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Course Information Letter ---- TG525

EXTRACTION STEAM TURBINE GENERATOR MAINTENANCE

TG525

HPC Technical Services' course on Extraction Steam Turbine Generator Maintenance is a more specific version of one of the most popular courses we offer, TG301. The course targets those individuals who have a need to better understand the maintenance process. This includes engineers (who have not yet received formal training on this topic), experienced-mechanics, mechanical maintenance foremen, planners and management.

Today, steam turbine generator outages are subject to much debate. Much of this debate is centered over the desire to shorten the outage length. Here at HPC we understand and appreciate this goal. The accomplishment of this goal should not be, however, at the sacrifice of properly inspecting and evaluating components that are critical to the return to surface and achieving a long run cycle. Over the past couple years the most commonly received comment is, "I wish I had taken this course 10-years ago." Well, the truth is, our course wasn't as near as good as it is now, 10-years ago. About 3-years ago, when we reorganized our instructor staff, this course underwent a long overdue revision. This revision was significant, and you can benefit!

Topical Outline includes: Planning, Scheduling and Decision Making; Maintenance of Shells, Casings & Rotors; Journal and Thrust Bearings; Couplings, SteamValves; Generator Maintenance; Steam Path Alignment; and Job Wrap Up.

OBJECTIVES: Upon completion of the course the participants should be able to:

1. List steam turbine-generator operational and safety issues that typically cause the scheduling of a maintenance outage.
2. List the considerations that must be included when developing an outage plan or schedule.
3. Describe the major considerations when making a replace/reuse/repair decision.
4. Describe the procedures necessary for the safe and effective disassembly and reassembly of steam turbine generator components.
5. Describe the purpose and operation of the major steam valves.
6. Describe the disassembly and reassembly of the major steam valves.
7. List the five (5) most common causes of steam path damage and their possible affects upon future operation.
8. Describe three (3) common causes steam path defects and their impact upon turbine efficiency and reliability.
9. Describe the type and purpose of clearance and alignment measurements commonly taken during the disassembly and reassembly of a steam turbine generator.
10. Describe the measuring instruments used to determine steam turbine generator component clearances.
11. List and describe the various non-destructive examinations performed during disassembly of the steam turbine generator.
12. Describe the common procedures for cleaning and inspecting steam turbine generator components.
13. Describe the criteria used to evaluate steam turbine generator defects.
14. Describe the common repair methods for repair of steam turbine components.
15. Describe the purpose of conducting a steam path audit, and how that audit would be accomplished.
16. Describe the common types and operation of journal and thrust bearings.
17. Describe the common causes of bearing damage.
18. Describe the measurements required to determine oil clearances.
19. Describe common bearing inspection and repair procedures.
20. Describe the considerations to be taken into account when evaluating alignment of steam turbine generator components.
21. Describe the methods used to properly align steam turbine generator components.
22. Demonstrate the ability to perform the necessary calculations to align steam turbine generator components.
23. List and briefly describe the electrical tests often performed on generator components.
24. State the purpose of each electrical test listed.
25. Describe the proper disassembly, inspection and reassembly of a generator hydrogen seal.

COURSE SYNOPSIS

Monday

Planning, Scheduling and Decision Making: This presentation is intended to provide participants with an understanding of those major items that must be considered PRIOR to commencing a scheduled turbine-generator outage. Discussion will also include those items we need to consider when making repair/replace/reuse decisions.

Turbine Shells, Casings & Rotors: Two hours into the course and we're into the meat! This lecture is intended to prepare the participant to safely and efficiently disassemble/reassemble major turbine components, as well as to improve inspection/repair techniques, communications on equipment, and make better replace/repair/reuse decisions. Presentations include specific discussions on the different types of distress typically found on these components.

Tuesday

Turbine Shells, Casings & Rotors continues for ½ day.

Journal & Thrust Bearings: Learn the different types of bearings and their applications, disassembly/reassembly procedures, inspection techniques, and typical types of distress as well as causes.

Couplings: Learn what types of couplings are used on T-G sets, how torque is transferred, how to properly disassemble/reassemble, how to inspect, what measurements to take, and what they mean.

Wednesday

Steam Valve Maintenance: Learn the purpose of the various steam turbine valves, how to properly disassemble/reassemble, how to inspect, what are the typical types of distress, what measurements to take, and what they mean.

Generator Maintenance: Learn how a large AC generator is constructed, how to disassemble major components, what are the typical types of distress, how to clean, routine repair, and why generator inspection/testing is so important. This presentation also includes an introduction to the various electrical test techniques.

Thursday

Alignment: Learn how to properly take clearance/alignment and how to evaluate. Discussions include how to calculate and make moves for stationary equipment such as diaphragms and inner shells. Discussions also include how to take coupling rim/face readings, how to calculate moves to correct for coupling misalignment, and how to calculate and make moves to bearings to accomplish alignment objectives.

