COURSE OVERVIEW PE0138
Process Optimization - Advanced (E-Learning Module)

Course Title
Process Optimization - Advanced (E-Learning Module)

Course Reference
PE0138

Course Format & Compatibility
SCORM 1.2. Compatible with IE11, MS-Edge, Google Chrome, Windows, Linux, Unix, Android, IOS, iPadOS, macOS, iPhone, iPad & HarmonyOS (Huawei)

Course Duration
30 online contact hours
(3.0 CEUs/30 PDHs)

Course Description

This E-Learning course is designed to provide participants with a detailed and up-to-date overview of advanced process optimization. It covers the block diagram, process flow diagram, piping & instrumentation diagram, abbreviations & symbols, orthographic drawings and isometric drawings; the separation process, pressure relief valves, normal operating parameters and importance of demulsification; the electrical methods, emulsion treatment equipment, crude oil desalting, sealing, level measuring, meter recalibration, water properties/contamination and water analysis; and the suspended solids, oil content, water ph, sulphur-reducing bacteria, corrosion, water compatibility (clay swelling) and emulsion.

Further, the course will also discuss the water/oil emulsion treatment, chemical processes, physical processes, mixed processes, hydrate formation and hydrate prevention; the produced water, injection water, chlorination, different types of filtration and filters and the difference between filtration and reverse osmosis; the filtration, reverse osmosis, slit density index (SDI), statistical process control and classifications of ion exchange resins; the drainage and effluent treatment systems, typical chemical treatment for contaminant removal, water treatment, methods of aeration and reverse osmosis; and the

potable water treatment and particle size techniques,
During this interactive course, participants will learn the application of rupture disks, flowline design and flowline corrosion protection; the field gathering system, pigging, typical procedure for pigging operation, common ignition sources, fire calculations and the effects of thermal radiation; the hydro testing, flow test, purging, sampling, draining/venting/depressurizing, lubrication, heat treating/stress relieving and calibration; the pressure vessels, fired heaters, heat exchangers, reactors, storage tanks, pumps, compressors, piping and airfin coolers; the process safety management (PSM), process safety information (PSI), process hazards analysis (PHA), operating procedures and pre-startup safety review (PSSR); the management of change (MOC), incident investigation, emergency planning and response, compliance audits and risk assessment and management; the loss sequence diagram, risk assessment methodology, hazard identification and hazard and risk identification; the area classification and explosion protection, hazard and risk scenario analysis, consequence modeling and hazard evaluation techniques and methods; and the HAZOP method, failure modes and effects analysis, equipment failure analysis and risk assessment techniques.

Course Objectives

At the end of this course, the Trainee will be able to:-

- Apply and gain an advanced knowledge on process optimization
- Describe in detail, process optimization philosophies and methods
- Identify and describe techniques used for process optimization
- Analyze and review performance of process equipment and systems
- Perform process optimization for various systems (such as pipeline integrity, chemical dosage, utility systems, etc.)
- Communicate results of optimization exercises using company prescribed protocols
- Provide recommendations to improve control philosophies and emergency shutdown logic
- Simulate process design scenarios to optimize various Oil and Gas processes
- Illustrate block diagram, process flow diagram, piping & instrumentation diagram, abbreviations & symbols, orthographic drawings and isometric drawings
- Discuss the separation process, pressure relief valves, normal operating parameters and importance of demulsification
- Apply electrical methods, emulsion treatment equipment, crude oil desalting, sealing, level measuring, meter recalibration, water properties/contamination and water analysis
- Explain suspended solids, oil content, water ph, sulphur-reducing bacteria, corrosion, water compatibility (clay swelling) and emulsion
- Carryout water/oil emulsion treatment, chemical processes, physical processes, mixed processes, hydrate formation and hydrate prevention

