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GAS PROCESSING PROGRAMS

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Best of the Best in Oil & Gas Talent Management



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COURSE CODE/NO	COURSE TITLE	COURSE DURATION
UETMT- GP- 101	NATURAL GAS PROCESSING TECHNOLOGY	5 days
UETMT- GP- 102	NGL RECOVERY & NGL FRACTIONATION	5 days
UETMT- GP- 103	LNG SHORT COURSE TECHNOLOGY AND THE LNG CHAIN	5 days
UETMT- GP- 104	NATURAL GAS DEHYDRATION FOR OPERATORS	5 days
UETMT- GP- 105	GAS PROCESSING- DEHYDRATION, REFRIGERATION, AND FRACTIONATION	5 days
UETMT- GP- 106	NITROGEN PLANT OPERATION AND MAINTENANCE	5 days
UETMT- GP- 107	GAS PROCESSING, TREATMENT AND SULPHUR RECOVERY	5 days
UETMT- GP- 108	GAS CONDITIONING & PROCESSING TECHNOLOGY	5 days
UETMT- GP- 109	ADVANCED GAS CONDITIONING AND PROCESSING	5 days
UETMT- GP- 110	GAS LIFT	5 days
UETMT- GP- 111	GAS TREATING AND SULFUR RECOVERY	5 days
UETMT- GP- 112	GAS & LIQUID CHROMATOGRAPHY	5 days
UETMT- GP- 113	GAS DEHYDRATION TECHNOLOGY	5 days
UETMT- GP- 114	GAS PLANT TROUBLESHOOTING & SPECIAL PROBLEMS	5 days
UETMT- GP- 115	GAS PROCESSING FUNDAMENTAL	5 days
UETMT- GP- 116	GAS WELL DELIQUIFICATION	5 days
UETMT- GP- 117	ADVANCED-GAS LIQUID SEPARATION	5 days





NATURAL GAS PROCESSING TECHNOLOGY

UETMT- GP- 101

Program Duration: 5 days

PROGRAM OVERVIEW

The success of every company depends of each employee's understanding of the key business components. Employee training and development will unlock the companies' profitability and reliability. When people, processes and technology work together as a team developing practical solutions, companies can maximize profitability and assets in a sustainable manner. Training and development is an investment in future success – give yourself and your employees the keys to success

TARGET AUDIENCE

- People who are making day to day decisions regarding operation, design, and economics of processing plants;
- 1st Line Operations personnel
- Operation Supervisors
- 1st Line Maintenance personnel,
- Maintenance Supervisors,
- Senior Plant Supervisors,
- Operations Engineers
- Process Support Engineers,
- Design Engineers,
- Process and Production staff,
- Managerial Staff,
- Projects and Constructions Engineers

TARGET COMPETENCIES

- Gas Processing Systems
- Properties of Hydrocarbons
- Qualitative Phase Behavior
- Vapor-Liquid Equilibrium
- Water-Hydrocarbon Phase Behavior
- Basic Thermodynamic Concepts

PROGRAM OBJECTIVES

- The various physical and chemical properties of natural gas components and industry
- Gain a working knowledge of many of the major processes including dehydration, acid gas removal (gas sweetening), hydrocarbon dew point control (HCDP control), LPG production, and NGL recovery and separation (fractionation)
- Review of the gas laws, calculations of natural gas properties,
- Inlet separation, condensate stabilization,
- Sweetening processes, dehydration processes (Glycol, M. Sieve, etc.),
- Refrigeration, LPG fractionation and gas sweetening processes,



• Unique design/operational features of gas processing plants that enable integration with diverse gas feed streams

- The design and selection criteria of key process equipment including separators, heat exchangers, pumps, compressors, valves and towers
- Some new and emerging technologies
- Safety, risk and hazard considerations

PROGRAM CONTENT

- Composition and specifications related to natural gas processing physical properties.
- Basic gas calculations
- · Gas processing systems
- Physical properties of hydrocarbons
- Qualitative phase behavior
- Vapor-liquid equilibrium
- Water-hydrocarbon phase behavior
- Basic thermodynamic concepts
- General system energy changes and rate processes
- Gas separation
- Condensate Stabilization
- Sweetening processes and sulfur recovery
- Dehydration processes
- Refrigeration (propane refrigeration)
- LPG / LNG
- Computer Dynamic Simulation Laboratories
- The design and selection criteria of key process equipment including separators, heat exchangers, pumps, compressors, valves and towers

GAS PROCESSING





NGL RECOVERY & NGL FRACTIONATION

UETMT- GP- 102

Program Duration: 5 days

PROGRAM OBJECTIVES

Upon completion of this program, the trainees must be able to understand:

Review of the Gas Laws, Calculations of Natural Gas Properties

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ECHNICAL & MANAGEMENT TRAINING

- Inlet Separation, Condensate Stabilization
- Physical Properties of NGL
- Gas Processing Systems
- Physical Properties of Hydrocarbons
- Qualitative Phase Behavior
- Vapor-Liquid Equilibrium
- Water-Hydrocarbon Phase Behavior
- Basic Thermodynamic Concepts
- Fluid Properties: Vapor Pressure, Boiling Point, etc.
- Pressure-Temperature Phase Diagrams ... etc.
- Flash Separators and Fractionators
- Mechanical Refrigeration: Principles and Equipment
- Tray-type Towers; Packed Towers
- NGL Recovery Plants Operation
- Economic Values of NGL
- Normal Operations and Controlling Techniques
- Simulations Cases Study

