

## ST100 – STEAM TURBINE GENERATOR FUNDAMENTALS



This course is essential for persons new to turbine generator maintenance and operations. It will provide a thorough understanding of the basics of turbines and generators. Before you can effectively comprehend the requirements of operating and maintaining the equipment you must first understand how it works.

The 2-day course should be attended by all power plant personnel involved in operating and maintaining steam turbine generators. Plant management, supervisors, engineers, operators, work leaders, and mechanics will benefit from attendance in this course.

### OBJECTIVES

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

- Describe the function of turbine nozzles.
- Describe the function of turbine blades/buckets.
- Describe the energy conversions that occur in impulse and reaction turbines and identify the components where the conversions occur.
- Describe the various types of turbines and their applications.
- Describe the function of the various steam turbine components.
- Describe the areas where the turbine is sealed.
- Explain how the turbine expands and why this is important.
- Explain the function of steam turbine valves.
- Describe full arc vs. partial arc operation.
- Trace the flowpath for steam turbine auxiliary systems.
- Describe the major components in steam turbine auxiliary systems.
- Describe the conversion of mechanical energy to electrical energy in AC generators.
- Describe the function of the components in AC generators.
- Describe the different types of generator cooling methods.
- Trace the flowpath for generator auxiliary systems.
- Describe the major components in generator auxiliary systems.

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

1. Generic Version – This course is presented using our standard, generic Steam Turbine Generator Fundamentals text at your facility.
2. Custom Version 1 (Partial Customization) - This course is presented using our standard generic Steam Turbine Generator Fundamentals 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 Mike McClintock at (717) 337-0874 or [mmclintock@fossilconsulting.com](mailto:mmclintock@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. 1.3 CEU's will be awarded for successful completion of this session.

## INSTRUCTORS

**Mike McClintock** has 40+ years of experience in the power generation industry, which includes gas and steam turbine manufacturers and 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.



## COURSE OUTLINE

### I. Introduction (Day 1-1hour)

- A. Introduction of Instructors
- B. Review Course Outline
- C. Discuss Course Text
- D. Class Participation
- E. Class Structure
- F. Course Objectives
- G. Maintenance Concerns
- H. Component Defects
- I. Operational Effects

### II. Turbine Fundamentals

(Day 1-2hours)

- A. The T/G in the Cycle
- B. Basic Turbine Theory
  - 1. Energy Conversion in the Turbine
  - 2. Conversion in Nozzles
  - 3. Conversion in Blades
- C. Basic Turbine Types
  - 1. Impulse Turbines
  - 2. Reaction Turbines
  - 3. Comparisons-Impulse vs. Reaction
- D. Turbine Classification

### III. Turbine Centerline

**Construction** (Day 1-3 hours)

- A. Turbine Sections
  - a. High Pressure
  - b. Intermediate
  - c. Low Pressure
  - d. Turbine Expansion
- B. Stationary Components
  - a. Shell/Cylinder
  - b. Inner Shell/Blade Ring
  - c. Nozzles/Diaphragm  
Stationary Blades
  - d. Turbine Seals
  - e. Bearings
  - f. Standards/Pedestals
  - g. Turning Gear
  - h. Atmospheric Relief Diaphragm
  - i. Shaft Grounding Brushes
- C. Rotating Components
  - a. Rotors/Spindles
  - b. Buckets/Blades

### IV. Main and Auxiliary Steam

**Valves** (Day 1-2 hours)

- A. Function
- B. Steam Chests
- C. Main Stop/Throttle Valves
- D. Control/Governor Valves
- E. Reheat Valves
- F. Auxiliary Valves

### V. Turbine Support Systems

(Day 2-2 hours)

- A. Lube Oil System
- B. Steam/Gland Seal System
- C. Exhaust Hood Cooling System
- D. Hydraulic Oil System
- E. Turbine Controls
- F. Turbine Monitoring System

### VI. Generator

Day 2-3 hours)

- A. Electrical Theory Review
  - 1. Magnetism
  - 2. AC Electricity
  - 3. AC Generators
  - 4. Power
  - 5. Three Phase Power
  - 6. Terminal Connections
- B. Generator Construction
  - 1. Stator & Windings
    - i. Frame
    - ii. Core
    - iii. Stator Bars
    - iv. Wedges
    - v. End Support
  - 2. End Shield/Bearing Brackets
  - 3. Bearings
  - 4. Generator Rotor
    - i. Forging
    - ii. Winding
    - iii. Retaining Ring/End Caps
    - iv. Fans/Blowers
    - v. Collector Rings
    - vi. Brushes
  - 5. Generator Cooling

### VII Generators Support Systems

(Day 2-2 hours)

- A. Gas Control System
- B. Seal Oil System
- C. Stator Winding Cooling System

### VIII. Course Conclusion

(Day 5-1 hr)

- A. Questions/Answers
- B. Review/Exam
- C. Course Critique