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# Fundamentals of Chemical Engineering Process Equipment Design

## 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 operations team understands the fundamentals of process unit operations concepts. This is the difference between being in the best quartile of operational ability and being in the last quartile. There is vast difference in the operational ability of operating companies and most benchmarking studies have confirmed this gap in operational abilities.

Whether you have a team of new or seasoned employees, an introduction or review of these concepts is very 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 operational principles is the most effective way to obtain the desired results. Training and learning should be an on going continuous life long goal.

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## Course Objective

This course will guide the participants to develop key concepts and techniques to design, process equipment in a process plant. 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.


A course such as these should almost be a requirement for young engineers and can be utilized as a refresher for engineers with experience. Understanding the practical applications of basic design engineering principles is a challenge for fresh graduates. Young engineers within the first year should be able to perform task such as;

1. Understand the content of process flow diagrams (PFD)
2. Understand the content of piping and instrument diagrams (P&ID)
3. Understand the calculation of line sizes and pressure drops
4. Understand flow measurement sizing and develop a flow measurement process data sheet
5. Understand control valve sizing and develop a control valve process data sheet
6. Understand relief valve sizing and develop a relief valve process data sheet
7. Understand flash drum sizing and develop a flash drum process data sheet
8. Understand distillation tray sizing and develop a distillation tray process data sheet
9. Understand heat exchanger sizing and develop a heat exchanger data sheet
10. Understand pump sizing and develop a pump data sheet
11. Understand compressor sizing and develop a compressor data sheet
12. Understand flare sizing and develop a flare data sheet
13. Understand the relationship between process design and Safety

There are many industry programs that will size many of these pieces of equipment; some are even developed by KLM Technology Group. Without a fundamental understanding of the basic concepts utilized in the programs, these programs can lead to incorrect solutions and potential safety hazards. It is critically important that your process team understand the basic fundamentals of process design.

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## What You Can Expect To Gain;

- Understand the practical applications of basic design engineering principles
  1. Understand the calculation of line sizes and pressure drops
  2. Understand flow measurement sizing and develop a flow measurement process data sheet
  3. Understand control valve sizing and develop a control valve process data sheet
  4. Understand relief valve sizing and develop a relief valve process data sheet
  5. Understand flash drum sizing and develop a flash drum process data sheet
  6. Understand distillation tray sizing and develop a distillation tray process data sheet
  7. Understand heat exchanger sizing and develop a heat exchanger data sheet
  9. Understand pump sizing and develop a pump data sheet
  10. Understand compressor sizing and develop a compressor data sheet
  11. Understand flare sizing and develop a flare data sheet
- Understand content and applications of process flow diagrams (PFDs) and piping and instrument diagrams (P&IDs)
- Understand key criteria involved in the specification of process equipment and instrumentation
- Understand the relationship between process design and safety

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## Course Syllabus

The goal of the course would be to refresh the knowledge of those who have a basic understanding of process equipment design techniques and to build a foundation to those who are new to the design.

### Typical Course Outline

#### A. Introduction

1. Introduction to the Process Industry
2. Safety for the Process Industry

#### B. Review of PFD

#### C. Review of P&ID

#### D. Understand the calculation of line sizes and pressure drops


1. Review of the Fundamentals
2. Application to Process Plants
3. Review of KLM Technology Group guidelines and developed program

#### E. Understand flow measurement sizing and develop a flow measurement process data sheet

1. Review of the Fundamentals
2. Application to Process Plants
3. Review of KLM Technology Group guidelines and developed program
4. Case Example – develop process data sheet

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F. Understand control valve sizing and develop a control valve process data sheet

1. Review of the Fundamentals
2. Application to Process Plants
3. Review of KLM Technology Group guidelines and developed program
4. Case Example – develop process data sheet

G. Understand relief valve sizing and develop a relief valve process data sheet

1. Review of the Fundamentals
2. Application to Process Plants
3. Review of KLM Technology Group guidelines and developed program
4. Case Example – develop process data sheet

H. Understand flash drum sizing and develop a flash drum process data sheet


1. Review of the Fundamentals
2. Application to Process Plants
3. Review of KLM Technology Group guidelines and developed program
4. Case Example – develop process data sheet

I. Understand distillation tray sizing and develop a distillation tray process data sheet

1. Review of the Fundamentals
2. Application to Process Plants
3. Review of KLM Technology Group guidelines and developed program
4. Case Example – develop process data sheet

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- J. Understand heat exchanger sizing and develop a heat exchanger data sheet
1. Review of the Fundamentals
  2. Application to Process Plants
  3. Review of KLM Technology Group guidelines and developed program
  4. Case Example – develop process data sheet
- K. Understand pump sizing and develop a pump data sheet
1. Review of the Fundamentals
  2. Application to Process Plants
  3. Review of KLM Technology Group guidelines and developed program
  4. Case Example – develop process data sheet
- L. Understand compressor sizing and develop a compressor data sheet
1. Review of the Fundamentals
  2. Application to Process Plants
  3. Review of KLM Technology Group guidelines and developed program
  4. Case Example – develop process data sheet
- M. Understand flare sizing and develop a flare data sheet
1. Review of the Fundamentals
  2. Application to Process Plants
  3. Review of KLM Technology Group guidelines and developed program
  4. Case Example – develop process data sheet
- N. Understand the relationship between process design and Safety

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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. Fresh Engineering Graduates
  2. Operations Engineers
  3. Process Support Engineers,
  4. Design Engineers,
  5. Cost Engineers
- An engineer who must troubleshoot and solve problems in a plant or an engineering office
- Technical Engineers, Operating Engineers, Process Support Personnel,
- Engineering graduates/technologists who will be reviewing and designing process equipment in their daily work.
- Technical Process engineers doing process design and optimization projects and studies that need who need advanced skills.
- 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.
- 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.

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