- Determine produced water, injection water, chlorination, different types of filtration and filters and the difference between filtration and reverse osmosis
- Describe filtration, reverse osmosis, slit density index (SDI), statistical process control and classifications of ion exchange resins
- Recognize drainage and effluent treatment systems, typical chemical treatment for contaminant removal, water treatment, methods of aeration and reverse osmosis
- Apply potable water treatment, particle size techniques, application of rupture disks, flowline design and flowline corrosion protection
- Discuss field gathering system, pigging, typical procedure for pigging operation, common ignition sources, fire calculations and the effects of thermal radiation
- Employ hydro testing, flow test, purging, sampling, draining/venting/depressurizing, lubrication, heat treating/stress relieving and calibration
- Identify pressure vessels, fired heaters, heat exchangers, reactors, storage tanks, pumps, compressors, piping and airfin coolers
- Carryout process safety management (PSM), process safety information (PSI), process hazards analysis (PHA), operating procedures and pre-startup safety review (PSSR)
- Implement management of change (MOC), incident investigation, emergency planning and response, compliance audits and risk assessment and management
- Illustrate loss sequence diagram, risk assessment methodology, hazard identification and hazard and risk identification
- Employ area classification and explosion protection, hazard and risk scenario analysis, consequence modeling and hazard evaluation techniques and methods
- Carryout HAZOP method, failure modes and effects analysis, equipment failure analysis and risk assessment techniques
- Discuss API 570 piping inspection code as well as apply inspection data evaluation, analysis, recording, repairs, alterations and rerating of piping system
- Inspect buried piping and identify fluid properties, density, specific gravity, API gravity, viscosity and vapor pressure
- Explain glycol units, reasons for dehydrating gas, gas sweetening units/amine units, gas scrubbing unit and hydrostatic testing
- Illustrate emulsions and foams separation, crude oil dehydration and demulsifier selection
- Describe crude oil desalting, corrosion inhibitors, cathodic inhibitors, organic inhibitors, guidelines for inhibitor selection and the factors involved in inhibitors selection
- Carryout inhibitor application, continuous treatment and measuring and monitoring corrosion
- Apply ultrasonic sound waves method and recognize nucleonic level measurement system, level switches, flow measurement and volumetric & mass flow rate flow

- Employ temperature measurement and repair procedure for closed drain system

Who Should Attend

This course provides an advanced overview of all process optimization for managers, leaders, section heads, superintendents, supervisors, process engineers, production engineers, plant engineers and planning engineers.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- USA International Association for Continuing Education and Training (IACET)

  Haward Technology is an Authorized Training Provider by the International Association for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 1-2013 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 1-2013 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Association for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited

international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Training Methodology

This Trainee-centered course includes the following training methodologies:-

- Talking presentation Slides (ppt with audio)
- Simulation & Animation
- Exercises
- Videos
- Case Studies
- Gamification (learning through games)
- Quizzes, Pre-test & Post-test

Every section/module of the course ends up with a Quiz which must be passed by the trainee in order to move to the next section/module. A Post-test at the end of the course must be passed in order to get the online accredited certificate.

Course Fee

As per proposal

Course Contents

- Block Diagram
- Process Flow Diagram
- Piping & Instrumentation Diagram
- Abbreviations & Symbols
- As Built Drawings
- Orthographic Drawings
- Isometric Drawings
- Exploded Drawings
- Basic Theory of Separation
- The Separation Process
- Construction of Separators
- Baffle plate deflector
- Straightening Vanes
- Mist Extractor
- Vortex Breaker

- Weir
- Coalescing Plates
- Water jets
- Sight Glass
- Separator Instrumentation and Control
- Pressure Relief Valves
- Level
- Pressure
- Temperature
- Abnormal conditions
- Normal operating parameters
- Possible problems
- The Separation Process
- Primary separation
- Secondary separation
- Mist Extraction
- Liquids accumulation
- Water separation @ interface
- Classification of Separators
- Classification according to duty
- Oil field Emulsions
- Importance of Demulsification
- What is an Emulsion
- Oil Field Emulsions
- Emulsifying Agents
- Emulsion Stability
- Natural surfactants
- Asphaltenes
- Paraffin Wax
- Inorganic Fines
- Emulsion instability & Demulsification
- Emulsion Destabilization
- Increased Temperature

