



Fundamentals of Process & Mechanical Technology Conference

1 – 12 March 2027
Johannesburg (South Africa)



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Introduction

Process engineering is integral to the chemical, oil, gas, and petrochemical industries. The fundamentals of mechanical technology and process conference encapsulate materials handling in different states and the importance of separation processes, safety, and economics.

Process engineering and mechanical technology are crucial in the chemical, oil, gas, and petrochemical industries. A deep understanding of mechanical principles alongside chemical engineering concepts is essential.

This mechanical technology course will delve into mechanical technology and its pivotal role in the containment and movement of materials under various operational conditions. This fundamentals of mechanical technology and process conference provides an in-depth exploration of the mechanical technology systems employed within these industries, allowing professionals to fully grasp mechanical technology's benefits.

What is Mechanical Technology?

Mechanical technology involves applying principles of mechanics and energy to the design of machines and devices. The fundamentals of mechanical technology and process conference revolve primarily around generating and using heat and mechanical power and designing, producing, and operating machinery.

Part of the fundamentals of mechanical technology and process conference includes a hands-on mechanical technology workshop, which empowers participants to apply their knowledge practically. Workshops will tackle what a mechanical workshop entails and explore equipment, tools, and safety practices.

Throughout the fundamentals of mechanical technology and process course, we will clearly define mechanical technology and demonstrate its uses. We will also address its broad applications in industrial settings and cover various mechanical technology systems that enhance efficiency, safety, and reliability.

The Fundamentals of Mechanical Technology and Process Conference is an engineering technology conference where the latest in manufacturing technology and mechanical engineering will be shared. The fundamentals of mechanical technology will be dissected to enable delegates to harness cutting-edge technologies and best practices.

Targeted Groups:

- Petroleum Engineers.
- Maintenance and Production Engineers.
- Process Engineers.
- R&D Chemists and Plant Chemists.
- Economists and Business Managers.

Conference Objectives:

At the end of this fundamentals of mechanical technology and process conference, the participants will be able to:

- Apply a practical understanding of central issues in process and mechanical engineering to oil, gas, petrochemical, chemical, and allied facilities.
- Understand fundamental principles used in processes and facilities and apply a practical understanding of essential process units and classes of units involved in separations, heat exchange, and reactions.
- Apply practical understanding to static and rotating mechanical equipment and related condition mentoring and inspection techniques.
- Understand mechanical testing methods, Failure Mechanisms, fitness for Service, NDT, and the principles of corrosion and corrosion protection.
- Perform relevant calculations and analyses to assist in operating, sizing, and troubleshooting chemical processes and mechanical equipment.

Targeted Competencies:

At the end of this fundamentals of mechanical technology and process conference, the target competencies will be able to:

- Overview of a practical introduction to the fundamentals of process engineering.
- Overview of a practical introduction to Mechanical Engineering, Equipment, and Materials fundamentals.
- Key areas applicable to major process industries, especially oil, gas, and petrochemicals.
- Process and Mechanical Engineering Influence on Safety and Risk, Failure Modes and Maintenance.
- Learn about the links between the two engineering disciplines.
- Understand the mechanical design of pressure equipment and piping systems in compliance with applicable codes, standards, and regulations.
- Learn engineering materials properties and selection criteria for specific applications.
- Identify and assess active degradation mechanisms and the failures they may cause.
- Understand the various static and rotating equipment used in the petrochemical environment.
- Apply maintenance strategies and philosophies.
- Know condition monitoring, inspections, and assessments.

Conference Content:

Unit 1: Introduction and Fundamentals of Process Engineering:

- Process engineering basics.
- Mass and energy balances.
- Batch and Continuous Processes.
- Reactor types.
- Process Equipment and Flow Diagrams.
- P&IDs.
- Flammability.
- Electrical area classification.
- Risk Management and Hazard Studies.
- Hydraulics and Fluid flow.
- Pressure and head.
- Bernoulli's Theorem and its Field Applications.
- Flow of liquids.
- Reynolds number and pressure drop in pipes.
- Two-phase and multiphase flow.
- Enthalpy and thermodynamics.
- Principle of Process Relief Devices and Process Design of Relief Systems.
- Principles of Pressure Vessel and Piping Design.
- Pumps.
- Compressors.
- Mixers.
- Mechanical Equipment - Types and application guidelines.

