NATURAL GAS PROCESSING, SWEETENING & SULPHUR RECOVERY

PCE176
Process and Chemical Engineering

TRAINIT ACADEMY

COURSE TITLE

NATURAL GAS PROCESSING, SWEETENING & SULPHUR RECOVERY

COURSE DATE/ VENUE

18th-22nd Mar 24'

Prague, Czech Republic

COURSE REFERENCE

PCE176

COURSE DURATION

05 Days

DISCIPLINE

Process and Chemical Engineering

COURSE INTRODUCTION

The Gas and Liquid Contracts that exist (or are being negotiated) will determine the objectives of the processes that you will have to incorporate into any new facility and how you have to operate any existing facility. There exists a variety of processes that will condition your Natural Gas and Hydrocarbon Liquids to satisfy the Contract requirements. The objective of this course is to make you aware of the options available to you so that you can evaluate all the processes that will satisfy your objective to determine which particular process is the best from a capitol cost and operating cost perspective.

COURSE OBJECTIVE

Upon successful completion of this course, the delegates will be able to:

- ✓ Evaluation and selection of processes to remove acid gases (H_2S, CO_2, COS, CS_2, mercaptans, etc.) from gas and NGLs
- ✓ The advantages and disadvantages of available gas treating technology and processes

- ✓ How to estimate solvent circulation rates, energy requirements, and equipment sizes
- ✓ recognize and evaluate solutions to common operating and technical problems
- ✓ Sulfur recovery technologies, including an overview of the Claus Sulfur process
- ✓ How to select among the proper sulfur recovery process given differing process conditions
- ✓ Describe Tail gas clean up

COURSE AUDIENCE

This course is designed for project managers, plant managers, plant supervisors, technical staff, and contractor personnel involved in project planning, process selection and operation of Natural Gas Production. The greatest benefit arises from considering all the processes that will accomplish your process requirements to determine which one is the best for your particular application from a capital cost and operating cost perspective. You will also be able to see which processes are available to you to de-bottleneck or modify existing processes. The practical techniques and examples provide useful insights that are valuable at any stage of project execution and operation.

COURSE CONTENT

Gas & Liquid Process Selection

Contract Terms

Basic Consideration

Gas Contracts

- Quantity
- Quality
    - Heating Value
    - Sulphur Content
    - Maximum Temperature
    - Water Content (H_2O Dewpoint)
    - Hydrocarbon Dewpoint (HCDP)
    - Other (N_2, He, Ar, CO_2, Hg, O_2)

Liquid Contracts

- Commercial Ethane
- Commercial Propane
- Commercial Butane
- Butane-Propane Mixes (LPG)
- Propane HD-5
- Natural Gasoline

Overall Production System

Solution Gas

Associated Gas

Non-Associated Gas

Gas Processing Module

Gas Conditioning Module

- H_2O Removal (Dehydration)
- H_2S & CO_2 Removal (Gas Sweetening)
- Nitrogen Removal
- Mercury Removal
- Oxygen Removal

NGL Extraction Module

- Products
- Absorption (Lean Oil)
- Adsorption (HRU)
- Condensation
    - Mechanical Refrigeration
    - Mixed Refrigerants
    - Turbo Expander
    - Twister
    - JT Refrigeration

Stabilization Module

Product Treating Module

Characterization of Natural Gas & it's Products

Physical Properties of Pure Components

Ideal Gas Laws

- Boyle's Law
- Charles' Law
- Avogadro's Principle
- Dalton's Law
- Combined Ideal Gas Law

Physical Properties of Mixtures

Equations of State

- Van der Waals
- Redlich-Kwong (RK)
- Soave Redlich-Kwong (SRK)
- Peng Robinson (PR)
- Benedict-Webb-Rubin-Starling (BWRS)

Thermodynamic Properties

- Entropy
- Enthalpy

Equilibrium Ratio (K Value)

Separation

Types of Separators

- Horizontal
- Vertical
- Spherical
- Centrifugal
- Cyclone
    - Reverse Flow
    - Axial Flow
    - Recycling
- Filter
- Liquid Coalescer

Water Vapour Removal (H2O Dewpoint Control)

Water Content

- HC Liquids
- Natural Gas
- Effect of H_2S & CO_2

Hydrate Formation Temperature

- Effect of Propane
- Effect of H_2S & CO_2

$CaCl_2$ Dehydrators

MeOH Injection

EG Injection

IFPEX-1

TEG Dehydration

Solid Desiccant Dehydration

HCDP Control

Adsorption (HRU's)

- 2 TOC
- 2 TCC
- 3 TOC
- 3 TCC
- 3 TOC w/TGC
- 3 TCC w/TGC
- Purge Cycle

JT Refrigeration

- LTX
- LTS

Mechanical Refrigeration

- Variations

Twister

Refrigeration Compressors

- Compression Cycle
- Single Stage

- Single Stage w/Economizer
- Two Stage
- Types
- Drivers

Gas Sweetening

Terminology

Safety Precautions

Types of Contaminants

Process Selection

Chemical Reaction Processes

- Amines
    - Chemistry
    - Typical PFD
    - General Considerations
    - Amines Used (MEA, DEA, DGA, MDEA, TEA, DIPA, Formulated Solvents)
    - Control Variable
- Caustic Wash
    - Chemistry

NGL Extraction

Low Temperature Mechanical Refrigeration

JT Refrigeration

Refrigerated JT Expansion

Adsorption (Lean Oil)

Turbo Expander

- Typical PFD
- Solid CO_2 Formation
- Solid Desiccant Dehydrator
- Inlet Compression
- Gas/Gas Exchangers
- Expander
- Re-Compressor

- De-Methanizer

Gas to Liquids

Sulphur Recovery

Claus Plan

Modified Claus Plants

- Typical PFD – 3 Stage
- Process Considerations
- Mechanical Considerations
- Instrumentation

Tail Gas Clean-up

- Incineration
- Super Claus 99
- Super Claus 99.5
- SCOT

Liquid Redox

COURSE CERTIFICATE

TRAINIT ACADEMY will award an internationally recognized certificate(s) for each delegate on completion of training.

COURSE FEES

£5,500 per Delegate. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

COURSE METHODOLOGY

The training course will be highly participatory and the course leader will present, guide and facilitate learning, using a range of methods including formal presentation, discussions, sector-specific case studies and exercises. Above all, the course leader will make extensive use of real-life case examples in which he has been personally involved. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice

type will be made available on daily basis to examine the effectiveness of delivering the course.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Case studies & Practical Exercises
- 10% Role Play
- 10% Videos, Software or Simulators (as applicable) & General Discussions