- Centrifugation
- Electrical methods
- Increasing residence time
- Chemical treatment
- Selection of Demulsifier
- Viscosity
- Specific Gravity
- Water cut
- Droplet size
- Principle of Emulsion Breaking
- Chemical treating effect
- Heating effect
- Settling Effect
- Emulsion Treatment Equipment
- Heat Treater
- Horizontal Heater Treater
- Chemelectric Treater
- Typical crude oil demulsifier
- Crude Oil Desalting
- Electrostatic Desalter
- Crude Oil Dehydration and Desalting at Halfaya CPF1 and CPF2
- Electrostatic Dehydrator
- Fixed Roof Tanks
- Construction of Fixed Roof Tanks
- Fixed Roof Tank Types
- Non-pressure tanks
- Low-pressure tanks
- Non-pressure tanks Fixed Roof Tank
- Fixed Roof Tank Auxiliary Equipment
- Vents
- Sealing
- Product Mixers
- Tank Heaters

- Level Measuring Devices
- Floating Roof Storage Tanks
- Floating Roof Tank construction
- Floating Roof Seal
- Types of Floating Roof
- Pan Roof
- Disadvantages of the pan roof
- Pontoon Roof
- Double Deck Roof
- Floating Roof Tank Auxiliary Equipment
- Roof Drains
- Tank Drains
- Mixers
- Level Measuring
- Sampling
- Dome Roof Storage Tanks
- Dome Roof Tank Construction
- Mixing Pumps
- Heaters
- Level Indicators
- Pressure Relief System
- Vacuum Relief System
- Spherical Tank
- Bullet Tanks
- Measuring Meters
- Meters Selections
- Flow Meters
- Direct Volumetric Meters
- Inference Meters
- Positive Displacement (PD) Meters
- Turbine Meters
- Coriolis Mass Meters
- Ultrasonic Flow Meters

- Meter recalibration
- Water properties/contamination
- Water analysis
- Suspended solids
- Dissolved gas
- Dissolved oxygen
- Dissolved carbon dioxide
- Dissolved hydrogen sulphide
- Oil content
- Water pH
- The pH is extremely important for several reasons
- Mineral scale accumulation
- Solid accumulation
- Bacteria
- Sulphur-reducing bacteria
- Aerobic bacteria
- Falcultative bacteria (FB)
- Main water problems
- Corrosion
- How to avoid corrosion
- Scaling tendency
- Water compatibility (clay swelling)
- Emulsion
- Water /oil emulsion treatment
- Chemical processes
- Physical processes
- Mixed processes
- Hydrate formation
- Hydrate prevention
- The different water sources for water injection
- Surface water : Sea water
- Surface water: lakes, river
- Subsurface water: deep or shallow aquifer

- Produced water
- Injection water
- Composition of the produced water
- Surface Water
- Deep Ground water
- Chemicals for water injection (raw river wate)
- Chlorination
- Sodium Hypochlorite
- Filter Aids
- Antifoams
- Oxygen Scavenger
- Scale Inhibitor
- Corrosion Inhibitor
- Biocides
- Filtration
- Different Types of Filtration and Filters
- Difference between Filtration and Reverse Osmosis
- Surface Filtration
- In Depth Filtration
- Media Filters
- Cartridge Filters
- Diatomaceous Earth Filters
- Dual Flow Filter
- Media Loading
- Acceptance of the System
- Media Loading Sequence
- Typical Dual Media Filter
- Typical Disposable Filter Cartridges
- Common Types of Filters
- Removal of Dissolved Mater
- Filtration
- Reverse Osmosis
- Slit Density Index (SDI)

- Statistical Process Control
- Zeolites
- Synthetic
- Natural
- Classifications of Ion Exchange Resins
- Sodium Zeolite Softening
- Principles of Zeolite Softening
- Softener Operation
- Sodium Zeolite Softener
- Softener Backwash
- Brining
- Slow Rinse
- Fast Rinse
- Poro-Edge Automatic Water Strainer
- Typical Recirculating Cooling Water System
- Typical Lake and River Water Application
- Typical Recycle or Reuse Solution System
- Proposed Automatic Back Wash Strainer Location
- Effluent Treatment Plant
- Collection Systems
- Corrugated Plate Interceptor
- Drainage and Effluent Treatment Systems
- Source of Water
- Common Source of Water
- Ground Water
- Surface Water (Rains, Rivers, Sea Water)
- The Nature of water
- Osmotic Equilibrium
- Reverse Osmosis
- Wastewater Treatment & Reuse
- Common Waste Water Contaminates
- Solids
- Oils