Unit 2: Heat Transfer and Reaction Engineering:

- Heat Transfer.
- Thermal conductivity.
- Conduction and convection.
- Insulation.
- Heat transfer coefficients and calculation.
- Heat Exchangers, Type, and Sizing.
- Steam reboilers
- Condensers and subcooling.
- Introduction to energy recovery.
- Catalysis and Reaction Engineering.
- Chemical reactions.
- Reaction kinetics.
- Introduction catalysis.
- Green Chemistry and Engineering.
- Reactor Design and Operation.

Unit 3: Distillation Processes and Equipment:

- Distillation basics.
- Phase behavior and vapor/liquid equilibria.
- Gas/Liquid separation.
- Distillation equipment - Columns and vessels.
- Columns and vessels - Sizing and selection guidelines.
- Column and Vessel Internals - Types and Selection Guidelines.
- Troubleshooting of process equipment.
- Reactor Design and Operation.

Unit 4: Separation Processes and Equipment:

- Overview of Other Separation Processes.
- Absorption and adsorption.
- Amine sweetening.
- Solid Liquid separation.
- Effluent treatment [in refinery and petrochemical] industries.

Unit 5: Process Control and Economics:

- Process Control Basics.
- Classification of control systems.
- Measured variables.
- Simple feedback control.
- Process Economics.
- Preliminary economic analysis.
- Fixed and Variable Costs, Break-even Analysis.
- Calculate raw materials usage.
- Estimate the cost of process equipment and plants.

Unit 6: Introduction and Fundamentals:

- Engineering Material Properties.
- Stress and Strain.
- Fracture Failure, Modes, Stress Concentration, and Fracture Toughness.
- Fatigue Failure, Testing, and Mechanism.
- Temperature Considerations and Creep Failure.
- Identification of Damage Mechanisms.
- Mechanical Design.
- ASME and API.
- Codes and Standards.
- Design for static strength.

Unit 7: Materials Selection and Inspection:

- Materials Selection.
- Materials of Construction.
- Carbon Steels.
- Alloy Steels.
- Stainless Steels.
- Nickel-Based and Titanium Alloys.
- Inspection techniques.
- Visual.
- Penetrant.
- Magnetic Flux.
- Eddy Current Inspections.
- X-ray and Gamma-ray.
- Ultrasonics - TOFD and Pulse-Echo.

Unit 8: Valves, Piping, and Fitness for Service:

- Valves.
- Valve Types.
- Valve Characteristics.
- Valve Applications.
- Valve Selection.
- Valve Actuators.
- Piping and Pipelines.
- ASME B31.
- Pipe Types, Construction, and Schedules.
- Steel Pipes.
- Welded Types and Sections.
- Flanges and Gaskets.
- Plastic Pipes, Composite Pipes.
- Pipe Coatings and Linings.
- Pipe Supports and Insulation Blocks.
- Stress Relief in Piping Design.
- Pigging.
- Water hammer.
- Overview of API 570 - Inspection and repair of Pipelines & Piping.
- API 579 overview.
- Fitness for Service.

Unit 9: Corrosion:

- Corrosion Fundamentals.
- Types of Corrosion.
- Corrosion Inspection and Monitoring.
- Corrosion Minimization.
- Coatings.
- Inhibitors.
- Cathodic Protection.

Unit 10: Compressors:

- Types of Compressors.
- Reciprocating, Centrifugal and Screw.
- Blading and Staging.
- Performance Curves.
- Compressed Air Usage and Instruments.
- Glands and Mechanical Seals.

Unit 11: Mechanical Maintenance:

- Strategies and Philosophies.
- Maintenance system optimization.
- Maintenance Management Systems.
- Condition Monitoring.
- Vibration Analysis.
- Shaft Alignment.