Best Technology Soultions **(BTS)**

Training Program

# Features & Technology Of Pumps & Pipe Systems

## Training Program

## Introduction:

The reliable operation of pumps and the integrity of connected pipework is essential to the cost effective operation of industrial facilities. This course will describe the function of both positive displacement and centrifugal pumps, discuss the operational characteristics and explain the maintenance requirements. Additionally, this course will discuss the various aspects of fluid flow in pipes and the requirements for the safe, compliant operation of pipe systems. The course will feature:

- Positive displacement pumps
- Centrifugal pumps
- Cavitation
- Pump components
- Pump installation & selection
- Pipe connections & systems
- Pipe stresses
- Fluid flow in pipes
- Pump & pipe condition monitoring
- Maintenance of pumps & pipe systems

## Who Should Attend?

Mechanical Engineers, General Supervisors, Consulting Engineers, Design Engineers, Foremen, Supervisors, Technicians, Maintenance Personnel, Engineers of all disciplines, Supervisors, Team Leaders and Professionals in Maintenance, Engineering and Production Managers, Maintenance Personnel, Heads of Maintenance and Operation, Chemical Engineers, Equipment Specialists, Technical Engineers, Operation Engineers, Planning Engineers, Process Engineers, Reliability Specialists, Boiler Plant Construction Managers, Consulting Engineers, Design Engineers, Insurance Company Inspectors, Operation, Maintenance, Inspection and Repair Managers, Supervisors and Engineers, Plant Engineers, Senior Boiler Plant Operators, Repairers and Installers, Project Engineers and Technologists, Facility Engineers, Consultants, Mechanical Engineers and Technologists, Maintenance and Operation Personnel, Plant/Facility Engineers, Technicians, Maintainers, Operators, Chemical Engineers & Technologists, Process Engineers & Technologists, Project Engineers & Technologists, Technicians & Supervisors who need to be familiar with the fundamentals associated with pumps and pipe systems, Plant & Facilities Operations Personnel Technicians & Supervisors responsible for plants and facilities, Stationary Engineers, Consultants & Contractors, Personnel in the food, chemical, petrochemical, pulp and paper, pharmaceutical, water utility and energy industries will find this course of particular interest

## Course Objectives:

**By the end of this course, delegates will be able to:**

- Gain an awareness of the performance characteristics of positive displacement and centrifugal pumps
- Gain an awareness of pipe system codes, standards, design and operation
- Become familiar with the fundamentals of pipe flow and pressure drop
- Understand the inspection and maintenance practices associated with pumps and pipe systems

## Course Outline:

**Introduction & General Information**

- Fluid characteristics
- Inertia pressure and jet force

- Fluid flow in pipes
- Fluid pressure & velocity relationships
- Valves - types and valve actuators
- Filters and strainers
- Properties of materials
- Welding practices & processes
- Lubrication - oils & greases, viscosity

**Regulations, Codes and Standards**

**Positive Displacement Pumps**

- Reciprocating: piston, plunger & diaphragm pumps
- Rotating: gear, lobe, screw, vane, progressive cavity & peristaltic pumps

**Centrifugal Pumps**

- Pressure & velocity relationships
- Impellers
- Performance curves
- System head
- Efficiency

**Affinity Laws**

- Series and parallel operation
- Flow control

**Cavitation**

- Vaporization, internal recirculation and air ingestion
- Net positive suction head

**Pump Components**

- Seals
- Ball and journal bearings
- Motors
- Pump/motor couplings
- Variable speed drives
- Belt drives
- Magnetic drive pumps

**Pump Condition Monitoring**

- Flow
- Pressure
- Temperature
- Level
- Vibration
- Oil analysis

**General Operating Considerations**

- Potential pump problems

**Pump Preventive Maintenance Program**

- Pump operating and maintenance costs
- Economic decision making

**Pump Installation**

- Supply tank suction
- Suction piping

- Discharge piping
- Foundations

**Pump Selection**

- Positive displacement versus centrifugal pumps
- Centrifugal pump types
- Selection considerations
- API pump codes

**Piping: General Overview of Industrial Piping**

- Pipe uses and designations
- Pipe sizes
- Pipe weights
- Pipe manufacture
- Pipe supply

**Pipe Connections**

- Fittings
- Joints – welded, bolted and threaded
- Gaskets

**Pipes as Structures**

- Theory of simple bending
- Basis of pipe stress code formulas

**Common Pipe Regulations, Codes and Standards: Pipe Stresses & Code Formulas**

- Sustained loads

- Occasional loads - wind, snow, ice, earthquake, vibration, water hammer, impact loads
- Thermal effects
- Pipe flexibility

**Piping Systems**

- Pipe supports
- Insulation and heat tracing

**Piping Systems Design Layouts**

- P & I D's
- Pipe flexibility
- Layout considerations

**Fluid Flow in Pipes**

- Types of flow
- Losses in pipes
- Transition losses
- Pipes in series and parallel
- Two phase flow

**Inspection and Maintenance of Pipe Systems**

- Erosion & corrosion
- Thermography
- Non-destructive examination
- Ice plugs
- Development of preventive maintenance program