- Typical Chemical Treatment for Contaminant Removal
- Suspended Solids
- The Commonly Used Types
- Dispersed Hydrocarbons (emulsion)
- Soluble Inorganic
- Soluble Organics
- Sludge Dewatering
- Gravity Sedimentation
- Parts of an Up Flow Clarifier
- Inlet Section
- Clarification Zone
- The Sludge Zone
- Outlet Zone
- Discrete Settling
- Unhindered Settling
- Hindered Settling (zone settling)
- Compression Settling
- “V“- Notched Weir and Flume ”
- Skimmer and Scum Trough
- Clarifier Design
- Laboratory Evaluation of Coagulants
- Stabilizer and Clarifier for Raw Water Treatment
- Radial Flow Clarifier Schematic
- Water Treatment
- A Typical Water Treatment Plant Schematic
- Sources of Water
- Ground water
- Saline water
- Raw water contaminants
- Physical contaminants
- Chemical contaminants
- Biological contaminants
- Radiological contamination

- Common Impurities Found In Water
- Water Treatment Overview
- Water Treatment Processes
- Aeration
- Methods of Aeration
- Water-Fall Aerators
- Air Diffusion Aerators
- Clarification
- Filtration
- General Filter Types
- Filter Media
- Multi-Media Filters
- Osmosis
- Reverse Osmosis
- Micron Filters
- RO Membrane assembly
- RO Membranes
- Reverse Osmosis – Spiral Wound Membrane
- Reverse Osmosis - Hollow Fibre Membrane
- Demineralization
- Potable water treatment
- Water Treatment Path
- Particle Size Techniques
- Membrane Technology
- Particles
- Scaling
- Biofouling
- Membrane system
- Membrane Technology- Micro filtration System (MFS)
- Membrane Technology-Filtration
- Flotation
- Reason for excess pressure in a vessel
- Block discharge

- Fire case
- Pressure Terminology
- Operating pressure
- MAWP
- Design pressure
- Set pressure
- Accumulation
- Overpressure
- Blowdown
- Types of Pressure Relief Devices
- Safety relief valves
- Conventional Pressure Relief Valves
- Working principle
- Section view of a conventional pressure relief valve
- Pilot - Operated Pressure Relief Valve
- Relieving Cycle
- Piston - Type Pilot - Operated Pressure Relief Valve
- Diaphragm - Type Pilot - Operated Pressure Relief Valve
- Balanced Bellows with Auxiliary Balancing Piston
- Power - Actuated Pressure Relief Valves
- Temperature - Actuated Pressure Relief Valves
- Pressure Vacuum Vent Valves
- Rupture Disk
- Application of Rupture Disks
- Primary relief
- Secondary relief
- Combination relief
- Types of Rupture Disks
- Conventional rupture disks
- Scored Tension - Loaded Rupture Disks
- Composite Rupture Disks
- Reverse - Acting Rupture Disks
- Graphite Rupture Disks

- Rupture Pin Relief Valves
- Buckling Pin Relief Valves
- Blowdown Valve
- Flowlines & Manifolds
- Oil fields in the Middle East
- Wellhead & Choke
- Fixed (Positive) Choke
- Adjustable Chokes
- Needle Type Adjustable Choke
- Needle Type Adjustable Choke Valve
- Rotary (Disc) Type Adjustable Chokes
- Adjustable Chokes
- Flowline Design
- Flowline dimensions
- Construction of Flowlines
- Flowline Corrosion Protection
- Internal Abrasion
- High Internal Pressure
- Scale Deposits
- Flowline Servicing
- Remote Gathering Manifold Station (RGMS)
- Check Valves (Non-Return Valves)
- Sample Points
- Trunk line
- Field Gathering System
- Inlet Manifold
- Pigging
- Pigging History
- Uses & Types of PIG
- Utility Pig
- Inline Inspection (ILI) Tools / Smart Pig
- Gel Pig
- Plug

