

<p style="text-align: center;"><b>KLM Technology Group</b></p> <p style="text-align: center;">Practical Engineering Guidelines for Processing Plant Solutions</p>	<div style="text-align: center;">  <p><b>Engineering Solutions Consulting, Guidelines, and Training</b></p> <p><a href="http://www.klmtechgroup.com">www.klmtechgroup.com</a></p> </div>	<p style="text-align: center;">Page 1 of 9</p> <p style="text-align: center;">Rev 1.0</p>
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## **Fundamentals of Refinery Catalytic Unit Operations Training Course**

### **Introduction**

The success of every company depends of each employee's understanding of the business's key components. Employee training and development will unlock the companies' profitability and reliability. When people, processes, and technology work together as a team developing practical solutions, companies can maximize profitability and assets in a sustainable manner.

It is strategically important that your group understands the fundamentals of project management. This is the difference between being in the best quartile of project management and being in the last quartile. There is vast difference in the ability of companies and most benchmarking studies have confirmed this gap in abilities.

Whether you have a team of new or seasoned employees, an introduction or review of these concepts is greatly beneficial in closing the gap if you are not in the best quartile or maintaining a leadership position. Most studies show that a continuous reinforcement of best practices in project management principles is the most effective way to obtain the desired results. Training and learning should be an ongoing continuous lifelong goal.

Most unit operations are divided in to two sectors; the reactor section and the separation section. The high value products are produced in the reactor section and purified in the separation section. The proper reactor design and catalyst selection can greatly improve company profit margins. The net effect is to produce increasing amounts of higher value products by improving selectivity.

Reactor design and catalyst developments are one of the largest Research and Development (R&D) Divisions in Chemical Engineering. To stay abreast of the current reactor designs and catalyst developments should be an operations personnel's target.

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### **Course Objective**

This course will guide the participants to develop key concepts and techniques to operate, select and optimize refinery catalytic unit operations processes. These key concepts can be utilized to make design and operating decisions. Training and development is an investment in future success – give yourself and your employees the keys to success.

This course covers a general overview of the Catalytic Processes in a Refinery and how each integrates with the high value products, with a special emphasis on Fluidized Catalytic Crackers, and Catalytic Reformers. A history of each Catalytic Process will be reviewed including; process description, process variables, reaction chemistry, catalyst development and evaluation.

### **Course Duration and Delivery**

Typical course duration is 3 to 5 days based on the background of the participants. One of our Senior Technical Professional with over 25 years of experience would lead the class. Instruction can be in house or in an online webinar.

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## Typical Course Outline

### Introduction

- Overview of the Processing Industry
- Safety for the Processing Industry

### Introduction to Refining

- Refinery Overview
- Chemistry Overview

### Alkylation

1. Introduction
2. History
3. Process Overview
4. Process Chemistry  
Feedstock, Reaction, Catalyst
5. Process Variables
6. Common Problems
7. Advance in Cat Development
8. Catalyst Evaluation Techniques
9. Summary

## Hydrogenation

1. Introduction
2. History
3. Process Overview
4. Process Chemistry  
Feedstock, Reaction, Catalyst
5. Process Variables
6. Common Problems
7. Advance in Cat Development
8. Catalyst Evaluation Techniques
9. Summary

## Dehydrogenation

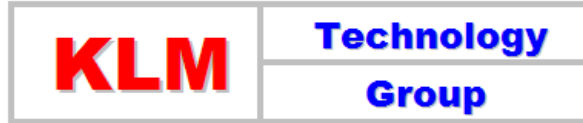
1. Introduction
2. History
3. Process Overview
4. Process Chemistry  
Feedstock, Reaction, Catalyst
5. Process Variables
6. Common Problems
7. Advance in Cat Development
8. Catalyst Evaluation Techniques
9. Summary

### Isomerization

1. Introduction
2. History
3. Process Overview
4. Process Chemistry  
Feedstock, Reaction, Catalyst
5. Process Variables
6. Common Problems
7. Advance in Cat Development
8. Catalyst Evaluation Techniques
9. Summary

### Hydrocracking and De-Alkylation

1. Introduction
2. History
3. Process Overview
4. Process Chemistry  
Feedstock, Reaction, Catalyst
5. Process Variables
6. Common Problems
7. Advance in Cat Development
8. Catalyst Evaluation Techniques
9. Summary



### Fluidized Catalytic Cracking

1. Introduction
2. History
3. Process Overview
4. Process Chemistry  
Feedstock, Reaction, Catalyst
5. Process Variables
6. Common Problems
7. Advance in Cat Development
8. Catalyst Evaluation Techniques
9. Summary

### Hydrotreating / Hydrodesulfurization

1. Introduction
2. History
3. Process Overview
4. Process Chemistry  
Feedstock, Reaction, Catalyst
5. Process Variables
6. Common Problems
7. Advance in Cat Development
8. Catalyst Evaluation Techniques
9. Summary

## Catalytic Reforming

1. Introduction
2. History
3. Process Overview
4. Process Chemistry  
Feedstock, Reaction, Catalyst
5. Process Variables
6. Common Problems
7. Advance in Cat Development
8. Catalyst Evaluation Techniques
9. Summary

## Summary

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## Who Should Attend

- People who are making day to day decisions regarding operation, design, maintenance, and economics of process industry plants.
  1. 1<sup>st</sup> Line Operations personnel,
  2. Operation Supervisors,
  3. 1<sup>st</sup> Line Maintenance personnel,
  4. Maintenance Supervisors,
  5. Senior Plant Supervisors,
  6. Operations Engineers
  7. Process Support Engineers,
  8. Design Engineers,
  9. Cost Engineers
  
- An engineer or chemist who must troubleshoot and solve catalyst problems in a plant, an engineering office or laboratory.
- Technical Engineers, Operating Engineers, Process Support Personnel, Chemist, and Managers
- Engineering graduates/technologists who will be using catalyst in their daily work.
- Technical Process engineers doing process design and optimization projects and studies that need who need advanced skills for more complex modeling tasks.
- Plant Operation Support Engineers checking plant performance under different operating conditions, and who are involved in design of new facilities or revamps of existing facilities.
- R&D engineers and researchers using catalyst for process synthesis, upgrade or modifications.



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- Ideal for veterans and those with only a few years of experience who want to review or broaden their understanding of process safety.
- Other professionals who desire a better understanding of the subject matter.

### **What You Can Expect To Gain**

- Overview of the Catalytic Processes in a Refinery, with a special emphasis on Fluidized Catalytic Crackers, Hydrotreaters and Catalytic Reformers.
- Catalyst Evaluation Techniques
- An understanding of Reactor and Catalyst interaction
- The operation, control and trouble shooting of a reactors and associated equipment
- An overview of reactors, practical solutions as well as theory
- An understanding of essential reaction concepts
- Valuable practical insights for trouble free design and field proven techniques for commissioning, start up and shutdown of reactor operations
- To tailor your approach to specific design, analysis and trouble shooting problems.