Reactor Troubleshooting and Optimization Training Course

Professional Development Training Course Outline

Category	General Training	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Modern industrial reactors are the heart of chemical, petrochemical, refining, pharmaceutical, polymer, and specialty chemical manufacturing operations. Achieving optimal reactor performance is critical for maximizing production throughput, improving product quality, reducing energy consumption, minimizing operational risks, and ensuring sustainable manufacturing practices. With increasing industry focus on Process Optimization, Digital Transformation, Advanced Process Control (APC), Predictive Analytics, Process Safety Management (PSM), Artificial Intelligence (AI), Industrial Internet of Things (IIoT), Energy Efficiency, Carbon Reduction, and Operational Excellence, professionals must possess advanced troubleshooting and optimization skills to maintain competitive operations.

Reactor Troubleshooting and Optimization Training Course equips participants with practical techniques to diagnose reactor performance issues, identify root causes of process deviations, optimize reaction kinetics, enhance catalyst performance, improve heat and mass transfer efficiency, and maximize plant profitability. Through real-world industrial case studies, simulation exercises, performance analysis, and best-practice methodologies, participants will develop expertise in solving complex reactor challenges while supporting reliability, sustainability, digitalization, and operational excellence initiatives.

Programme Curriculum

Reactor Troubleshooting and Optimization Training Course

Introduction

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Course Duration

5 days

Course Objectives

By the end of this course, participants will be able to:

1. Understand advanced reactor design principles and operational fundamentals.
2. Diagnose reactor performance bottlenecks using data-driven methodologies.
3. Apply Root Cause Analysis (RCA) for complex reactor failures.
4. Optimize reactor conversion, selectivity, and yield.
5. Improve catalyst performance and catalyst lifecycle management.
6. Utilize Digital Twin Technology for reactor performance monitoring.
7. Implement Artificial Intelligence (AI) and Machine Learning (ML) techniques in reactor optimization.
8. Enhance process safety through Process Safety Management (PSM) practices.
9. Apply Advanced Process Control (APC) strategies for stable reactor operation.
10. Optimize heat transfer and mass transfer performance.
11. Reduce energy consumption and support Net Zero operational goals.
12. Analyze reactor data using predictive analytics and industrial dashboards.
13. Develop sustainable and reliable reactor operation strategies for operational excellence.

Target Audience

1. Process Engineers
2. Chemical Engineers
3. Production Engineers
4. Operations Supervisors
5. Plant Managers
6. Process Control and Automation Engineers
7. Reliability and Maintenance Engineers
8. HSE and Process Safety Professionals

Course Modules

Module 1: Fundamentals of Reactor Systems

- Reactor classifications and applications
- Batch, CSTR, PFR, fluidized bed, and catalytic reactors
- Reaction kinetics and reactor performance indicators

- Heat and mass transfer fundamentals
- Reactor operating envelopes
- **Case Study:** Performance evaluation of a refinery hydroprocessing reactor.

Module 2: Reactor Performance Monitoring and Diagnostics

- Key performance indicators (KPIs)
- Online monitoring technologies
- Process data collection and validation
- Early detection of performance degradation
- Performance benchmarking techniques
- **Case Study:** Identification of declining conversion in an ammonia synthesis reactor.

Module 3: Advanced Reactor Troubleshooting Techniques

- Systematic troubleshooting methodology
- Root Cause Analysis (RCA)
- Failure Modes and Effects Analysis (FMEA)
- Problem-solving frameworks
- Troubleshooting workflow development
- **Case Study:** Unexpected reactor temperature runaway incident analysis.

Module 4: Catalyst Performance and Optimization

- Catalyst fundamentals
- Catalyst deactivation mechanisms
- Catalyst regeneration techniques
- Catalyst life-cycle optimization
- Performance monitoring strategies
- **Case Study:** Catalyst poisoning in a petrochemical reforming reactor.

Module 5: Process Optimization and Advanced Process Control

- Process optimization methodologies
- Advanced Process Control (APC)
- Model Predictive Control (MPC)
- Constraint management
- Yield improvement techniques
- **Case Study:** APC implementation improving polymer reactor productivity.

Module 6: Digital Transformation in Reactor Operations

- Digital Twin applications
- Industrial Internet of Things (IIoT)
- Artificial Intelligence and Machine Learning
- Predictive analytics tools
- Smart manufacturing systems
- **Case Study:** AI-based predictive monitoring for reactor fouling prevention.

Module 7: Process Safety and Risk Management

- Process Safety Management (PSM)

- Hazard and Operability Studies (HAZOP)
- Layer of Protection Analysis (LOPA)
- Thermal runaway prevention
- Emergency response planning
- **Case Study:** Investigation of a major reactor overpressure event.

Module 8: Sustainability and Operational Excellence

- Energy efficiency optimization
- Carbon footprint reduction strategies
- Sustainability performance metrics
- Asset performance management
- Continuous improvement frameworks
- **Case Study:** Energy optimization project delivering significant utility savings and emissions reduction.

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

Ready to enroll or request a customized program? Book online or contact us:

Register Online Now

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com