

# Fired Process Heaters

Focus on Design, Operation and Reliability

DIRECTED BY

**Nicholas Bohensky** — Director-Operations, Wood Foster Wheeler Fired Heaters



**Course Topics Include:**

- Principles
- Equipment
- Safety and Efficiency Specifications
- Troubleshooting
- Interactive Learning Experience

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## about the course

Fired process heaters (also known as fired heaters, process heaters, furnaces, process furnaces, and direct-fired heaters) are critical pieces of equipment in petroleum refineries, petrochemical plants, chemical plants, and other industrial process facilities where providing heat to a process fluid at elevated temperature levels is required. They are a major consumer of energy in such facilities, and their proper operation is integral to their safety, reliability, production capacity, and profitability.

This 13-hour, accredited training, delivered over four consecutive days, will provide insight to the design parameters and limitations of both thermal/ hydraulic and mechanical/structural design of fired process heaters and ancillary equipment (burners, fans, air preheaters, etc.). Additional major topics include instrumentation and controls, operations and troubleshooting, mitigation of emissions/corrosion/fouling, and revamping/modification. Techniques for specification development and proposal/design evaluation also will be discussed. The course will be taught in interactive lecture format, with roundtable discussions for certain topics.

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## who should attend

The course would be valuable to professionals working with fired process heaters in the petroleum refining, petrochemical, chemical and related industries, such as:

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| • Process Engineers/Designers  | • Mechanical Engineers/Designers    |
| • Project Engineers/Managers   | • Maintenance Personnel             |
| • Those involved in design, specification, and retrofitting of fired heaters | • Heat Transfer Engineers/Designers |
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- Operators
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## learning objectives

**Upon completion of this course, you will be able to:**

- Describe the thermal and hydraulic principles of fired heater and ancillary equipment design and operation
- Explain the structural and mechanical aspects and limitations of fired heaters and ancillary equipment
- Analyze and troubleshoot fired heater performance
- Apply techniques for safe operation, to improve efficiency, and to minimize emissions, corrosion, and fouling
- Evaluate options for fired heater modifications and revamps
- Create specifications
- Evaluate proposals and designs

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## course outline

**Review of Learning Objectives**

**Introduction to Fired Heaters:**

- General Overview
- Applications and Configurations
- Heat Transfer Modes

**Combustion:**

- Fuel Types
- Properties and Calculations
- Efficiency Determination

**Radiant and Convection Sections:**

- Thermal Design
- Firebox and Coil Layouts
- Extended Surface Types

**Tube Design / Fluid Hydraulics:**

- Elastic and Creep/Rupture Design
- Determination of Tube Metal Temperature
- Calculation of Tube Thickness
- Tube and Fitting Material/Selection
- In-tube Pressure Drop

**Air and Flue Gas Hydraulics:**

- Fired Heater Draft Profile
- Natural Draft
- Stack
- Forced and Induced Draft
- Dampers

**Burners / Fuels / Emissions:**

- Burner Types
- Components
- Effects of Fuel Types on Heater Design
- Emissions Types
- Emissions Reduction (Burners, SCR, SNCR)

**Structural / Mechanical / Refractory:**

- Structure and Casing
- Tube Supports
- Access
- Refractory Types and Selection Criteria
- Heat Loss
- Refractory Mechanical Design

**Air Preheat Systems and Fans:**

- Types of Air Preheaters
- Fan Basics
- Thermal and Hydraulic Design
- Ductwork and Mechanical Aspects

**Instrumentation and Controls:**

- Temperature Measurement
- Draft Measurement
- Tubeskin Thermocouples
- Flue Gas Analysis
- Flame Monitoring
- Burner Management Systems

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**Operations:**

- Startup
- Troubleshooting
- Routine Checks/Monitoring
- Efficiency Testing
- Mitigation of Fouling and Corrosion

**Revamps and Modifications:**

- Capacity Changes
- Efficiency Improvements
- Burner Modifications
- Coil Modifications/Additions
- Addition of Air Preheat
- Case Studies

**Specification and Review:**

- Data Sheets
- Requisition Dos and Don'ts
- Common Evaluation Pitfalls
- Shop Assembly

**Assessment Opportunity**

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**course  
instructor**

**Nicholas Bohensky** is currently the Director-Operations at Wood for their Foster Wheeler Fired Heaters product line, with the primary responsibility of thermal and hydraulic design of fired process heaters and ancillary equipment. He has over 28 years of experience in this topic, as well as in proposal development, applications engineering, staff management and training, and contract negotiation for both new and aftermarket fired heater applications. He has previously worked for Petro-Chem Development Company and Struthers Wells. He has presented numerous presentations on fired heaters, both to customers and in-house personnel for training, and has been active in the American Petroleum Institute's revisions of standards 560 (Fired Heaters for General Refinery Service), 530 (Calculation of Heater-tube Thickness in Petroleum Refineries) and development of 561 (Reforming Furnaces for Hydrogen and Syngas Production).

Mr. Bohensky holds a BS degree in Mechanical Engineering from Rutgers College of Engineering and a MS degree in Management from Stevens Institute of Technology. He is a licensed professional engineer in the states of New Jersey, Texas, Louisiana, Kentucky, Illinois, and Washington.

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## Accreditations



### **International Accreditors for Continuing Education and Training (IACET)**

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