

## **Catalyst Material Handling: Loading, Unloading, Oxidation, Reduction & Techniques**

### **Why Choose this Training Course?**

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using one of our state-of-the-art simulators. This course is designed to provide participants with a detailed and up-to-date overview on catalyst material handling, loading, unloading, oxidation, reduction and technique. It covers the preparation of catalyst change plan; executing the catalyst project efficiently and safely; the catalyst changes operation main requirement; the work in inert and toxic atmospheres plus hot and hostile environments; the reactor cooling utilizing a proprietary liquid nitrogen system; the unloading and loading of catalyst under inert or normal atmospheres; the dense phase loading systems; and the innovative, purpose built-equipment ensuring low catalyst attrition rate. Further, the course also covers the catalyst sampling and particle measurement; the vacuum unloading with closed loop nitrogen recirculation; the catalyst transportation, storage & containment (unapproved); the tubular reformer loadings using unidense? loading and conventional techniques; the pre-sulphiding (DMDS injection); the metals reclamation and disposal of materials; the shutdown planning, coordination and execution; the edge equipment; the modifications for catalytic reactors, vessels on a blinds to blinds? basis; and the confined space and inert/toxic

entry operations.

During this interactive course, participants will learn the unloading of catalyst under inert/toxic atmosphere; the screening of catalyst under continuous nitrogen purging; the loading by conventional and licensed loading technologies; the HSE requirement; the environment requirement; the catalyst change/replacement report; and the catalyst change learned lessons and case studies.

## What are the Goals?

Upon the successful completion of this course, each participant will be able to: -

- Apply systematic techniques in handling, loading, unloading, oxidation and reduction of catalyst material handling
- Prepare catalyst change plan and execute catalyst projects efficiently and safely with minimal delays from fusing, minimal catalyst attrition and dust control systems
- Identify catalyst change operation main requirements including pre-commissioning of reactors and vessels
- Determine work in inert and toxic atmospheres in hot and hostile environments as well as reactor cooling utilizing a proprietary liquid nitrogen system
- Unload and load catalyst under inert or normal atmospheres and dense phase loading systems
- Use dense phase loading system in transferring catalyst directly from grade to reactor man way without using cranes and hoppers
- Describe innovative and purpose-built equipment ensuring low

catalyst attrition rate and perform catalyst sampling and particle measurement

- Employ vacuum unloading with closed loop nitrogen re-circulation and catalyst transportation, storage and containment
- Use tubular reformer loadings using unidense loading and conventional techniques
- Perform pre-sulphiding, metals reclamation, disposal of materials, shutdown planning, coordination and execution
- Describe edge equipment, modification for catalyst reactors, vessels on a blinds-to-blinds basis, confined space and inert toxic entry operations
- Unload catalyst under inert/toxic atmosphere, screen catalyst under continuous nitrogen purging and apply loading by convention and licensed loading technologies
- Enumerate HSE requirement, environment requirement, catalyst change/replacement report and lesson learned

## Who is this Training Course for?

This course covers systematic techniques of catalyst material handling for those who are involved in loading, unloading, oxidation and reduction. This includes refinery, chemicals and petrochemical engineers, supervisors and operation staff.

## How will this Training Course be Presented?

In addition to a set of slides and a training manual, a highly interactive instructor presentation of the most important concepts, procedures, and issues will be provided. Furthermore, the course will also use several interactive Workshops and Exercises. In addition, a selected number of highly appropriate Videos will be shown.

## Organisational Impact

Upon returning to their organization, employees will have:

- ☒ **Operational Efficiency:** Efficient loading and unloading of catalyst materials are vital for maintaining continuous production processes. Proper handling techniques ensure minimal downtime due to maintenance, replacement, or cleaning of catalyst beds. Organizations that excel in catalyst material handling can optimize their operational efficiency, leading to higher productivity and cost savings.
  
- ☒ **Product Quality:** Catalysts directly influence the quality of products in many industrial processes. Effective handling techniques help maintain the integrity and effectiveness of catalyst materials, ensuring consistent product quality. Organizations that prioritize proper handling techniques can achieve better control over product specifications, reducing variability and enhancing customer satisfaction.

- ☒ **Safety and Environmental Compliance:** Catalyst materials can pose safety risks if mishandled, especially if they are reactive, toxic, or hazardous. Organizations must implement robust handling procedures to mitigate risks to personnel, the surrounding environment, and the community. Compliance with safety regulations and environmental standards is crucial for avoiding accidents, minimizing liabilities, and maintaining a positive reputation.
- ☒ **Cost Management:** Efficient handling of catalyst materials can contribute to cost savings in several ways. Minimizing waste, preventing contamination, and extending the lifespan of catalysts through proper handling techniques help reduce operational costs. Additionally, optimized loading and unloading processes can lower labor expenses and minimize the need for frequent replacements or repairs.
- ☒ **Process Optimization and Innovation:** Organizations that invest in research and development to improve catalyst handling techniques can gain a competitive edge. Innovations in loading, unloading, oxidation, reduction, and other handling processes can lead to breakthroughs in catalyst performance, process efficiency, and product innovation. Continuous improvement in catalyst material handling techniques enables organizations to adapt to changing market demands and technological advancements.
- ☒ **Supply Chain Resilience:** Reliable access to high-quality catalyst materials is essential for maintaining a resilient supply chain.

