHC System Components: MHC Amplifiers -- Function/Description and Design Considerations. Component Details including Single Acting Integrator, Double Acting Relay, Pilot Valves Principles, Pilot Valve Over-travel, Pilot Valve Balancing, Fully Balanced Double-Acting Pilot Valves, Bleeding Pilot Valve Limiters and Stops, including Mechanical Stops, Flow Limiters and Dashpots. Trip-Latch Mechanism, Function Generator

Tuesday

Oil Systems: System Function/ Description and Design Considerations, Major Components or Sub-systems to include Booster Pump, Oil Pumps, Oil Coolers, Relief Valve, Oil Reservoir, Vapor Extractor, Bearing Header System Operations (On Turning Gear, At Speed and Shutdown)

Overview of Steam Turbine Controls

Speed/Load Control: System Function/Description and Design Considerations, Operating Speed Control, Speed Governor and Speed Relay (Design Clearance and Regulation), CV Positioning (Valves on Shell), CV Positioning (Separate Valve Chest), Speed/Load Changer, Load Limit Control, Stop Valve Bypass. Discussions include upgrade considerations.

Wednesday

Reheat Turbine Controls: System Function/Description and Design Considerations, First Line of Defense, Second Line of Defense, Separate Intercept Valves, Shell Mounted Intercept Valves, Separate Reheat Stop Valves, Combined Reheat Valves, Two Speed Governing Systems including Pre-Emergency Governor and Regulation, Single Speed Governing System, Dashpot Breakdown Link, Intercept Valve Transmittal/Receiver Relays, Trip Anticipator

BWR Turbine Controls: Mechanical Pressure Regulator, Electric Pressure Regulator, and Bypass Valves

Thursday

Overspeed Protection and Emergency Trip System: System Function/Description, Overspeed Control, Normal Overspeed Operation, Emergency Overspeed, Second Line of Defense, Stop Valves, Emergency Trip Valves, Emergency Governor, Emergency Governor Control, Trip Valves, Manual and Solenoid Trip, Sequential Tripping, Trip Testing System, Vacuum Trip

Lever Diagrams and Setting Instructions

Friday

Adjustments and Problem Solving: Keeping Out of Control Trouble, Control System Trouble-Shooting, Safety Rules of MHC Work, Basic Rules for Adjusting

Certification Examination

WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, (GE) MHC Steam Turbine Controls, a \$195 value, as written by Harold Parker. This text contains a significant number of equipment photographs, graphics and data tables. 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.

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 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.
- Can HPC Technical Services provide recommendations and support upgrade considerations? Yes. Call or contact Harold Parker, hparker@hpcnet.com, for discussion.

STEAM TURBINE I&C 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 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. His work on the steam turbine Mechanical Hydraulic Controls included work on nuclear (BWR) units, fossil applications, and industrial 3-arm governors. 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.

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Robert Doughty. Mr. Doughty has more than 30 years of experience in start up, maintenance and operation of both large and small turbine-generators. Bob started his career as a power plant instrumentation technician while he completed his BS degree in Engineering Technology (1976) at the University of Houston. He has worked as a start up and field engineer for one of the major turbine-generator OEM's and as a consulting engineer, supporting the initial operation of two nuclear fueled power plants. His most recent position (1999) as the President of Turbine Services, Inc., has allowed him to continue to provide on site technical direction, start up and controls adjustments for several major turbine inspections in the range of 35 to 835 MW. He is experienced in electro-hydraulic and mechanical governor control systems and turbine valve and control system up-grades. Bob is a member of ASME (18 years) and has worked closely with HPC on multiple projects, training as well as field service.



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.

Joe Byrd. Joseph Byrd has over 29 years of experience in the power industry, concentrating in the area of turbine-generator controls and operations. He graduated from North Carolina State University in December 1978 with BS in Mechanical Engineering. He began his career in January 1979 as a Field Engineer, and subsequently a Start-Up Engineer with GE and was lead Start-up Engineer on five turbine-generator installations. He left GE in 1986 to consult directly to utilities on control systems calibration and maintenance with MD&A. In June 2008, he ended his relationship with MD&A and became available to HPC to instruct. Joe resides near Raleigh NC. His primary areas of expertise are GE manufactured Large Steam and Mechanical Drive Turbine MHC control systems as well as EHC systems.

HPC TECHNICAL SERVICES
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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: _____
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
- Magazine advertisement
- Internet search
- Other: _____