



Course Information Letter ---- CT518

(SIEMENS V84.2) COMBUSTION TURBINE O&M CT518

This 4 day course was developed to improve the effectiveness of maintenance activities associated with Siemens V84.2 combustion 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. Combustion turbine operation is discussed from the perspective of auxiliary systems and how operating factors may impact maintenance intervals. Combustion, hot gas path and major inspections are discussed.

A topical outline includes: Review of CT Fundamentals, V84.2 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 Siemens V84.2 combustion turbines.

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

1. Describe the major components and systems associated with Siemens V84.2 combustion 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 V84.2 support systems and requirements for operation.
7. Describe the procedures necessary for the safe and effective disassembly and reassembly of combustion 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 combustion 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 combustion turbine.
14. Describe the common procedures for cleaning and inspecting combustion turbine components.
15. Describe the criteria used to evaluate combustion turbine component defects.
16. Describe the common repair methods for repair of combustion 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 combustion turbine components.
22. Describe the methods used to properly align combustion 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 may be 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. Combustion Turbine Fundamental Review

II. Siemens V84.2 Combustion 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. Atomizing Air System
- H. Starting System
- I. Protection System

IV. Controls & Operation Overview

- A. Control Philosophy
- B. Speed / Load Control
- C. Temperature Control
- D. 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

COMBUSTION 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, (Siemens V84.2) Combustion 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):

Len Berube. Len 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.

Alan J. Kaufman. Mr. Kaufman has been providing engineering services on Westinghouse manufactured combustion turbines since 1970. After graduating with a BSME he joined Westinghouse Power Generation Services and was immediately assigned to combustion turbine installation and startups. Service was his primary activity through 1978. From 1978 to 1980 Mr. Kaufman was a manager within Westinghouse responsible for maintenance services. Since 1980 he has worked for 3rd party engineering companies and/or as an independent. Immediately after his departure from Westinghouse he became involved with maintenance outages on GE gas turbine equipment. Most recently he provided technical direction for the relocation of six Westinghouse W501AA gas turbine generators from Osaka Japan to Reno Nevada. He was then retained after construction to act as Plant Manager, engaged in planning operation and maintenance. Prior to this assignment, as an example, he joined East Coast Management Inc. as Gas Turbine Engineer to develop and execute gas turbine overhaul, repair and relocation projects. He was recently engaged in the major repair of a Westinghouse W501AA gas turbine including heavy shop repair and re-blading of the rotor and other components. Other assignments was to develop a turn-key project to procure, rebuild, up-rate, and install two GE Frame 6 gas turbine generators for a major I.P.P., and provide a full range of warranted up-rates for GE frame gas turbines.

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 offerings.
 Received a fax
 Received an email
 Website search
 Other: _____