Fired Heaters / Combustion Technology

Potential PDH: 24

Description:

Upon completion of this course, participants will be able to:

- Understand combustion basics and operating best practices
- Understand hardware and instrumentation of fired equipment
- Make rough calculations for trouble shooting of field problems
- Optimize/balance proper operation and thermal efficiency of fired equipment

Outline:

Combustion Theory
- Combustion of fuels
- Furnace efficiency calculations
- Flammability limit

Burners
- Burner types
- Operating characteristics
- Optimization

Atomization (for oil fired configurations)
- Atomizer types
- Operating characteristics
- Optimization

Low NOx Burners
- Formation of NOx and Solids
- Overview of NOx and Solids reduction techniques
- How to reduce the impact of combustion on the environment

Furnaces
- Purposes and process application
- Furnace scheme, components, and general lay-out
- Main parameters in furnace efficiency
- Transfer of heat from fuel to process (radiation/convection; gasfiring / oil firing)
- Two phase flow
- Causes of furnace tube overheating
- Effect of coke formation
- Different furnace types

Air Preheat

- Effects on efficiency
- SO3 Dew point corrosion
- Different types
- Operation / maintenance

Furnace Control and Safety

- Minimum stops:
  - Mechanical minimum stops
  - Active minimum stops
- Steam atomizers
- Fuel temperature and steam-oil delta p control
- Safeguarding
- Air/fuel ration control schemes
- Effect of variations in molecular weight
- Safeguarding types:
  - Flame detection
  - Low pressure trips

Furnace Draft

- Purpose of furnace stacks
- Pressure profiles of natural and forced draught systems
- To be able to calculate actual draught levels in combustion systems

Start-up and Operation

- Maintenance and inspection of burners
- Furnace Oxygen – and draft control
- Normal operation – "control knobs"

Furnace Tube Decoking

- Shot blasting
- High Pressure Water Jetting
- Spalling
- Steam-Air decoking
- Mechanical decoking aka Pigging

Refractory

- Integrity and drying
- Preparations
- Water requirements and bonding systems

Furnace Tube Failure

- Causes
- Prevention
- Detection
- Managing small verses large tube failures

On-Line Chemical Cleaning

- Fuel additives

- Radiant cell additives

Trial for Ignition Time

- Critical parameters
- Calculation of the safe time periods for purge/etc
- Trial-For-Ignition time restrictions for process safeguarding

Exercises applicable to discussed calculations / topics

Who Should Attend:

The *Fired Heaters / Combustion Technology* training is ideal for professionals engaged in the operation, maintenance, engineering, and management of fired heaters and combustion systems in industrial settings. Suitable attendees include plant operators, technicians, maintenance and process engineers, reliability engineers, combustion specialists, as well as plant managers and supervisors. This training offers critical insights into the principles of combustion, heater performance optimization, safety, and emissions control, enabling participants to enhance the efficiency, safety, and reliability of fired heater operations, reduce fuel costs, and ensure compliance with environmental regulations.

Subject Matter Expert (SME):

Belal Hassoun, P. Eng., is a seasoned professional with 25+ years in oil and gas, specializing in fired equipment engineering. His roles have included Design Engineer, Sr. Fired Equipment Engineer, Package Engineer, and Consultant. Belal has led/participated in numerous projects, including a high-profile FAIR at Kuwait's KNPC Shuaiba Refinery and the evaluation of a new ferrule system in a Sulphur Recovery Unit. These projects resulted in significant cost savings and operational improvements. He holds a Bachelor's in Chemical Engineering from the University of Calgary and is known for his collaborative approach and commitment to delivering results.

Cor Sinke BSc brings over 36 years of experience at Shell, specializing in combustion technology and fired equipment. With a BSc in Mechanical Engineering from Technical University Amsterdam, he has excelled in R&D, technical support, and refinery operations. As Shell's principal engineer for fired equipment, he is a Subject Matter Expert in control and safeguarding (EN-746-2, NFPA) and heater mechanical design (API-560), with Technical Authority TA/2 for all fired equipment.
His expertise includes start-up and commissioning of 40+ furnaces, design and troubleshooting of two-phase flow heaters, and consultancy for energy saving and emission control in refineries worldwide. An accomplished lecturer, he has led over 20 Combustion Processes training courses. His recent roles include Principal Consultant for fired equipment and combustion at EPS Customer Solutions, NL, and various positions at Shell Global Solutions, Amsterdam, and Kuala Lumpur.

Dirk Jan Treur is a Mechanical Engineer with 23 years of experience with design, construction, commissioning, start-up, and operation in heat transfer, and fired equipment in the oil & gas,

energy, and power generation industries. He has provided asset, engineering, and project support in furnace design, process/technical safety, troubleshooting, burners and combustion, emissions, maintenance, inspections, turnaround, commissioning & start-up support as well as areas including energy & power, boiler, steam, condensate, feed water, heat transfer fluid systems, fuel systems, industrial gases, utility water treatment, cooling/chilling systems design.