Direct Fired Heaters: Design and Operations

Course general description:

Direct fired heaters are critical equipment in process industries, serving as primary heat transfer devices in refineries, petrochemical plants, and other industrial facilities. This intensive five-day course provides participants with comprehensive knowledge of direct fired heater design, operation, and maintenance. The course combines theoretical principles with practical applications, enabling participants to optimize heater performance, improve energy efficiency, and ensure safe operations.

Audience:

This course is designed for:

1. Process Engineers
2. Operations Engineers
3. Maintenance Engineers
4. Plant Supervisors
5. Equipment Designers
6. Project Engineers

Course objectives:

1. Demonstrate comprehensive understanding of direct fired heater fundamentals and their critical role in process industries, including refineries and petrochemical plants.
2. Apply theoretical principles to analyze and evaluate direct fired heater design parameters and specifications for optimal performance.
3. Develop proficiency in operating direct fired heaters safely and efficiently while maintaining compliance with industry standards.
4. Master maintenance procedures and troubleshooting techniques to ensure reliable heater operation and extend equipment life.
5. Implement strategies to optimize energy efficiency and reduce operational costs while maintaining desired process conditions.

Course duration:

5 days

Course location:

Cairo-Dubai-Istanbul

Course contents:

Day 1: Fundamentals and Basic Principles

- Introduction & Pre-Test – Overview of fired heaters, heat transfer fundamentals, and combustion theory.
- Types & Components – Fired heater classifications, key components, material selection, and design standards.
- Design Considerations – Heater selection criteria and material compatibility.
- Hands-on Learning – Heat transfer calculations and industry application discussions.
- Case Study & Review – Analysis of heater selection and discussion of real-world applications.

Day 2: Design and Engineering

- Thermal Design – Principles of radiation, convection, and stack design.
- Burner & Refractory Systems – Types, selection, and their impact on heater efficiency.
- Mechanical & Safety Aspects – Structural integrity, safety features, and compliance with design codes.
- Hands-on Learning – Design calculations and selection criteria exercises.
- Assessment & Review – Quiz on design parameters and discussion on optimal design strategies.

Day 3: Operations and Control

- Operational Procedures – Start-up, shutdown, and normal operation conditions.
- Control & Automation – Control system architecture, safety instrumented systems, and process optimization.
- Performance & Safety – Emissions control, energy management, and performance monitoring.
- Hands-on Learning – Control loop configuration and troubleshooting techniques.
- Case Study & Discussion – Analysis of operational challenges and troubleshooting scenarios.

Day 4: Maintenance and Reliability

- Maintenance Strategies – Preventive maintenance, condition monitoring, and inspection techniques.
- Reliability & Life Extension – Troubleshooting methodologies, reliability improvements, and revamp considerations.
- Failure Management – Fouling prevention, heater life extension, and performance assessment.
- Hands-on Learning – Inspection planning and reliability enhancement exercises.
- Case Study & Review – Industry best practices for maintenance and troubleshooting.

Day 5: Technology Advancement and Future Trends

- Digital Innovations – Industry 4.0 applications, digital monitoring, and automation.
- Efficiency & Sustainability – Energy efficiency improvements and environmental considerations.
- Alternative Fuels & Future Trends – Emerging technologies in heater design and fuel alternatives.
- Final Assessment & Review – Case studies review, final Q&A, and comprehensive assessment.
- Certification & Closing – Course summary, certification ceremony, and future industry outlook.

Methodology:

- 50% lectures & concepts
- 10% Videos
- 15% Case studies
- 15% Exercises & Quizes.
- 10% Discussions

Course code: (TPR0017)