



# Introduction To Static Equipment (Valves, Pressure Vessels; Piping & Heat Exchangers)



## Introduction:

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Introduce a team of fresh Mechanical Graduates, with different backgrounds, to various static equipments used in oil & Gas industry; particularly an overview of Block, PFD and P&ID presentation of equipments; construction and operation of separators, reactors, columns, filters, scrubbers, knockout drums and other pressure vessels, Tanks, flare and flare systems, valve types and their application; basics of heat exchange and exchangers.

## Who Should Attend?

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*Mechanical Engineering*

## Course outline:

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### Introduction

- Purpose & basics of schematics, block, Process Flow & Piping & Instrumentation diagrams
- Typical symbols used in P&ID diagrams
- Reading of P&ID diagrams

- Explaining phases and basic processes with Oil/Gas vessel i.e. separation, washing, sedimentation etc..

## Tanks

- Types and construction of Oil/Gas tanks.
- Floating/fixed roof tanks.
- Use and application of tanks; surge, buffer, storage etc..
- Main tank's control/monitoring and protection devices
- Applicable standards.

## Pressure vessels

- Purpose & utilization of various types of vessels (separator including three phase,
- filter, scrubber, columns, de-aerators etc..)
- Their principle of operation, construction and operating parameters/limitations.
- Identification on P&ID s.
- Main control/monitoring and protection devices
- Applicable standards

## Piping & flanges

- Purpose of piping and their material classification (metallic, non-metallic)
- Process piping classification, seamless, spiral and log. Welded pipes and their
- application in Oil & Gas.
- Basic process piping specifications; material. Schedule, pressure rating & sizes
- Applicable industry standards such as ANSI, API, DIN, ISO etc.
- Types of flanges and their use.
- Classes, material & ratings as per API, ANSI and ISO
- Flange bolts, their tightening sequence and torque values
- Gasket and joints used in piping systems.

- Basic installation and testing methods and procedures; welding, flanged, supports
- threaded & expansion loops, pressure testing.
- Pipe coating and protection

## Valves

- Purpose of valves and their application
- Types of valves, their components and utilization (gate, ball, butterfly, globe, plug, check, choke, needle, PSV etc.)
- Valve material (trim) and specifications
- Full bore/partial bore valves
- Sizes and classes/rating as per API, ANSI, ISO
- Operating and test pressure
- Valve operation/Actuators and their use (MOV, gearbox, diaphragm, pneumatic, hydraulic, manual etc.)
- Control valve and control trim
- Shut Down Valves (SDV) and principle of failsafe open/close
- Definition of PSV/PRV and principle of operation.
- Valve testing procedures (both normal and safety) and applicable standards
- Special valves such as solenoid, vacuum breaker, SCSSSV, pilot operated valves

## Heaters & heat exchangers

- Recap of principles of heat exchange; vaporization, condensation, conduction, convection, radiation
- Basic types of heat exchangers: parallel, counter and cross flow
- Temperature profiles in heat exchangers and basic terminology like approach & pinch point, mean temperature
- Basic calculations of heat exchangers.

- Types of heat exchangers (shell and tube, single and double & multi pass, bundle,fin, plate and fin, dual phase etc.)
- Materials and applicable standards
- Heaters and their types; fired and unfired types
- Construction & operating parameters
- Inspection requirements
- Testing procedures