TARGET AUDIENCE

- Operation Supervisors
- Senior Plant Supervisors
- Operations Engineers
- Process Support Engineers
- Design Engineers
- Process and Production Staff
- Projects and Constructions Engineers
- Maintenance Personnel
- Maintenance Supervisors

TARGET COMPETENCIES

- Gas Processing Industry
- Flash Separators and Fractionators
- Absorption Technology
- Mechanical Refrigeration
- NGL Recovery Plants

PROGRAM CONTENT Day 1

Overview of Gas Processing Industry

- Hydrocarbon Systems
- Physical Properties of NGL
- Fluid Properties: Vapor Pressure, Boiling Point, etc.
- Pressure-Temperature phase Diagrams ... etc.

Application of Phase Envelopes: Hydrocarbon Dew Point Control, Equilibrium

Day 2

- Flash Separators and Fractionators
- Separator Design, Performance, Selection, Troubleshooting
- Understanding Phase Behavior
- Water-Hydrocarbon Behavior
- Meaning of Absorption Technology
- Glycol & Methanol Injection System Operation and Troubleshooting

Day 3

- Mechanical Refrigeration: Principles and Equipment
- Propane Refrigeration Unit Principle, Operation and Troubleshooting
- Refrigeration Compressor Selection, Operation, Troubleshooting
- Tray-type Towers; Packed Towers

Day 4

- NGL Recovery Plants (Compressor and Utilities)
- Principles of Gas Expansion NGL recovery and Process Variations
- Stabilizers, Fractionators, and Fractionation Trains
- Normal Operations and Controlling Techniques

<u>Day 5</u>

- Troubleshooting
- Cryogenic Gas Processing and Troubleshooting
- Equipment Troubleshooting
- Reciprocating Compressors, Reciprocating Engines
- Loss in Centrifugal Compressor Capacity
- Gas Turbine Driven
- · Safety Measures related to the Process
- Cases Study
- Simulation Case Study and Troubleshooting Solving



LNG SHORT COURSE TECHNOLOGY AND THE LNG CHAIN

UETMT- GP- 103

Program Duration: 5 days

PROGRAM OVERVIEW

Technical LNG basics are covered in this intensive short-course. It provides an overview of the technology in the LNG chain. Key commercial issues are also described. The course covers facility operation topics, technical and design areas. Selected exercises and syndicates are used throughout the course. In-house versions available with either: increased technical and operational emphasis, or increased project and development emphasis. This course, formerly known as G-9LNG, is available in customized versions.

TARGET AUDIENCE

- Technical and Senior Operations staff
- Commercial and Management staff needing technical overview.

TARGET COMPETENCIES

- LNG
- Gas Processing Basics
- Refrigeration and LNG Liquefaction
- LNG Storage & Terminals

PROGRAM OBJECTIVES

- Overview of LNG
- Survey commercial and contractual issues
- General project costs, feasibility and development
- Become familiar with some fundamentals of gas technology
- Understand and apply knowledge of LNG gas pretreatment, drying and refrigeration
- Grasp liquefaction technology
- Review of compressor drivers, gas turbines and electric motors
- Understand LNG Storage, Shipping and terminals

PROGRAM CONTENT

- Introduction to LNG
- Commercial issues
- Technical Fundamentals
- Gas Processing Basics
- Major Equipment
- Refrigeration and LNG Liquefaction
- Shipping
- LNG Storage & Terminals
- Future Trends

NATURAL GAS DEHYDRATION FOR OPERATORS

UETMT- GP- 104

Program Duration: 5 days

PROGRAM OBJECTIVES

To improve understanding of Gas & Glycol dehydration process.

TARGET AUDIENCE

Technical and Senior Operations staff

TARGET COMPETENCIES

- Natural Gas Handling and Processing
- Water in Natural Gas
- Gas Dehydration
- Glycol Dehydration Process

PROGRAM CONTENT

Introduction.

- Overview of natural gas handling and processing.
- Gas composition and properties.
- Gas measurement.
- · Water in natural gas.

Hydrates.

- Formation and characteristics.
- Prediction of formation conditions (Temperature and Pressure).
- Inhibition of hydrates formation.

Gas Dehydration.

- Incentives for gas dehydration.
- Initial and final water dew points.
- Estimation of quantity of water to remove from gas (Absorption and Adsorption).
- Overview of main gas dehydration methods.
- · Selection of dehydration method.

Glycol Dehydration Process.

- · Principles of process.
- Types and selection of glycols.
- · Process equipment.
- Plant operations and troubleshooting.

Desicant-Bed Dehydration Process.

- Principles and types and selection of adsorbing materials.
- Process equipment.
- Plant operations and troubleshooting.





