Best Technology Soultions **(BTS)**

Training Program

Mechanical Engineering For Non-Mechanical Engineers

Training Program

Introduction:

Engineers, technicians, maintainers and operators who may not have a mechanical background are often given the responsibility for the procurement, installation, operation and maintenance of mechanical equipment. To be effective, such personnel should have a fundamental understanding of the principles that dictate the design, operation and maintenance of this mechanical equipment. The course will emphasize practicality and cost effectiveness. This course is designed to meet the needs of individuals of all disciplines and will also benefit those with a mechanical background seeking to refresh their knowledge.

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

- Basic metallurgy & properties of materials
- Metal fabrication

- Maintenance & planning practices
- Power transmission
- Lubrication & bearings
- Pressure vessels & storage tanks
- Boilers & process heaters
- Industrial piping
- Pumps, fans & compressors
- Equipment reliability

Course Objectives:

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

- Apply practical knowledge regarding the operation and maintenance of mechanical equipment
- Add to your ability to achieve a cost-effective approach to the use of mechanical equipment
- Implement a process to improve equipment reliability
- Select the most appropriate equipment that meets the specific needs of your industrial processes

Course Outline:

Introductions to Mechanical Engineering

- Safety
- Economy
- Reliability

Regulations Codes and Standards: Engineering Materials

- Basic metallurgy
- Heat treatment of metals
- Properties of materials
- Behavior of metals
- Mechanical properties of materials
- Non-destructive examination (NDE)

Metal Fabrication Processes

- Welding
- Machining and machineability
- Metal forming – stamping & pressing, spinning, forging, casting
- Limits and fits
- Bolting and gaskets

Maintenance & Planning Practices

- Maintenance definitions
- Maintenance strategy
- Prioritizing maintenance work
- Planning & scheduling
- Maintenance measures

Torque and Power

- Basic theory
- Shafts
- Flywheels
- Power screws

Power Transmission

- Belt drives
- Gearing
- Cams
- Couplings
- Mechanical fastening
- Clutches

Lubrication

- Static and dynamic friction
- Lubricant viscosity
- Oils and greases

Bearings

- Hydrostatic and hydrodynamic journal bearings
- Rolling element bearings – types and components
- Ball, roller and CARB bearings
- Rolling element bearing life and reliability
- Rolling element bearing failure characteristics

Pressure Vessels

- Types
- Major components
- Codes and regulations
- Design
- Protection
- Repairs and alterations

Liquid Storage Tanks

- Types and applications
- Emissions
- Specifications, codes and standards
- Leaks
- Maintenance
- Foundations

Heat Transfer Systems and Equipment

- Heat transfer
- Conduction
- Convection
- Radiation
- Phase change
- Evaporation and vapor pressure
- Basic terms
- Heat exchangers
- Components and types
- Shell and tube
- Plate heat exchangers
- Air cooled heat exchangers
- Calculations
- Maintenance

Fired Boilers, Process Heaters and Heat Recovery Equipment

- Fuels and combustion
- Fuel burners
- Industrial boilers

- Packaged fire tube boilers
- Fired process heaters
- Condensers
- Waste heat recovery
- Cogeneration
- Operation and efficiency

Instrumentation and Control

- Temperature monitoring
- Pressure monitoring
- Level monitoring
- Flow monitoring
- Position monitoring
- Control systems
- Automatic control
- Proportional control

Fluid Engineering

- Mechanics of fluids
- Properties of fluids
- Flow of fluids
- Flow in pipes

Industrial Piping

- General overview
- Pipe manufacture and materials
- Fittings and joints
- Valves, filters and strainers

- Regulations, codes and standards
- Pipe stresses
- Sustained loads
- Occasional loads
- Expansion loads
- Pipe supports
- Insulation and heat tracing

Pumps

- Positive displacement pumps
- Reciprocating
- Rotating
- Centrifugal pumps
- Cavitation
- Performance curves
- Affinity laws
- Multi-pump systems
- Magnetic drive pumps
- Pump selection

Fans and Compressors

- Fans
- Axial
- Centrifugal
- Performance
- Effects of gas temperature and density
- Efficiency
- Association
- Compressors

- Basic theory of compressed gasses
- Compression cycle
- Standard terms
- Effect of elevation and temperature
- Types of compressors
- Positive displacement
- Dynamic
- Compressor flow regulation
- Associated compressor equipment
- Filters
- Intercoolers and aftercoolers
- Dryers
- Air receivers
- Compressed air systems
- Pressure drop
- Air lines
- Demand assessment
- Basic design of compressor facilities

HVAC and Refrigeration Systems

- HVAC
- Purpose and design
- System components
- Codes and regulations
- Air systems
- Variable air volume (VAV) systems
- Acoustic and noise control
- Refrigeration
- Major components

- Cycle
- Chillers
- Heat absorption
- Packaged HVAC specifications

Process and Instrument Diagrams

- P & I D symbols
- Isometrics

Miscellaneous Mechanical Components

- Sealing devices
- Packing
- 'O' rings
- Mechanical seals
- Motors
- AC and DC motors
- Variable frequency drives

Equipment Reliability

- Failure and risk
- Maintaining for improved reliability