

## Hydraulics (Hands-On)

This five-day course provides participants with an excellent understanding of the principles of hydrostatics and hydrodynamics which serve as the foundation for discussions of hydraulic system component functions and operations. The course then progresses to troubleshooting methodology as applied to hydraulic systems, both complex and simple.

### I. Introduction to Hydraulic Components

- System Familiarization
- Introduction to Hydraulic Systems
- Hydraulic Fluids
- Filtration Systems
- Hydraulic Pumps
- Pressure Control Devices
- Manual Directional Control Valves
- Check Valves
- Needle Valves
- Hydraulic Cylinders
- Hydraulic Flow Control Valves

### II. Hydraulic Applications Laboratories

- Paired Cylinders in a Circuit
- Hydraulic Press Application
- Hydraulic Jack Application
- Hydraulic Positioner Application
- Hydraulic Symbols and Schematics

### III. Physical Properties of Hydraulic Systems

- Flow Rate in Hydraulic Systems
- Force In Hydraulic Systems
- Hydraulic Force Transformers
- Work Done with Hydraulic Systems
- Power in Hydraulic Systems
- Energy in Hydraulic Systems

- Pressure Drop in Pipes and Components

### IV. Hydraulic Pump Design

- Standards
- Applications
- Pump Classifications
- Basic Pump Types
- Dynamic (Kinetic)
- Centrifugal Pump Classes
- Terminology

### V. Pump Operation and Theory

- Centrifugal Pumps
- Design Aspects
- Pump Laws
- Positive-Displacement Pumps
- Pump Performance Comparisons
- Special Purpose Pumps
- Pump Characteristic Curves
- Performance Testing of Centrifugal Pumps

### VI. Rotary Pump Troubleshooting and Maintenance

- Pump Performance
- Pump Tests
- Weigh Liquid
- Rotary Pump Problems
- Rotary Pump Maintenance

## **VII. Reciprocating Pump Troubleshooting and Maintenance**

- Steam Pumps
- Troubleshooting Pumps
- Metering Pumps
- Axial- and Radial-Piston Pumps
- Hydraulic Pump Maintenance
- Axial-Piston Pump Maintenance
- Radial Piston Pumps