

Pumps and Pumping Systems Optimization

Course general description:

Pumps of various designs and applications are encountered nowadays throughout petrochemical and process industries as well as in power generation and environmental engineering. Pumping systems have to provide efficient transport of various liquids, sometimes complex and difficult two-phase fluids. Although there has been great progress in pump design in recent years, there are still many issues related to the mechanical and hydraulic problems to be considered that are associated with efficient operation of the whole pumping system. There is always need for optimization of the pumping system in operation with the goal of reducing the overall costs of production. This intensive Pumps & Pumping Systems Optimization training course will provide an overview of important technical aspects of pumps and pumping systems as encountered in industrial applications. Of special interest will be centrifugal pumps as well as other types of positive displacement pumps. This course will also concentrate on the thorough understanding of technical principles of fluid flow in pumping systems as a prerequisite for successful pump operation. The focus will be on the elimination of potential problems as well as on pump inspection and condition monitoring. The training course will include several real-life case studies that will be solved in the form of workshops in order to illustrate the methods of efficient operation and maintenance of pumping systems.

Audience:

This course is designed for:

1. Mechanical & Process engineers who are working in petrochemical and process industry
2. Technologists in Power Generation, Water Supply & Environmental Engineering
3. Technical personnel who deal with piping and flow control systems
4. Operators & Maintenance personnel
5. Technical personnel in charge of inspection of pumping system

Course objectives:

The course objectives are:

1. Make the adequate selection of various types of pumps based on the application
2. Optimize the efficiency of operation of pumping systems
3. Analyze the problems in operation related to seals, bearings and flow control
4. Use the root cause analysis in detecting problems of pumping system & piping
5. Apply the best practices for maintenance, problem solving & troubleshooting

Course duration:

5 days

Course location:

Cairo-Dubai-Istanbul

Course contents:

Day-1

- Pretest

- Overview of Pumps and Pump Design Elements
 - Overview of Centrifugal Pumps Based on Design and Application
 - Reciprocating and rotary positive displacement pumps
 - Main elements of centrifugal pump construction
 - Critical Pump Elements: Seals & Bearings
 - Pumps for special applications
 - Workshop: Examples and Problem Solutions
 - Workshop: Examples and solutions

Day-2

- Centrifugal Pump Q-H Characteristics
 - Pump Characteristic Curve (Q-H) and selection of BEP
 - Calculation of Net Positive Suction Head (NPSH)
 - Cavitation Prevention and Suction Piping Design
 - Parallel & Series of Pumps in Operation
 - Pump Capacity Control Methods: Throttling, Speed Variation, etc.
 - Workshop: Examples and Problem Solutions

Day-3

- Pumping System Layout and Hydraulic Calculations
 - Principles of Piping Layout & Safety Requirements
 - Calculation of Friction Losses & Pressure Drop in piping systems
 - Pipe sizing based on Pumping Power requirements
 - Piping Load estimates: Stresses and Thermal movements
 - Pipe Vibrations and Support Systems Selection
 - Workshop: Examples and Problem Solutions

Day-4

- Pumping System Optimization
 - Pumping System Efficiency Analysis
 - Reasons for Inefficiency of Pumping Systems
 - Steps in Successful Pumping System Optimization
 - Pump Inspection, Control & Performance Testing
 - Condition Monitoring and Vibration Analysis
 - Workshop: Examples and Problem Solutions

Day-5

- Pump Installation, Maintenance & Troubleshooting
 - Installation, Commissioning and Start-Up of Pumping Systems
 - Importance of Proper Pump Alignment
 - Root Cause Analysis of Typical Pump Problems in Operation
 - Optimization of Maintenance Procedure of Pumping Systems
 - Troubleshooting of Problems in Operation
 - Summary & Conclusions
- Posttest

Methodology:

- 50% lectures & concepts
- 10% Videos
- 10% Case studies
- 10% Exercises
- 10% Discussions
- 10% Software (if applicable or examples)

Course code: (TEME039)