Organizations must establish robust supplier relationships, ensure consistent material specifications, and implement contingency plans to mitigate supply chain disruptions. Effective handling practices contribute to supply chain stability, enabling organizations to respond effectively to market fluctuations and unforeseen challenges.

In summary, catalyst material handling has a multifaceted impact on organizations, encompassing operational efficiency, product quality, safety, cost management, innovation, and supply chain resilience. By prioritizing proper handling techniques and investing in continuous improvement, organizations can enhance their competitiveness, sustainability, and long-term success in industries reliant on catalyst-driven processes.

## Personal Impact

Participants will gain in depth understanding of:

- ☒ **Efficiency and Productivity:** Effective handling techniques can significantly enhance efficiency and productivity in catalyst processes. Proper loading and unloading procedures ensure minimal downtime and maximize the utilization of catalyst materials.
- ☒ **Quality Control:** Accurate handling techniques are crucial for maintaining the integrity and quality of catalyst materials. Improper handling can lead to contamination, degradation, or loss of catalytic activity, impacting the overall process performance.
- ☒ **Safety:** Catalyst materials can be hazardous if mishandled. Ensuring proper safety protocols during loading, unloading, and handling procedures is essential

to mitigate risks associated with toxic, reactive, or flammable catalysts.

- ☒ **Cost Optimization:** Efficient handling practices contribute to cost optimization by reducing material wastage, minimizing downtime, and extending the lifespan of catalyst materials through careful handling and storage.
- ☒ **Environmental Impact:** Catalyst materials play a significant role in environmental remediation and pollution control processes. Proper handling techniques ensure the effective utilization of catalysts in processes such as oxidation and reduction, leading to reduced emissions and environmental impact.
- ☒ **Technology Advancement:** Advancements in handling techniques, such as automation, robotics, and advanced monitoring systems, contribute to the optimization of catalyst material handling processes, enhancing overall efficiency and performance.
- ☒ **Regulatory Compliance:** Adherence to regulatory requirements regarding the handling, storage, and disposal of catalyst materials is essential for compliance with environmental and safety regulations. Personnel involved in catalyst material handling must be adequately trained to ensure regulatory compliance.
- ☒ **Innovation in Catalyst Design:** Personal involvement in catalyst material handling can inspire innovation in catalyst design and development to improve handling characteristics, stability, and performance, leading to enhanced efficiency and sustainability of catalytic processes.

Overall, personal impact in catalyst material handling encompasses various aspects, including operational efficiency, safety, environmental sustainability, and technological advancement, all of which contribute to the overall success

and effectiveness of catalytic processes.

## Course Outlines:

### Day 1:

- Welcome & Introduction
- PRE-TEST
- Preparing Catalyst Change Plan
- Execute Catalyst Project Efficiently & Safely
  - Minimal Delays from Fusing.
  - Minimal Catalyst Attrition.
  - Dust Control Systems.
- Catalyst Change Operation Main Requirement
  - Pre-Commissioning of Reactors & Vessels
- Work in Inert & Toxic Atmospheres Plus Hot & Hostile Environments
- Case Study & Related Video
- Recap



## Day 2:

- Reactor Cooling Utilizing a Proprietary Liquid Nitrogen System
- Unloading & Loading of Catalyst Under Inert or Normal Atmospheres
- Dense Phase Loading Systems
  - Transfer of Catalyst Directly from Grade to Reactor Man Way, Without the Use of Cranes & Hoppers
- Innovative, Purpose Built-Equipment Ensuring Low Catalyst Attrition Rate
- Case Study & Related Video
- Recap

## Day 3:

- Catalyst Sampling & Particle Measurement
- Vacuum Unloading with Closed Loop Nitrogen Re-Circulation
- Catalyst Transportation, Storage & Containment (UN approved)
  - Catalyst Loading of Reactors Using UOP® Dense Loading & Conventional Techniques
- Tubular Reformer Loadings using Unidense® Loading & Conventional Techniques
- Pre-Sulphiding (DMDS Injection)
- Case Study & Related Video
- Recap

## Day 4:

- Metals Reclamation & Disposal of Materials
- Shutdown Planning, Coordination & Execution
- Edge Equipment
  - Life Support Systems.
  - Vacuum Unloading.
  - Screening Equipment.
  - Modular Equipment.
- Modifications for Catalytic Reactors, Vessels Etc. on a Blinds to Blinds'
- Basis
- Confined Space & Inert/Toxic Entry Operations
- Case Study & Related Video
- Recap

## Day 5:

- Unloading of Catalyst Under Inert/Toxic Atmosphere
- Screening of Catalyst Under Continuous Nitrogen Purging
- Loading by Conventional & Licensed Loading Technologies
- HSE Requirement
- Environment Requirement
- Catalyst Change/Replacement Report
- Catalyst Change Learned Lessons



# Training Program Outlines

- Course Conclusion
- POST-TEST

## Course Completion Certificate

On successful completion of the Training Course, the participants will be awarded with a 5M International Consultancy & Training Company Certificate.

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