GAS PROCESSING- DEHYDRATION, REFRIGERATION, AND FRACTIONATION

UETMT- GP- 105

Program Duration: 5 days

TARGET AUDIENCE

- Process Engineers
- Chemical Engineers
- Operation Engineers who are working in Oil Production Facilities and Oil Refineries

PROGRAM OBJECTIVES

- At the end of the course, participants will be able to:
- Understand Principles of Gas Dehydration
- Understand Hydrate Formation
- Factors Promoting Hydrate Formation
- Procedures and Resources for Determining Hydrate-Formation
- Temperature Control Methods and Equipment used to Inhibit Hydrate
 Formation in a Natural Gas Stream
- Methanol Injection Rate required Inhibiting Hydrate Formation in a Natural Gas Stream
- Glycol Dehydration System Components
- Optimizing and Troubleshooting Dehydrator Operations
- Solid Desiccant Dehydration
- Refrigeration Systems and Troubleshooting
- Hydrate Inhibitor Injection Technology

PROGRAM LEARNING OUTCOME

Enhance and Understanding of the Facility of Gas Plant

PROGRAM CONTENT

DAY ONE

- Understanding Principles of Gas Dehydration
- Water Content of Gases
- Understanding Hydrate Formation
- Factors Promoting Hydrate Formation

DAY TWO

- Procedures and Resources for Determining Hydrate-Formation
- Temperatures of Sweet and Sour Gas Streams
- Temperature Control Methods and Equipment Used To Inhibit Hydrate Formation in a Natural Gas Stream

DAY THREE

- Methanol Injection Rate Required Inhibiting Hydrate Formation in a Natural Gas Stream
- Glycol Dehydration
- Describing the Glycol Dehydration Process
- Glycol Dehydration System Components

DAY FOUR

- Refrigeration Systems and Troubleshooting
- Optimizing and Troubleshooting Dehydrator Operations
- Solid Desiccant Dehydration
- Glycol & methanol Injection Technology
- Adsorption Calculations

DAY FIVE

 Process Flow and the function of the major components of Solid
 Desiccant Dehydrator and Function of Major Components of Solid Desiccant Dehydrators Refrigeration, LPG Fractionation

NITROGEN PLANT OPERATION AND MAINTENANCE

UETMT- GP- 106

Program Duration: 4 days

PROGRAM DESCRIPTION

This course cover Identify the operation principle for Nitrogen System, the quality of Nitrogen and Nitrogen Distribution System, the nitrogen system package, compressor, filter, nitrogen dryers operation and troubleshooting

PROGRAM OBJECTIVES

The course addresses the most common technology in nitrogen system including an overview of the major equipment and the options offered by recent technological advances. The course covers the available technologies with the proposed design improvement through various case studies.

PROGRAM LEARNING OUTCOME

At the end of the course, participants will be able to:

- Identify the Operation principle for Nitrogen System
- Nitrogen Plant Maintenance
- Oxygen removal unit Operation Principle
- Effect of low PSAs Operating Pressure on Nitrogen Quality

TARGET AUDIENCE

- Operation Supervisors
- Utilities Operator, Supervisors, Engineers
- Maintenance Personnel
- Maintenance Supervisors
- Senior Plant Supervisors
- Operations Engineers
- Process Support Engineers
- Design Engineers
- Process and Production Staff
- Projects and Constructions Engineers

PROGRAM CONTENT

DAY ONE

- Apply skills and knowledge on utilities in Process Plants
- List the various types of Nitrogen, inert Gas Generation, Cryogenic Nitrogen Generation and nitrogen/inert Gas requirements
- Explain Pressure-swing adsorption Nitrogen Generation
- Membrane Permeation

DAY TWO

- HPN (High Pressure Nitrogen)
- HPN Plant advantages
- Choice of the Process
- Cryogenic Techniques
- Nitrogen Services for Pipeline and Process Applications

<u>DAY THRE</u>E

- Nitrogen Purging displacement/Pressure Cycle
- Nitrogen Pigging
- Nitrogen Drying
- Nitrogen Cooling
- Nitrogen Pressure Testing

DAY FOUR

- Nitrogen high-velocity flushing
- Nitrogen Gas Lifting
- Nitrogen Pipe Freezing



GAS PROCESSING, TREATMENT AND SULPHUR RECOVERY

UETMT- GP- 107

Program Duration: 5 days

PROGRAM OVERVIEW

The removal of acidic components (primarily H2S and CO2) from hydrocarbon streams can be broadly categorized as those depending on chemical reaction, absorption, or adsorption. Processes employing each of these techniques are described.

Acid gas streams that contain H2S, may be flared, incinerated, or converted to elemental sulphur in a Sulphur Recovery Unit. Various Sulphur Recovery Processes (primarily The Modified Claus Process) are discussed.

