FOSSIL CONSULTING SERVICES, INC
6325 WOODSIDE COURT, SUITE 350, COLUMBIA, MD 21046
(410) 312-6240 fcs@fossilconsulting.com

CT100 - COMBUSTION TURBINE OPERATIONS & MAINTENANCE

This 3-day course was developed to improve the effectiveness of the operations and maintenance activities of combustion turbines. Increase your ability to reduce forced outages and increase unit reliability and availability.

This course has been designed for plant personnel who are involved in safely and effectively operating and maintaining combustion turbine/generators. It will provide the attendee with a thorough understanding of operations and maintenance of combustion turbines.

OBJECTIVES

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

- Describe the major components and systems associated with combustion turbines.
- Describe the sequencing that occurs in a normal startup, synchronization and operation.
- Describe the support systems and requirements for operation.
- Demonstrate the ability to use effective and safe maintenance procedures.
- Properly plan the maintenance outage prior to shutdown.
- Demonstrate the knowledge necessary to measure and interpret information as it relates to the unit outage.
- Demonstrate the knowledge necessary to disassemble/reassemble equipment in an orderly and safe manner.
- Demonstrate the knowledge necessary to properly clean and inspect turbine components.
- Describe combustion turbine control concepts and protective features.

This course is offered for "on-site" presentation in three versions:

1. Generic Version – This course is presented using our standard, generic Introduction to Combined Cycle Power Plant text at your facility.

2. Custom Version 1 (Partial Customization) - This course is presented using our standard generic Introduction to Combined Cycle Power Plant text; but the presentation is customized using site and unit specific materials. FCS will provide the client with a detailed list of required reference materials. FCS will use these materials to provide a plant and unit specific student handout. The unit specific handout is used during the presentation.

3. Custom Version 2 (Fully Customized Training Manual) – Prior to the course presentation, FCS personnel will visit the site to gather reference materials, photograph key plant equipment, and discuss plant procedures and operating concerns with plant personnel. FCS will develop a unit specific training manual that covers the same topics included in the outline. This customize training manual will be used during the course presentation and will be provided in an editable electronic form so that additional copies can be printed and the materials can be further customized should changes at your plant warrant.

Contact Hal Grace, in Jacksonville, FL at (904) 272-9537 or at hgrace@fossilconsulting.com for information regarding technical content and pricing

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CONTINUING EDUCATION UNITS

FCS is authorized to provide Continuing Education Units for successful completion of its training courses and seminars. 1.9 CEU's will be awarded for successful completion of this session.

INSTRUCTORS

Harold Grace brings 30+ years experience to Fossil Consulting Services. He has provided Combined Cycle Power Plant training to over 500 individuals over the past several years. Prior to FCS, Mr. Grace was Vice President of HPC Technologies in Bradenton Florida. Prior to that he was Manager - Turbine Generator Services, for General Physics, where he was responsible for turbine generator training, engineering and consulting services. Mr. Grace was also employed by GE for 18 years in a number of capacities including Field Engineer, Senior Project Manager, Service Supervisor, Service Manager, and Manager of Power Generator Jacksonville Service Shop. He is a licensed Chief Engineer with the National Institute for the Uniform Licensing of Power Engineers, Inc (NIULPE), Ohio State Association of Power Engineers, Inc., a NIULPE Technical Instructor, Licensed Examiner, and is Chairman/President - NIULPE of Florida. Mr. Grace is a member of and Vice Chairman for the ASME Combined Cycle Power Plant Committee.

Mike McClintock has 30+ years of experience in the power generation industry, which includes 11 years with gas and steam turbine manufacturers and 19 years in development of plant operations and maintenance training programs and short courses. He has done erection, startup and maintenance of steam and gas turbines in a variety of plants. He has managed, developed and presented training for plant operations and maintenance personnel on steam and gas turbine operations and maintenance. His experience covers GE, Westinghouse, Allis Chalmers/Siemens, Pratt & Whitney, ABB, Dresser-Rand, Hitachi, Toshiba, and Mitsubishi equipment. He has successfully developed and presented courses on plant heat rate improvement for operators and engineering personnel. Mike is a licensed Professional Engineer in Maryland.

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COURSE OUTLINE

I. Introduction
- A. Introduction of Instructors
- B. Review Course Outline
- C. Discuss Course Text
- D. Class Participation
- E. Class Structure
- F. Course Objectives

II. Combustion (Gas) Turbine Fundamentals
- A. Introduction
- B. Basic Cycle
- C. Gas Turbine Relationships
- D. Power Relationships
  1. Compressor
  2. Combustor
  3. Turbine

III. Turbine Construction & Operating Principles
- A. Introduction
- B. Turbine Function
- C. Component Description
  1. Turbine Flow
  2. Air Inlet Equipment
     a. Inlet Guide Vane & Casing
  3. Compressor Section
  4. Combustion Section
  5. Turbine Section
  6. Exhaust Section
  7. Bearings
  8. Compressor Spindle/Rotor
  9. Turbine Spindle/Rotor

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

V. CT Controls Overview
- A. Introduction
- B. Control Philosophy
- C. Major Components
- D. Speed Control
- E. Temperature Control
- F. Alarm & Protection

VI. Maintenance Preparation & Planning
- A. Introduction
- B. Periodic Inspections
- C. Records
- D. Running Inspections
- E. Combustion Section Inspection
- F. Turbine Inspection
- G. Major Inspection
- H. Documentation
- I. Component and Parts Requirements
- J. Safety
- K. Tools & Measuring Equipment
- L. Scheduling

VII. Combustion Section Inspection
- A. Introduction
- B. Accessibility
- C. Parts Identification
- D. Fuel System
- E. Ignition and Flame Detection
- F. Combustion Components
- G. Borescope Inspection
- H. Inspection Data
- I. Reassembly

VIII. Turbine Inspection
- A. Introduction
- B. Accessibility
- C. Turbine Shell Disassembly
- D. Nozzle Disassembly
- E. Inspection
- F. Reassembly

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

X. Alignment
- A. Readings
- B. Procedure

XI. Startup & Test
- A. Introduction
- B. Pre-Startup Checks
- C. Startup Checks
- D. Evaluation

XII. Course Conclusion
- A. Review
- B. Examination