Friday

Alignment: Continued

Job Wrap-Up: Learn what kind of data should be recorded following the outage, and what checks to make as we prepare to return the equipment to service.

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. This significant textbook is available for $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 the planning and implementation of our outages? 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, Extraction Steam Turbine Generator Maintenance, a $195 value, as written by Harold Parker, with technical support by Doug Lemmo of Power Generation Consulting Services. 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.

STEAM TURBINE MAINTENANCE CERTIFICATION:

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

1. Engineer
2. Mechanical 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.

SATISFIED CLIENTS: American Crystal Sugar, Amoco Oil, Boralax-Stratton Energy, Calpine Corporation, Cargill Fertilizer, Crawsfordsville Electric, Light & Power, Daishowa-Marubeni International LTD, Dartmouth College, Equistar Chemicals, Erving Paper Mills, Fort James Marathon LTD, General Chemical, Irving Pulp & Paper, Mead Paper Company, OxyChem, Pinetree Power Fitchburg, Port Townsend Paper, Sherwin-Alumina, Suncor, Syncrude, US Air Force, US Sugar, Valero Aruba Refinery, Waste-Management Energy, Weldwood of Canada, Wheelabrator Energy Systems, Willamette Industries.

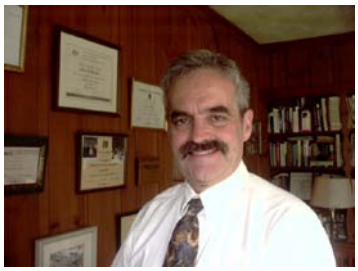
INSTRUCTOR (S):

Most likely the assigned instructor will be one of the following (although HPC has worked with a couple others in this subject area):

Ray Militello. Mr. Militello has approximately 40-years experience maintaining steam turbine generator equipment. He has worked as a Field Representative for GE Installation & Service Department as well as a Turbine Repair Specialist for GE Apparatus Repair Division. Additionally, Mr. Militello was employed as a Supervisor - Maintenance and Maintenance Planning with Southern California Edison Company. Ray also worked as Manager, Maintenance Training Services with HPC Technical Services for 4-years before joining the Elliot Company as a service shop manager. For the last four years, Mr. Militello has been performing independent contractor work as a consultant, technical writer, and maintenance training instructor for the utility industry.

Douglas Lemmo, PE. Mr. Lemmo has 35 years experience in the power generation industry, 31 of them with GE. Within GE he was initially employed as a field engineer (1971-1976). Here he was responsible for the installation and startup of a number of large and medium steam turbine generators and the feed pump turbines. In addition to this installation work, Mr. Lemmo also performed maintenance service on a variety of nuclear, fossil and marine turbine units. After leaving the field, Mr. Lemmo taught in GE's Field Engineering Development Center. Here his specialty was steam turbine generators, installation, alignment and maintenance. After a couple years instructing, he accepted a position selling maintenance and repair services. In 1982, Mr. Lemmo was the Project Manager for a Waste-to-Energy site. Later projects included a modernization of a hydroelectric facility and the management of the installation of a few combined cycle sites. In 2002, Doug left GE and founded Power Generation Consulting Services, which focuses primarily on the operation, maintenance and repair of steam turbine generators.

Art Hinch, P.E. Mr. Hinch as worked in the Power Generation industry for 30+ years. During the 1974-1980 period, Mr. Hinch was employed by GE and was responsible for the installation of multiple large steam turbine generators (fossil and nuclear) and for multiple steam and gas turbine generator outages. To 1992 Mr. Hinch worked as an independent consultant in the south and southwestern regions. During this time frame he worked many turbine-generator outages on GE, Westinghouse, and Siemens units. In addition he worked the start up of a 1300-MW turbine generator unit. In 1992 Art signed on with Arkansas Nuclear One as a senior engineer in the turbine group where he worked primarily in the planning and implementing of turbine generator outages (GE and Westinghouse units). In 2003, Art accepted an early retirement package and has again functioned as an independent engineer, an associate of HPC Technical Services. In this capacity Art has worked multiple steam turbine generator outages on a variety of manufacturers as well as being primary instructor on a number of courses that HPC offers.



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.

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. He also was the field-engineering supervisor with overall responsibility for construction testing, initial start up and operations of a 600 MW coal fired generating plant. Later, as an employee of one of the larger independent turbine-generator service corporations, he worked as a start up and maintenance engineer on turbine-generators of all sizes from nearly all the major manufacturers. 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.

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?

- ☐ Familiar with HPC course offerings
- ☐ Fellow employee
- ☐ Received a fax
- ☐ Received an email
- ☐ Internet search
- ☐ Other: _____