TARGET AUDIENCE

- The program is specifically designed to be of substantial benefit to graduate engineers with less than 3 years experience as technologists, mechanical engineers, inspection engineers and maintenance and project engineers
- It is designed for both technical and non-technical personnel as well as operational staff at supervisory level employed in refineries, petrochemical, and oil and gas process industries
- It will serve as an introduction to gas technology for those who are unfamiliar with the subject and will also assist those who need the ability to progress to a detailed knowledge of the gas processing technologies

TARGET COMPETENCIES

- Gas Sweetening
- Alkanolamine Processes
- Liquid Hydrocarbon Sweetening
- Sulphur Recovery

PROGRAM OBJECTIVES

- Have an understanding of sweetening and Sulphur Recovery technologies
- Gain and explanation of the key features of gas treating
- Understand the thermodynamics of gas processing
- Identify the main process steps
- Monitor / evaluate and troubleshoot treating operations
- Perform process engineering calculation

PROGRAM CONTENT

DAY 1 - Gas Sweetening

- General Considerations and Safety
- Types of Contaminants
- Process Selection and Classification
- Chemistry of Gas Sweetening
- Operating Problems
- Selective Sweetening Systems

DAY 2 - Alkanolamine Processes

- Process Flow and General Design Criteria / Guidelines
 - ✓ MEA
 - ✓ DEA
 - ✓ MDEA
 - ✓ DGA
 - ✓ DIPA
 - ✓ Formulated Solvents
 - ✓ Sterically Hindered Amines
- Caustic Wash
- Case Studies



DAY 3 - Treating Processes

- Physical Solvent Processes
 - ✓ Selexol
 - ✓ Purisol Process
 - ✓ Fluor Solvent
 - Rectisol Process
 - ✓ Morphysorb
- Combination (Chemical and Physical) Processes
 - ✓ Sulfinol
 - ✓ Hi-Pure
- Alkaline Salt Processes Chemistry
- Batch Processes
 - ✓ Iron Sponge
 - ✓ ChemSweet
 - ✓ Sulpha-Check / Sulpha-Treat
 - ✓ Zinc Oxide PURESPEC
 - ✓ Molecular Sieve
- Iron Chelate processes
 - ✓ LO-CAT Process
 - ✓ SulFerox Process
- Membrane Separation

DAY 4 - Liquid Hydrocarbon Sweetening

- Regenerated Caustic
- Peco Solid Copper Chloride
- Batch Caustic Wash
- Solid Potassium Hydroxide
- Molecular Sieve
- Liquid/Liquid Processes
- Gas and Hydrocarbon Liquid Sweetening....(continued)
 Case Studies

DAY 5 - Sulphur Recovery

- Claus Process Considerations and Modifications
 - ✓ Tail Gas Handling
- Incineration
- Clean-up
- SO2 Recovery Process
- H2S Recovery Process
- Direct Oxidation Process
- Liquid Redox
- The EUROCLAUS Concept
- SCOT
- Sulphur Storage and Handling
- Claus Process Calculations and Exercises

GAS PROCESSING



GAS CONDITIONING & PROCESSING TECHNOLOGY

UETMT- GP- 108

Program Duration: 5 days

PROGRAM OBJECTIVES

Upon completion of this course, trainees must be able to understand:

- The various Physical and Chemical Properties of Natural Gas Components
 and Industry
- Gain a working knowledge of many of the major Processes including Dehydration, Acid Gas removal (*Gas Sweetening*), Hydrocarbon Dew Point Control (*HCDP Control*), LPG Production, and NGL Recovery and Separation (*Fractionation*)
- Review of the Gas Laws, Calculations of Natural Gas Properties
- Inlet Separation, Condensate Stabilization
- Slug Catcher & Knockout Vessels
- Water Content & Dew Point
- Hydrates Formation (*Prediction and Inhibition*)
- Sweetening Processes, Dehydration Processes (Glycol, M. Sieve, etc.),
- Adsorption Principles and Troubleshooting
- Solid Bed Dehydration and Troubleshooting
- Refrigeration, LPG Fractionation and Gas Sweetening Processes
- Unique Design/Operational Features of Gas Processing Plants that enable
 Integration with diverse Gas Feed Streams
- The design and selection Criteria of key Process Equipment including Separators, Heat exchangers, Pumps, Compressors, Valves and Towers
- Some new and Emerging Technologies
- Safety, Risk and Hazard Considerations

TARGET AUDIENCE

- People who are making day to day decisions regarding Operation, Design, and Economics of Processing Plants
- 1st Line Operations Personnel
- 1st Line Maintenance Personnel
- Senior Plant Supervisors
- Operation Supervisors
- Maintenance Supervisors
- Operations Engineers
- Design Engineers
- Process and Production staff
- Managerial Staff
- Projects and Constructions Engineers

TARGET COMPETENCIES

- Natural Gas Processing
- Basic Gas Calculations
- Physical Properties of Hydrocarbons
- Gas Separation
- Hydrates Formation
- Refrigeration
- LPG / LNG Recovery

PROGRAM CONTENT

Day 1

- Composition and Specifications related to Natural Gas Processing Physical Properties.
- Basic Gas Calculations
- Gas Processing Systems

- Physical Properties of Hydrocarbons
- Qualitative Phase Behavior
- Vapor-liquid Equilibrium
- Water-hydrocarbon Phase Behavior
- Basic Thermodynamic Concepts
- General System Energy Changes and Rate Processes

Day 2

- Gas Separation
- Slug Catcher & Knockout Vessels
- Adsorption Principles and Troubleshooting
- Soli Valve Expansion: JT Plants
- Cryogenic Gas Processing Dehydration and Troubleshooting
- Water Content & Dew Point
- Sweetening Processes and Sulfur Recovery
- Amines Sweetening Technology
- Solid Desiccants Sweetening Technology
- Liquid and Solid Desiccants Operation, Performance Variables, Startup and Troubleshooting