- Pig Launchers and Receivers
- Wellhead Flowline and Pig Launcher schematic
- Barred Tee
- Pigging Operation
- Safety
- Typical procedure for pigging operation
- Steps to be followed at pig launcher end
- Steps to be followed at pig receiver end
- Oil & Gas Glossary
- Abandon
- Absorption
- Abstract of title
- Acidizing
- Acidizing a well
- Acoustic log
- Acre
- Acre-foot
- Adsorption
- Advance Payment Finance
- Advanced Piston Corer (APC)
- AFE (Authorization for Expenditure)
- Air Gap
- Alkanes
- Alkylation
- Aliphatic Hydrocarbons
- Angle of Deflection
- Annular Blowout Preventer
- Annular space
- Annulus
- Annulus of a well
- Anode
- Anticline
- Anti Knock Compounds

- API
- API gravity
- Appraisal Well
- Aquifer
- Arab oil embargo of 1973-74
- Aromatic Hydrocarbons
- Articulated Platform
- Artificial Drive
- Artificial Lift
- Asphalt
- Associated Gas
- ASTM
- Azimuth
- Brent Crude Oil Specification
- Process Safety in Design And Operations
- Accident Theory
- Significant Contributors to Major Outages
- Inherently Safer Plant Designs
- Process Integration Checklist
- Physical and Process Hazards
- Physical Hazards
- Physical Impact
- Electricity
- Radiation (Infrared)
- Radiation (Ionizing)
- Process Hazards
- Chemical Reactivity
- Flammability
- Toxicity
- Dust
- Odour
- Respiratory Hazards
- Hazardous Events and Scenarios

- Mechanical Failure
- Material Failure
- Loss of Containment
- Illustration
- How to Avoid Leaks
- Bunding and Containment Berms
- Leak Boxes
- Electric Power Failure
- Runaway Reactions
- Impact-sensitive or thermally sensitive materials
- Runaway reactions
- Chemical incompatibility between two or more substances
- Chemical incompatibility
- Chemical reaction
- Seveso Reactor System
- Distribution of Reactive Chemical Incidents by Category
- Fire
- Important Properties which Determine How Materials Burn
- Chemical Composition
- Flash Point
- Autoignition Temperature
- Boiling Point / Vapor Pressure
- Flammable (Explosive) Limits
- Pool Fire
- Flash Fire
- Jet Fire
- 3D Fire
- FIreball
- Bleve
- Common Ignition Sources
- Fire Calculations
- Effects of Thermal Radiation
- Explosion

- Internal Explosion
- Dust Explosion
- Toxic Dispersion
- Human Response and Behavior
- Fundamental Behavior
- Human Error
- Latent Human Error
- Reduction or Elimination of Human Error
- Information Management
- Ergonomics
- Instrumentation and Process Control
- Startup and Shutdown
- Feed In
- Hydro testing
- Flow test
- Purging
- Sampling
- Draining / Venting / Depressurizing
- De-watering
- Lighting Pilots / Burners
- Mixing
- Lubrication
- Refractory Dryout
- Heat Treating / Stress Relieving
- Calibration
- Pre-Startup Safety Review
- Common Equipment Failure Modes
- Civil / Structural
- Mechanical Equipment / Machinery
- Pressure Vessels
- Fired Heaters
- Heat Exchangers
- Reactors

- Storage Tanks
- Pumps
- Compressors
- Piping
- Airfin Coolers
- Loss Prevention Engineering
- Equipment Sizing and Rating
- Plant and Equipment Spacing
- Inter Equipment Spacing Guidelines (IRI) (distances in feet)
- System Isolation
- Grading and Drainage
- Mechanical Integrity
- Material Selection
- Corrosion
- Cracking
- Erosion
- Relief and Blowdown
- Electrical Area Classification
- Duration of Time Gas Is Present
- Fire Protection
- Gas Detection
- Detonation Flame Arresters
- Heating and Ventilation
- Process Buildings
- People Occupied Buildings (Facility Siting)
- References
- Process Safety Management (PSM)
- Employee Participation
- Process Safety Information (PSI)
- Process Hazards Analysis (PHA)
- Operating Procedures
- Training
- Contractors

