



Catalyst Handling Course: Reactor Loading and Unloading During Turnarounds



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Introduction:

Catalyst handling, covering reactor loading and unloading during turnarounds, is a 1-week course for refinery and petrochemical units that plan, supervise and verify catalyst change-outs, ending with a Catalyst Change-Out Execution Plan for a case unit. Turnarounds overrun and reactors restart with channelling, high pressure drop or fires in spent material when unloading methods, inert entry, loading density and activation are left to contractors without owner checks. Nominees already take part in shutdown work on hydrotreaters, reformers or petrochemical fixed-bed reactors and learn through case studies built on change-out records. CoreConcept Training Center delivers this catalyst handling course.

Course Objectives:

- Prepare a catalyst change-out scope, quantity take-off and logistics schedule that fits the turnaround critical path
- Select gravity dump, vacuum extraction or water flooding unloading for each reactor and set cool-down and purge conditions before opening
- Control inert entry under nitrogen with breathing air, continuous atmosphere monitoring, attendants and a staged rescue team
- Supervise sock or dense loading, grading layers and inert ball placement and accept beds on outage and pressure drop readings
- Choose in-situ sulphiding or presulphided catalyst activation and manage pyrophoric and spent catalyst through packaging, shipment and metals reclaim
- Build a Catalyst Change-Out Execution Plan with hold points, contractor controls and acceptance criteria for a case unit

Target Audience:

- Turnaround units responsible for planning and coordinating reactor catalyst change-outs
 - Process and operations units responsible for reactor shutdown, cool-down, purging and restart of catalytic units
 - Reactor owner and technical units responsible for accepting loaded beds and activation records
 - Health, safety and environment units responsible for inert entry permits, rescue cover and spent material hazards
 - Contract supervision units responsible for overseeing specialist catalyst handling contractors on site
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Course Outline:

Day 1: Turnaround Catalyst Change-Out Scope and Readiness

- Change-Out Scope Register for Hydrotreater, Reformer and Petrochemical Reactors
- Fresh Charge Quantity Take-Off From Loading Diagrams and Bulk Density
- Catalyst Logistics Schedule for Drums, Bulk Bags and Inert Media
- Turnaround Critical Path Placement of Reactor Opening and Closure
- Change-Out Readiness Review Checklist and Long-Lead Material Status

Day 2: Reactor Shutdown, Cool-Down and Unloading Methods

- Hydrocarbon Free Sweep and Hot Hydrogen Strip Before Cool-Down
- Controlled Cool-Down Rate and Nitrogen Purge Sequencing
- Gravity Dump Nozzle Unloading and Discharge Rate Control
- Vacuum Extraction Unloading of Upper Beds and Bed Supports
- Water Flooding Unloading Trade-Offs for Non-Regenerable Spent Charges

Day 3: Inert Entry, Loading Techniques and Bed Verification

- Inert Entry Permit With Breathing Air and Umbilical Supply
- Standby Rescue Team Staging and Tripod Retrieval Arrangements
- Dense Loading Machine Calibration Against Sock Loading Bed Density
- Inert Ball and Grading Layer Placement Against Loading Diagram
- Outage Measurement and Bed Pressure Drop Test Records

Day 4: Activation, Spent Catalyst Hazards and Contractor Control

- In-Situ Sulphiding Versus Presulphided Catalyst Activation Choices
- Pyrophoric Iron Sulphide and Self-Heating Spent Catalyst Control
- Spent Catalyst Packaging, Labelling and Shipment for Metals Reclaim
- Reformer Platinum Catalyst Recovery Accounting and Chain of Custody
- Specialist Contractor Oversight With Hold Points and Daily Progress Metrics

Day 5: Case Study on a Catalyst Change-Out Execution Plan

- Case Hydrotreater Change-Out Data Pack and Scope Review
 - Case Unloading Method Selection and Inert Entry Plan
 - Case Loading Sequence, Outage Targets and Pressure Drop Acceptance
 - Case Spent Catalyst Disposition and Contractor Control Plan
 - Catalyst Change-Out Execution Plan Completion and Peer Challenge
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Skills You Will Gain:

- Change-Out Scope Planning
- Catalyst Quantity Take-Off
- Unloading Method Selection
- Inert Entry Supervision
- Loaded Bed Acceptance
- Catalyst Activation Oversight
- Pyrophoric Material Control
- Catalyst Contractor Supervision

Why Attend This Course:

- Deliver a Catalyst Change-Out Execution Plan to the turnaround manager and reactor owner for approval before the shutdown
- Decide which unloading method, loading technique and activation route each reactor in the next turnaround should use
- Prevent restart delays, bed maldistribution, nitrogen asphyxiation incidents and spent catalyst fires caused by unchecked contractor work
- Coach shift crews and contractor supervisors with the course hold point, outage and inert entry checklists

Conclusion:

Back at work, the participant gives the turnaround manager and reactor owner a Catalyst Change-Out Execution Plan that fixes scope, unloading methods, inert entry controls, loading targets, activation route and spent catalyst disposition for the case unit. Planners use it to place reactor work on the critical path, while HSE and contract supervisors use its hold points to release each stage. After the first change-out under the plan, the unit should compare duration, loaded density, start-of-run pressure drop and safety observations with the targets and revise them.

Frequently Asked Questions FAQ:

What should participants know before a catalyst handling and reactor loading course?

Participants should already work on shutdowns of catalytic units and read loading diagrams, permits and unit logs. Bringing an anonymised loading diagram, change-out report or contractor method statement helps them apply the case work to their own reactors.

How does a catalyst handling course differ from a reactor design or hydroprocessing operations course?

This course stays on turnaround execution: unloading, inert entry, loading, bed acceptance, activation and spent material. Reactor design courses size reactors and choose catalysts, and hydroprocessing operations courses run units between turnarounds, touching change-out work only briefly.

Why is spent catalyst handling during reactor unloading a fire risk?

Spent hydroprocessing catalyst and iron sulphide scale can self-heat and ignite when exposed to air. Crews therefore keep the material under nitrogen or wetted, monitor temperature in containers and avoid opening sealed bins until the material is confirmed stable.

What do participants take back from the catalyst handling and reactor loading course?

Participants take back a Catalyst Change-Out Execution Plan for a case unit, with scope and quantity take-off, unloading and inert entry controls, loading and outage targets, activation choices, spent catalyst disposition and contractor hold points ready to adapt to their own reactors.