Day 3

- Hydrates Formation (Prediction and Inhibition)
- Dehydration Processes
- Glycol Absorption Dehydration Technology
- Glycol and Methanol Injection Technology
- Solid Desiccants Sweetening Technology
- Liquid and Solid Desiccants Operation, Performance Variables, Startup and Troubleshooting

Day 4

- Condensate Stabilization
- Refrigeration (Propane Refrigeration) Technology
- LPG / LNG Recovery
- Computer Dynamic Simulation Laboratories
- The design and selection Criteria of key Process Equipment including Separators, Heat Exchangers, Pumps, Compressors, Valves and Towers

Day 5

- Equipment Troubleshooting
- Reciprocating Compressors, Reciprocating Engines
- Loss in Centrifugal Compressor Capacity
- Gas Turbine Driven
- Plant Pipeline Hydrate, Corrosion Problems
- Problem Set





ADVANCED GAS CONDITIONING AND PROCESSING

UETMT- GP- 109

Program Duration: 5 days

PROGRAM OVERVIEW

This course has been designed to cover G-4 topics in an accelerated 5-day format using a commercial simulator to perform calculations. This course is presented using commercial simulator packages such as HYSYS[®], PROVISION[®], PROSIM[®], CHEMCHAD[®], etc. A comprehensive course exercise based on actual offshore processing facility and onshore gas processing options is used in class.

TARGET AUDIENCE

Engineers requiring a more intensive review of natural gas and associated liquids processing

TARGET COMPETENCIES

- Gas Processing Systems
- Physical Properties of Hydrocarbons
- Vapor-Liquid Equilibrium
- Water-Hydrocarbon Behavior
- Basic Thermodynamic Concepts

PROGRAM OBJECTIVES

- Analyze processes to dehydrate gas, control hydrocarbon dewpoint, and extract NGL's etc. using the simulator
- · Consolidate understanding of gas engineering principles
- Handle issues of physical/thermodynamic property correlations in gas technology and simulation
- Perform and review equipment sizing using hand and simulation methods.

PROGRAM CONTENT

- Gas Processing Systems
- Physical Properties of Hydrocarbons
- Qualitative Phase Behavior
- Vapor-Liquid Equilibrium
- Water-Hydrocarbon Behavior
- Basic Thermodynamic Concepts
- System Energy Changes
- Separators
- Heat Transfer
- Pumps
- Compressors
- Refrigeration
- Fractionation/Distillation
- Glycol Dehydration
- Adsorption Systems

GAS LIFT

UETMT- GP- 110

Program Duration: 5 days

PROGRAM OVERVIEW

Gas Lift is one of the most widely used artificial lift techniques. Participants will investigate the impact of tubing sizing, gas lift valve selection, gas lift mandrel spacing, gas lift valve design, casing pressure, surface choke size, gas volume, etc., on well design and operation. Participants practice mandrel spacing design and gas lift valve design, surveillance and optimization at the well and field level using actual field data including the use of software programs. After attending this course, participants will be able to identify, diagnose, analyze and solve gas lift problems. Up to date computer programs will be used/demonstrated during the course. The class includes pictures and videos of most important equipment components while being applied, to further participant understanding. With increased prices, more emphasis is placed on techniques to maximize production. New developments at various stages of development and application are also covered. *One personal computer is provided, at additional cost, for each two participants.*

TARGET AUDIENCE

Production engineers and operations staff responsible for designing gas lift installations and/ or performing surveillance and optimization on wells using gas lift; appropriate for staff at all levels of gas lift expertise and has been given with good results to both production engineers new to gas lift as well as industry gas lift consultants

TARGET COMPETENCIES

- · Gas Lift Concepts and Data
- Nodal Analysis
- Equilibrium Curves
- Gas Lift Equipment and Valve Mechanics

PROGRAM OBJECTIVES

- · Select the appropriate gas lift systems and equipment
- Design continuous-flow gas lift systems
- Analyze operating gas lift systems Increase production from your wells using gas lift technology and optimization
- · Improve the economics of gas lift operation

PROGRAM CONTENT

- Gas lift concepts and data
- Inflow
- Outflow
- Nodal analysis
- Equilibrium curves
- Gas lift equipment and valve mechanics
- Valve selection
- Gas lift equipment demo
- Valve calibration
- Unloading
- Mandrel spacing and step-by step, complete gas lift design for a well
- Temperature effects on valves
- Determine the Ptro
- Orifice sizing techniques
- Lift gas rates for best economics
- Causes and solutions of instability
- Gas lift surveillance
- Gas measurement
- Analysis of flowing pressure gradient surveys
- Analysis of GL surface charts and measurements
- Gas allocation and field optimization
- Use of computer programs for gas lift design, trouble-shooting and optimization

GAS PROCESSING



GAS TREATING AND SULFUR RECOVERY

UETMT- GP- 111

Program Duration: 5 days

PROGRAM OVERVIEW

This program emphasizes process selection, practical operating issues, technical fundamentals, and integration of the sweetening facilities into the overall scheme of gas processing. Sulfur recovery and tail gas processes are also covered including standard Claus configurations, SuperClaus[®], EuroClaus[®], SCOT[®] etc. Special design and operation topics such as trace sulfur compound handling and optimization of H2S:CO2 ratio is covered.