- Pre-Startup Safety Review (PSSR)
- Mechanical Integrity
- Hot Work Permits
- Management of Change (MOC)
- Incident Investigation
- Emergency Planning and Response
- Compliance Audits
- Trade Secret
- Risk Assessment & Management
- Basic Concepts
- What is risk?
- Types of risk
- What is loss?
- Loss Sequence Diagram
- Failure Chronology
- Types of Failure
- Chronic Failures
- Risk Assessment
- Risk Assessment Methodology
- Exposure
- Impact
- Probability / frequency
- Probability
- System risk
- Total system risk
- Hazard identification
- Risk management
- Hazard and risk identification
- Management of CHANGE?
- Examples of Change
- Human Error
- Previous Loss History
- Risk Evaluation

- Risk Ranking Exercise
- Comparison of Life Threatening Risks
- Individual Fatality Statistics
- Risk Assessment Applications
- Don't Start with Numbers
- Simple Risk Assessment
- Risk Estimate
- Documentation
- Other Considerations
- Risk Acceptance – Will you fly?
- What is acceptable risk?
- BP Approach to Risk
- Land Use Allocation
- Risk Controls
- Major Accident Theory Demonstration
- Complete the Process
- Residual Risk
- Follow-Up
- Monitoring
- Risk Communication
- Safety Critical Equipment (SCE) Decision Tree
- Engineering Design
- Layers of Safety
- Stages of safety
- Codes and Standards
- Typical 30-year old platform design
- Inherently Safer Design Philosophy
- Inherently Safer Design: Tangguh
- Corrosion Resistant well Flowlines
- Which is Inherently Safer?
- Engineering Design
- Safe – Reliable – Sustainable
- Layout and Spacing

- Facility Siting Studies
- Major Concerns
- Strategy for existing buildings
- Equipment Sizing
- Drainage
- System Isolation
- Safety Critical Equipment
- Safety-Related Devices (pressure)
- Emergency Isolation Valves
- Instrumentation & Control
- Common Control Problems
- Prevent/Control/Mitigation Systems
- Process Alarms/Trips: the First Barriers
- PSVs: the Last Overpressure Barriers
- Example Safety Instrumented Function
- Safety Instrumented Systems
- Safety Integrity Level - SIS
- Gas Detection
- Fire Protection
- Fire Protection Methods
- Assurance in Design and Construction
- Safety Reviews in Projects
- What is a PHSSER?
- Pre-Startup PHSSER: Key Activities
- Capital Value Process
- PHSSER Alignment with CVP
- BP Protocol
- Internal Hazards
- SIS & SIL
- Modern vehicle safety features
- Legal
- Origins of Process Safety
- Origins of Safety Management

- Safety legislation in US (& Canada)
- BP Grangemouth 1987
- Major Process Safety Legislation
- US OSHA PSM Elements
- What is Process Safety Management
- IM Standard
- Integrity Management Elements
- The Law only defines the minimum
- Process Safety Management
- The new Group IM Standard
- Integrity Management Standard
- Framework
- Company Policy
- What Really is PSM?
- Getting HSE Right
- Equipment Failure
- How Can Equipment Fail?
- Causes of Equipment Failure
- Types of Equipment Failure
- Pressure Safety
- Vacuum Safety
- Covered Vent
- Railcars
- Materials of Construction Failure
- Noteworthy Incident - Materials Failure
- Piping Systems
- Piping System Failure Modes
- Pipe Failures
- Pipe Failure – Alaska, 2006
- Fired Heaters
- Tankage
- Offshore Failure Mechanisms
- Riser Break

- GoM Shelf
- Accident
- Incident
- Area Classification and Explosion Protection
- Permit Tells the Following
- Hazard and Risk Scenario Analysis
- Mechanical Failure
- Hydrotest Failure
- Defective Equipment
- Release Modeling
- Common Release Sources
- Atmospheric Dispersion
- Consequences
- Consequence Modeling
- Consequences: Types of Fires
- Noteworthy Incident – BLEVE
- Explosions
- Vapour Cloud Explosion
- Internal (Mechanical) Explosions
- Secondary Fires
- Dust Explosions
- Toxicity
- Smoke
- Nitrogen
- Consequence Impacts
- Scenario Impacts
- Environmental Impacts
- Noteworthy Incident – Steam
- Process Safety Information
- Process Safety Information Sources
- Things to look for when reviewing P&ID's
- BP Techniques
- Hazard Evaluation Techniques

