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Course Information Letter ---- CT521

(GE FRAME 7) GAS TURBINE MAINTENANCE

CT521

This 4- day course was developed to improve the effectiveness of maintenance activities associated with GE Frame 7 gas turbines. First we need to learn to properly identify all the major components and systems. An overview of the identification of this equipment is offered in advance of the more detailed lectures to follow. Next, we need to learn to better plan and implement gas turbine maintenance outages. Planning, safety, procedures and considerations regarding replace/reuse/repair decision-making are very important topics covered. We examine the most common causes of gas path damage and the impact upon efficiency, reliability and availability. Related topics include clearance data taking, NDE, bearing inspections, and alignment issues. Gas turbine operation is discussed from the perspective of auxiliary systems and how operating factors may impact maintenance intervals.

A topical outline includes: Review of CT Fundamentals, Frame 7 Construction and Operating Principles, Auxiliary Systems, Controls Overview, Maintenance Preparation and Planning, Combustion Section Inspection, Turbine Inspection, Major Inspection and Alignment.

This course has been specifically designed for plant personnel who are involved in safely and effectively operating and maintaining of these GE Frame 7 gas turbines.

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

1. Describe the major components and systems associated with MS7000 gas turbines.
2. List gas turbine operational and safety issues that typically cause the scheduling of a maintenance outage.
3. Describe differences between a hot gas path inspection, turbine inspection, and major inspection.
4. List the considerations that must be included when developing an outage plan or schedule.
5. Describe the major considerations when making a replace/reuse/repair decision.
6. Describe the Frame 7 support systems and requirements for operation.
7. Describe the procedures necessary for the safe and effective disassembly and reassembly of gas turbine components.
8. Describe the disassembly and reassembly of the major fuel valves.
9. List the most common causes of gas path damage and their possible affects upon future operation.
10. Describe most common causes gas path defects and their impact upon turbine efficiency and reliability.
11. Describe the type and purpose of clearance and alignment measurements commonly taken during the disassembly and reassembly of a gas turbine unit.
12. Describe the measuring instruments used to determine gas turbine component clearances.
13. List and describe the various non-destructive examinations performed during disassembly of the gas turbine.
14. Describe the common procedures for cleaning and inspecting gas turbine components.
15. Describe the criteria used to evaluate gas turbine component defects.
16. Describe the common repair methods for repair of gas turbine components.
17. Describe the common types and operation of journal and thrust bearings.
18. Describe the common causes of bearing damage.
19. Describe the measurements required to determine oil clearances.
20. Describe common bearing inspection and repair procedures.
21. Describe the considerations to be taken into account when evaluating alignment of gas turbine components.
22. Describe the methods used to properly align gas turbine generator components.

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? This text is not yet available for purchase.
- 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 outage planning, implementation or troubleshooting? Yes we can. Call or contact Harold Parker, hparker@hpcnet.com for our rate sheets and any further information required.

COURSE OUTLINE

I. Gas Turbine Fundamental Review
II. MS7000 Gas Turbine Construction & Operating Principles
- A. Turbine Function
- B. Component Description

III. Turbine Auxiliary Systems
- A. Lube Oil System
- B. Hydraulic Supply
- C. Cooling and Sealing Air System
- D. Fuel Gas System
- E. Fuel Oil System
- F. Fuel Forwarding System
- G. NOx Control System
- H. Atomizing Air System
- I. Inlet Guide Vane System
- J. Compressor Cleaning System
- K. Inlet System
- L. Starting System
- M. Protection System

IV. Controls & Operation Overview
- A. Control Philosophy
- B. Speed / Load Control
- C. Temperature Control
- D. NOx
- E. Alarm & Protection

V. Maintenance Preparation & Planning
- A. Periodic Inspections
- B. Running Inspections
- C. Combustion Section Inspection
- D. Turbine Inspection
- E. Major Inspection
- F. Documentation
- G. Scheduling

VI. Combustion Section Inspection
- A. Accessibility
- B. Parts Identification
- C. Ignition and Flame Detection
- D. Combustion Components
- E. Borescope Inspection
- F. Reassembly

VII. Turbine Inspection
- A. Accessibility
- B. Turbine Shell Disassembly
- C. Nozzle Disassembly
- D. Inspection
- E. Reassembly

VIII. Major Inspection
- A. Accessibility
- B. Disassembly
- C. Bearings
- D. Rotor
- E. Compressor Stator
- F. Reassembly

IX. Alignment
- A. Readings
- B. Procedure

GAS TURBINE 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 HPC gas turbine certification program.

WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, (GE Frame 7) Gas Turbine Operations & Maintenance.
2. A "Certificate of Completion" with 2.3 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

ASSOCIATE INSTRUCTOR(S):

Eldon Bearden Mr. Bearden has 21 years experience in the power generation industry, 10 of them with GE. He started his career as a GE field engineer providing technical services for installations and maintenance (1976-1981 and 2000-2004). Here he was responsible for the installation and startup of a number of large steam turbine-generators and frame 7 gas turbines as well. In addition to the installation work, he also performed maintenance service on a variety of fossil, nuclear and combined cycle sites.

Brendan Bennett has over 20 years hands on experience in all areas of power generation as a field engineer, generator specialist, and project manager. His employment history includes General Electric, Trans Alta Utilities and Manitoba Hydro. At General Electric, he provided technical direction on the repair and overhaul of gas turbines, steam turbines and generators, including generator rewinds ranging in size of 30 to 1200 megawatts. His experience includes GE Frame 5, 6, 7 and 9 gas turbines, D-11 steam turbines, and Alstom and Hitachi generators. As a project manager at Trans Alta, he was responsible for managing capital projects for three large thermal generating stations. This included tracking costs, developing and monitoring work progress and coordination of schedule conflicts. He has also performed risk analysis and investigated equipment performance issues.

Len Berube is a power technology engineer with diverse field experience in power plant application, construction, retrofit upgrades, and relocation of thermal power generation equipment. Proven consulting expertise in combustion turbine risk assessments, life-cycle evaluations, and appraisal of power generating equipment. Management skills include power plant engineering, operation and maintenance planning, life extension refurbishment engineering, and evaluation of long-term service agreements (LTSA's). Technically focused on domestic and international power plant initiatives incorporating life-extension retrofit upgrades and reapplication of refurbished power turbines. Multi-lingual; with international field service and project management experience in steam and gas turbine power generation technology, life extension upgrades, and capital asset renovation projects.

Sal Paolucci has over 28 years of, (GE frame 3, 5, 6, & 7) Gas Turbine Operation, Maintenance, Installation, Start-up, and troubleshooting Gas Turbine Controls; MK2, MK4, & MK5. 10 years of experience in Combine Cycle Plant, Outage Planning, Plant Spare parts, and Plant Performance (Heat Rate). BSME Cleveland State University, Cleveland OH. Career includes approximately 15-years as a GE field engineer servicing clientele in the USA as well as internationally. He also worked for 10-years (5 in operations and 5 in maintenance) for Mass Power, in Massachusetts. He currently resides in the Boston MA area.

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:_____ 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#_____

Please advise how you found out about this course initially.

- o Website search
- o Fax advertisement
- o Magazine advertisement
- o Familiar with HPC
- o HPC mailing
- o Other_____