TARGET AUDIENCE

Production and Processing personnel involved with gas treating and sulfur recovery requiring an understanding of the principles of these process operations. This program is also for facilities engineers, process engineers, operations personnel, field supervisors and others who select, design, install, evaluate or operate gas sweetening and sulfur recovery facilities.

TARGET COMPETENCIES

- Process Flow Scheme
- Process Control
- Tail Gas Clean-Up Processes

PROGRAM OBJECTIVES

Upon completion of this program, participants will have gained a broad understanding on:

- Evaluation and selection of processes to remove acid gases (H₂S, CO₂, COS, CS₂, mercaptans, etc.) from gas and LPG's
- The advantages and disadvantages of available gas treating technology and processes
- How to estimate solvent circulation rates, energy requirements and equipment sizes
- Recognizing and evaluating solutions to common problems
- Sulfur recovery technologies, including an overview of the Claus Sulfur process
- How to select the proper sulfur recovery process given differing process conditions
- Providing participants with technical information on the operations and safety aspects of all units associated with sulfur recovery processes, and also to present how the operation can be optimized.
- Knowing the chemistry, the technologies and environmental issues associated with the removal of hydrogen sulfide from refinery gas streams
- Knowing the main processes (amine units and Claus units) used in the conversion of the H2S into elemental sulfur.

PROGRAM CONTENT

Amines Units

- Chemical reaction between amines and H₂S.
- Process flow scheme: absorption, regeneration, filtration, equipment review.
- Process control: pressures, temperatures, amine solution optimization, steam flow rate to regenerator optimization.



- Regeneration quality: objectives, follow-up methods, and performances impacts.
- Troubleshooting: amine solution degradation, foaming, corrosion, washing quality follow-up.
- Application: amine solution flow rate determination (typical unit), and amine analysis: what you can learn from your analysis (routine and detailed).

Sulfur Recovery Units

Chemical reaction.

• **Process flow scheme:** thermal stage, catalytic stage, sulfur recovery, tail gas incineration, Operating parameters, Sulfur yields.

Process Control:

• H₂S/SO₂ ratio control, air flow rate optimization, tail gas analyzer, temperatures at the converters.

Troubleshooting:

• Hydrocarbons presence, sulfur behavior as per temperature, H2S degassing from sulfur product, safety, Shutdowns.

New technologies:

• oxygen enrichment, sour water stripper gas as feed.

Tail Gas Clean-Up Processes

Process flow schemes:

- CLAUSPOL, SCOT and SULFREEN.
- Influence of the H2S/SO2 ratio control.
- Sulfur yields.

Sour Water Treating

- Sour water characteristics. Ammonia content.
- Principle, main equipment, operating parameters, quality follow-up.

Program workshop and summary



GAS & LIQUID CHROMATOGRAPHY

UETMT- GP- 112

Program Duration: 5 days

PROGRAM OVERVIEW

- This program is designed to give the participants a basic understanding of chromatography principles for both Gas and Liquid Chromatography. Theory covered will include the principles of chromatography separation, sample preparation, injection techniques, detection and data processing. In this program you will learn how to:
- develop a greater understanding of the theoretical and practical relationships of GLC
- build the expertise needed to choose optimum parameters for separating species present in complex mixtures

TARGET AUDIENCE

- It is designed for chemists, technicians and others and participants do not need to have basic knowledge in chromatography
- Also designed for beginners and intermediate-level practitioners in gas chromatography who have some practical laboratory experience

TARGET COMPETENCIES

- Chromatography Components
- Chromatography Applications

PROGRAM OBJECTIVES

- Master the fundamentals of GLC
- Develop a better understanding of GLC theory
- Improve your ability to choose the optimum separation mechanism for a given sample
- Increase your knowledge of GLC detectors and columns

TRAINING METHODOLOGY

Participants will learn by active participation during the program through the use of individual exercises, questionnaires, team exercises, short training videos and discussions.

PROGRAM SUMMARY

This five-day program covers packed and capillary column gas chromatography (GC). It will emphasize problem solving, practical day-today operation tips, minimum of theory, column and phase selection, detectors, applications, method development, quality control, and troubleshooting. All major GC detectors will be covered. A session is devoted to the mass spectrometer detector and basic interpretation of data. Also, GC applications will be discussed which are relevant to the oil and gas Industry.

