Inprocess Technology & Consulting Group, S.L.
Gran Via de Carles III, 86 · 9è · E-08028 BARCELONA (Spain)
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TC-SS01: Simulation of Natural Gas Transmission and Processing

Objectives

The governing engineering principles are reviewed, applied to relevant problems, and solved using commercial Process Simulators. Emphasis is placed on the understanding of the underlying concepts and principles as well as the associated applications of process simulators to solve real problems. The main objectives are:

- Overview of the natural gas industry from wellhead to marketplace.
- Discuss principles and advances in natural gas transmission and processing.
- Practical advice on how to improve gas plant design and operations.
- Learn about the engineering principles used in simulating natural gas processing facilities.

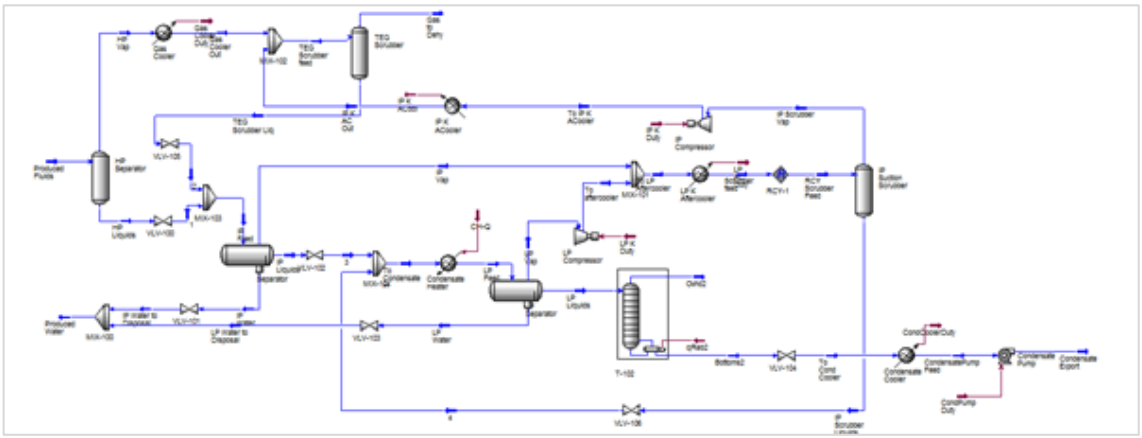
Participants

New process/chemical engineering graduates and technologists who need to develop an understanding of natural gas transmission and processing. Professionals who have been working in industry but are new to the natural gas transmission and processing industry. Professionals who are familiar with natural gas transmission and processing but are unfamiliar with how process simulators can be used to solve everyday problems.

Contents

This participative and interactive five day course covers the processes in the Natural Gas transmission and processing industry, using a commercial process simulator to carry out the calculations. The Elsevier's Handbook of Natural Gas Transmission & Processing, co-authored by the course lecturer (*Saeid Mokhatab*, see section **¡Error! No se encuentra el origen de la referencia.**), is the basis for the material presented during theoretical morning lectures, coupled with comprehensive afternoon hands-on sessions based on typical gas transmission and processing facilities. With this combined approach, attendees will:

Review the properties of natural gas, basic equations, PVT behaviour, vapour-liquid equilibria, and gas hydrates. **Learn** the basics of natural gas transmission and processing as well as the recent advances and new opportunities for solving current gas transmission and processing problems. **Discuss** key considerations to be taken into account for any natural gas field project in development. **Acquire** good simulation practices through the guided creation of simulation cases of increasing complexity. **Understand** and **Discover** optimization ways for the several common units found in the natural gas processing industry using simulation exercises. **Incorporate** the necessary know-how in steady state process simulation that should allow them to afford the design and operation of any possible future process in the natural gas and associated industries. **Transform** current processes into more competitive ones by an optimal use of process simulators. **Reduce** the execution time of projects.



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Five-Days Course Agenda

Theoretical lectures are listed with numbers. Simulation exercises are listed with letters.