- Hazard Evaluation Methods
- Simple Hazard Evaluation Methods
- What-If Analysis – Scope of Deviations
- What-If – Exercise
- HAZOP
- HAZOP Method
- HAZOP Worksheet
- Failure Modes and Effects Analysis
- Equipment Failure Analysis
- Failure Mode & Effect Analysis Approach
- Fault Tree Analysis
- Risk Assessment Techniques
- Risk Assessment Methods
- Risk Matrix
- BP Risk Matrix (MAR)
- Layer of Protection Analysis (LOPA)
- LOPA Background
- LOPA Method
- LOPA Sequence
- LOPA Process
- LOPA Application
- LOPA Summary
- Quantitative Risk Assessment (QRA)
- Apply QRA Selectively
- QRA Data Requirements
- Societal Risk fN curve
- Individual Risk
- The MAR Process (GP 48-50)
- MAR and the IM Standard
- BP Approach to Risk
- MAR Approach
- Limitations of MAR
- Remember this about MAR!

- What MAR Is Not
- IM & MAR Measures – Impact on Risk
- Continuous Risk Reduction (CRR)
- The End Result of Risk Management
- Hazard and Operability (HAZOP) & Hazard Analysis Training
- HAZOP Fundamental
- Points to Ponder
- Can we make it more systematic?
- What is HAZOP?
- Origin of HAZOP
- Later Development - HAZOP
- Objective of HAZOP
- How and Why HAZOP is Used
- Purpose of HAZOP
- HAZOP - Hazard and operability
- Relevant Question About HAZOP
- Features of HAZOP Study
- Documents Needed for HAZOP Study
- Before Detailed HAZOP
- P&ID
- P&I D and Safety
- HAZOP Study Procedure
- HAZOP Study Flow Chart
- Guidelines for Division into Sections
- Crude oil Treatment Schematic
- Crude oil Treatment Process Flow Diagram
- Gas Compression and Export Process Flow Diagram
- Oil and Gas Gathering
- Guide Words
- HAZOP Study Form
- Strength of HAZOP
- Weakness of HAZOP
- Managing HAZOP

- Preliminary HAZOP Example
- Preliminary HAZOP on Reactor - Example
- Preliminary HAZOP on Reactor - Answer
- Case Study - Shell & Tube Heat Exchanger
- HAZOP on Heat Exchanger
- HAZOP Management
- Planning for HAZOP Study
- Team Characteristics
- Questioning Techniques
- Responsibility of HAZOP Team Members
- Responsibility of HAZOP Team
- Hazard Analysis Methodologies
- What- If
- What-f - Steps
- Checklist Question Categories
- Checklist - Summary
- What- If/Checklist
- What-If/Checklist - Steps
- What-If/Checklist - Summary
- Loss of Containment Deviations
- HAZOP 's Inherent Assumptions
- HAZOP - Pros and Cons
- FMEA - Failure Mode Keywords
- FMEA on a Heat Exchanger
- Fault Tree Analysis
- Accident Scenarios May Be Missed by PHA
- Summary
- Using What You Learn
- Where to Get More Information
- Safety Instrument System (SIS)
- SIS Description
- Emergency Shutdown (ESD)
- Process Shutdown (PSD)

- Emergency Depressurizing (EDP)
- Fire & Gas (F&G)
- Example Safety Instrumented Function
- SIS Integrity Issues
- Safety Integrity Level
- Risk and Safety Integrity
- Risk and Safety Integrity Level Determination
- Other Reasons for SIL Determination
- SIL Scope
- Layer of Protection Analysis
- Independent Layers of Protection
- SIL Scope
- HIPS/HIPPS
- Risk Assessment, allocation to layers
- Safety Integrity Level
- SIL Determination Team
- When to Do SIL Determination
- API 570 - Piping Inspection Code
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