PROGRAM CONTENT

DAY 1 - Introduction to Chromatography

- The History of Chromatography GC & LC
- Overview of GC & LC Chromatography
- The Modern Chromatograph
- Liquid Chromatography The Development Process
- Factors Controlling Retention
- Molecular Forces and Chromatographic Selectivity
- Chromatography Nomenclature

DAY 2 - Basic Chromatography Components

- The role of columns in GC operations
- Column selection & maintenance
- · Column temperature and temperature program
- How columns can impact GC performance.
- Peak Dispersion in a Chromatographic Column
- Detectors Type, Classification, Selection and maintenance
- How detectors can impact GC performance

DAY 3 - Setup and Operation

- Effects of Stationary Phase Type and Loading on the Performance of a Chromatographic System
- Carrier gas selection and flow rates
- Sample Collection, preservation, preparation, storage
- Solid phase extraction, Liquid-liquid phase extraction
- Purge-and-trap, thermal desorption, headspace
- Injection ports performance & maintenance
- Basic steps to setup a GC
- Preparation for operation

DAY 4 – Data Analysis

- Accuracy and precision
- Significant figures
- Data Acquisition and Processing System
- Graphs & graphical methods
- Internal Standard method
- Calibration linked to GC performance
- Data reduction and analysis

DAY 5 - Chromatography Applications

- Environmental Monitoring and Cleanup
- Petrochemical Industry
- Refining Industry
- Criminal Forensics and Law Enforcement
- Food, Beverage and Perfume Analysis
- Medicine
- Laboratory Management & Troubleshooting







GAS DEHYDRATION TECHNOLOGY

UETMT- GP- 113

Program Duration: 5 days

PROGRAM OBJECTIVES

- Understanding Principles of Gas Dehydration
- Understanding Hydrate Formation.
- Factors Promoting Hydrate Formation
- Procedures and Resources for Determining Hydrate-Formation
- Temperature Control Methods and Equipment Used To Inhibit Hydrate Formation in a Natural Gas Stream
- Methanol Injection Rate Required Inhibiting Hydrate Formation in a Natural Gas Stream
- Glycol Dehydration System Components
- Optimizing and Troubleshooting Dehydrator Operations
- Solid Desiccant Dehydration
- Optimizing Adsorption-Type Dehydrators

TARGET AUDIENCE

Junior Engineers, Senior Operators, and Operators who are working in Oil Production Facilities and Oil Refineries.

TARGET COMPETENCIES

- Gas Dehydration
- Hydrate Formation
- Natural Gas Stream
- Glycol Dehydration Process

PROGRAM CONTENT

- Understanding Principles of Gas Dehydration
- Water Content of Gases
- Understanding Hydrate Formation.
- Factors Promoting Hydrate Formation
- Procedures and Resources for Determining Hydrate-Formation
- Temperatures of Sweet and Sour Gas Streams
- Temperature Control Methods and Equipment Used To Inhibit Hydrate Formation in a Natural Gas Stream
- Methanol Injection Rate Required Inhibiting Hydrate Formation in a Natural Gas Stream
- Glycol Dehydration
- Describing the Glycol Dehydration Process
- Glycol Dehydration System Components
- Process/Design Variables
- Optimizing and Troubleshooting Dehydrator Operations
- Solid Desiccant Dehydration
- Adsorption Calculations
- Process Flow and the function of the major components of Solid
- Desiccant Dehydrator and Function of Major Components of Solid Desiccant Dehydrators

GAS PLANT TROUBLESHOOTING & SPECIAL PROBLEMS

UETMT- GP- 114

Program Duration: 5 days

PROGRAM OBJECTIVES

- Overview of gas processing industry
- Meaning of absorption technology
- Glycol dehydration operation and troubleshooting
- Gas sweetening operation and troubleshooting
- Adsorption principles and troubleshooting
- Solid bed dehydration and troubleshooting
- Refrigeration systems and troubleshooting
- Cryogenic gas processing and troubleshooting

TARGET AUDIENCE

Junior engineers, senior operators, and operators who are working in oil production facilities and oil refineries.

TARGET COMPETENCIES

- Gas Processing Industry
- Water-Hydrocarbon Behavior
- Absorption Technology
- Glycol Dehydration
- Gas Sweetening Operation

PROGRAM CONTENT

- Overview of gas processing industry
- Understanding phase behavior
- · Water-hydrocarbon behavior
- Meaning of absorption technology
- · Glycol dehydration operation and troubleshooting
- Gas sweetening operation and troubleshooting
- Adsorption principles and troubleshooting
- Solid bed dehydration and troubleshooting
- Refrigeration systems and troubleshooting
- Valve expansion: It plants
- Cryogenic gas processing and troubleshooting
- Equipment troubleshooting
- Reciprocating compressors, reciprocating engines
- Loss in centrifugal compressor capacity
- Gas turbine driven
- Plant pipeline hydrate ,corrosion problems
- Problem set







GAS PROCESSING FUNDAMENTAL

UETMT- GP- 115

Program Duration: 5 days

PROGRAM OVERVIEW

This course provides a three day overview of the gas processing industry. It is designed for a broad and more technical audience. It is based on the same high standards as other JMC programs. It provides an overview of important aspects of gas processing from basic terminology to process types and their application range.

TARGET AUDIENCE

Geologists, reservoir engineers, line managers, operational staff, shift foremen, those new to the industry such as entry-level engineers or anyone interested in a solid understanding of the principles of the gas processing industry

TARGET COMPETENCIES

- Gas Processing
- Hydrates, Hydrate Inhibition
- Gas Dehydration
- Gas Conditioning

PROGRAM OBJECTIVES

- Understand the key processes and technology
- Address common terminology
- Identify some commercial and contract issues
- Understand key areas in surface facilities
- Describe the available technology and processes
- How gas is transported and sold
- Differentiate between various gas conditioning processes
- Oil & gas facilities technology
- Summarize gas measurement
- Explain Propane, Butane, NGL, LPG etc.