Module	Module title and short description	Time	Day
1	Natural Gas Fundamentals Introduction to Natural Gas by describing its origin and composition, gas sources, phase behavior and properties, as well as transportation methods.	1 hour	Day 1
2	Raw Gas Transmission This session covers all the important concepts of multiphase gas-condensate transmission from a fundamental perspective.	1.5 hours	
3	Basic Concepts of Natural Gas Processing General overview of the design and function of the different process units within a natural gas processing plant.	1.5 hours	
A	Introduction to the Process Simulator Working with an existing case. Getting used to GUI elements. Setting-up a user preferences file. How to work with fluid streams. How to install stream utilities. How to install and connect unit operations. The Degrees Of Freedom concept.	1 hour	
B	Basic Thermodynamics Creating a new case. How to select components for a simulation: Traditional - Hypothetical. The need for thermodynamic correlations and methods.	1 hour	
C	Phase Envelopes and Phase Behavior Analysis of different phase envelopes according to fluid composition. Expected production. Expected behavior. Influence of heavy components.	1 hour	
D	Production Gathering Intensive use of the Pipe Segment to calculate separation plant inlet conditions, estimate well conditions, evaluate pressure drops and heat losses for different types of pipe insulation.	1 hour	
4	Phase Separation Review of the principles governing the basic separation process and to describe the commonly used separation facilities in the gas processing industry.	1 hour	Day 2
5	Condensate Production Some of the basic processes for condensate stabilization, and the associated facilities such as condensate storage, condensate hydrotreating, monoethylene glycol (MEG) regeneration and reclaiming, and sour water treatment.	1.5 hours	
6	Natural Gas Compression Brief overview of the two major types of compressors, a procedure for calculation of the required compression power, as well as additional and useful considerations for the design of compressors.	1.5 hours	
E	Hydrate Formation And Inhibition Use of the existing utility to evaluate the possible formation of hydrates and exploration of methods to depress them and avoid their formation.	1 hour	
F	Phase Separation and Condensate Stabilization Building a separation plant to obtain the phases that constituted the inlet fluid. Condensates stabilization by distillation.	3 hours	

MODULE	MODULE TITLE AND SHORT DESCRIPTION	TIME	DAY
7	NATURAL GAS SWEETENING Basic concepts and discussion about some of today's gas sweetening problems.	1 hour	Day 3
8	SULFUR RECOVERY AND HANDLING Properties of elemental sulfur and description of some of the common methods for processing H_2S.	1.5 hours	
9	NATURAL GAS DEHYDRATION AND MERCAPTANS REMOVAL While this session addresses dehydration design, the different methods and configurations of mercaptans removal are also discussed at the end of it.	1.5 hours	
G	ACID GAS SWEETENING WITH AMINES Acid Gas Treating unit. Removal of acidic components by amines reaction and absorption.	1 hour	
H	MULTISTAGE GAS COMPRESSION Rigorous simulation of a multistage gas compression unit. Determination of optimal working condition as a function of intermediate pressure values.	2 hours	
I	NATURAL GAS DEHYDRATION WITH TEG Construction of a dehydration plant to dehydrate a gas stream using triethylene glycol. Evaluate optimal plant operation conditions.	1 hour	
10	NATURAL GAS LIQUIDS RECOVERY AND FRACTIONATION Production of NGL from hydrocarbon dew pointing to propane and ethane recovery, including their history, and various technologies and design options as well as NGL fractionation.	2 hours	Day 4
11	SALES GAS TRANSMISSION Important concepts of sales gas transmission from a fundamental perspective.	2 hours	
J	TURBO EXPANDER FOR ETHANE RECOVERY Construction of a turbo-expander plant for deep recovery of ethane from a natural gas stream. Heat recovery network is built in a separate subflowsheet.	1 hour	
K	NATURAL GAS LIQUIDS RECOVERY AND FRACTIONATION Natural Gas Liquids are extracted by LTS technology. Recovery of light hydrocarbons by successive distillation. Column Design.	3 hours	
12	NATURAL GAS LIQUEFACTION PROCESSES Critical overview of the process technology options available for the liquefaction of natural gas, and discusses the factors that should be considered by project developers in order to select the most appropriate process for their situation.	2 hours	Day 5
13	SELECTING BEST PROCESS TECHNOLOGY LINEUP Most commonly used process technologies for designing the gas processing units and how integration of process technologies and expert process know-how make a difference.	2 hours	
L	REFRIGERATION LOOPS Analysis of the effect of pressure drops in refrigeration loops. Determination of optimum intermediate pressures for economizer. Impurities effects.	1 hour	
M	NATURAL GAS LIQUEFACTION BY CASCADE REFRIGERATION These facilities use the classical cascade cycle where three refrigeration systems are employed: propane, ethylene and methane.	3 hours	