PROGRAM CONTENT

- Industry overview
- Gas processing fundamentals
- Terminology
- Chemistry of oil and gas
- Gas contracts and specifications
- Markets
- Demand patterns and load factors
- Technical fundamentals, e.g. physical properties and phase behavior
- Oil and gas production facilities
- Hydrates, hydrate inhibition
- Gas dehydration process options and selection range
- Gas conditioning (hydrocarbon dewpoint control) and NGL extraction process options and selection criteria
- Nitrogen rejection / Helium recovery
- NGL markets and transportation systems
- NGL fractionation
- Natural gas transportation pipelines and LNG
- Gas storage and distribution
- Gas processing economics
- Compressors types, applications, and selection criteria
- New developments and emerging technology

GAS WELL DELIQUIFICATION

UETMT- GP- 116

Program Duration: 5 days

PROGRAM OVERVIEW

- As gas wells deplete, the velocity in the tubing drops and eventually liquids from the well and from condensation begin to accumulate in the tubing. This increase of liquids in the tubing adds back pressure on the formation, which in turn reduces flow or even stops flow all together. The course introduces this problem and discusses how to recognize liquid loading as opposed to other possible well problems.
- The course will then cover the various methods of solving the problem of liquid loading, showing how to apply the various solutions and the advantages and disadvantages of each method.
- Solution methods include use of surfactants, velocity strings, compression, use of plunger lift, various other pumping methods, gas lift, and the injection of fluids below a packer so gas can flow up the annulus.
- The attendee should be able to recognize the problem of liquid loading and have a good idea of which methods can solve the problem and select the best method/s for solution after attending the course. There are about 400,000 gas wells in the USA and most are liquid loaded. Solving this problem may on the average increase production by ~40% per well. The course will consist of slide presentations, example problems and discussion. Some films will be shown.

One personal computer is provided, at additional cost, for each two participants

TARGET AUDIENCE

 Engineers, field technicians, field supervisors, and others who select, design, install, evaluate, or operate artificial lift systems for use in dewatering gas wells.

TARGET COMPETENCIES

- Systems Nodal Analysis
- Sizing Tubing
- Plunger Lift
- Hydraulic Pumps

PROGRAM OBJECTIVES

- Recognize liquid loading in a gas well using field symptoms, critical velocity and Nodal Analysis
- Recognize the advantages and disadvantages of various methods of liquid removal
- Install and trouble shoot several of methods
- · Understand economics of each method covered

PROGRAM CONTENT

- · Recognize symptoms of liquid loading in gas wells
- Critical velocity
- Systems Nodal analysis
- Sizing tubing
- Compression
- Plunger lift
- · Use of foam to de-liquefy gas wells
- Hydraulic pumps
- · Use of beam pumps to de-liquefy gas wells
- · Gas lift
- Electrical submersible pumps
- Progressive cavity pumps
- · Other methods to attack liquid loading problems



ADVANCED-GAS LIQUID SEPARATION

UETMT- GP- 117

Program Duration: 5 days

PROGRAM OBJECTIVES

Upon completion of this course, participant will be to gain:

- Identify principle and theory of separation
- Identify the separator configuration
- Explain separator internal and sizing
- Stage separation and phases of separation
- Understand operating procedures and put them into practice
- Troubleshoot typical operating problems

TARGET AUDIENCE

- People who are making day to day decisions regarding operation, design, and economics of processing plants;
- 1st Line Operations personnel,
- Operation Supervisors,
- 1st Line Maintenance personnel,
- Maintenance Supervisors,
- Senior Plant Supervisors,
- Operations Engineers
- Process Support Engineers,
- Design Engineers,
- Ideal for veterans and those with years of experience who want to review or broaden their understanding in Processing Plant Operations.
- Other professionals who desire a better understanding of subject

TARGET COMPETENCIES

- Separation Process
- Oil and Water Separation
- Separator Sizing (Design)
- Separation Operation and Troubleshooting

PROGRAM CONTENT

<u>Day 1</u>

Introduction

- Separation Process
- Principles of Separation
 - ✓ Gravity Separation
 - ✓ Separation System Problems
 - Factors Affecting Separation



Day 2

Phases Separation

- Primary Separation
- Secondary Separation
- Mist Extraction
- Liquid Accumulation
- Oil and Water Separation

Stage Separation

Day 3

Separator Configuration

- Horizontal Separators
- Vertical Separators
- Spherical Separators

Separator Internals

- Inlet Configuration
- Intermediate Configuration
- Outlet Configuration

Day 4

Separator Sizing (Design)

- Definitions
- Sizing Knock Out Drum
- Sizing Liquid Accumulators
- Sizing Vapor Liquid Separators

<u>Day 5</u>

Separation Operation and Troubleshooting

- Separator Control
- Troubleshooting

Operating Problems

- Foamy Crudes
- Paraffin
- Sand
- Emulsion
- Slugging

For more details on Gas Processing Training Programs Kindly send e-mail to **sherine@uetmt.ae / admin@uegdxb.ae** "or" visit our Website: **www.uetmt.ae**

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