### Oil & Gas Process Simulation
Simulation using HYSYS™ & PRO/II™

<table>
<thead>
<tr>
<th>5 days</th>
<th>Overview</th>
<th>PENG/SIMULGB</th>
</tr>
</thead>
</table>

#### LEVEL
Knowledge

#### PURPOSE
This course provides a comprehensive knowledge of all field treatments, and develops practical skills in simulation of Oil & Gas treatment processes using the software HYSYS™ and PRO/II™.

#### LEARNING OBJECTIVES
Upon completion of the course, participants will be able to:
- understand Oil & Gas processing operations: flash separation, compression, expansion, heating or cooling, mixing, pumping, etc.,
- grasp common Oil & Gas processing schemes and operating parameters,
- build a Process Flow Diagram (PFD) and optimize existing processing schemes,
- simulate an industrial unit at different operating stages,
- extract thermodynamics data from the simulation software database (phase envelope, critical point parameters, hydrate formation risk area, different physical properties...).

#### WAYS AND MEANS
Highly interactive training by industry-specialist lecturers.
Several simulation case studies, addressing most of Oil & Gas field treatments.
Extensive practice of PRO/II™ and HYSYS™ simulation software.

#### LEARNING ASSESSMENT
Assessment by test at the end of the course.

#### PREREQUISITES
No prerequisites for this course.

### Agenda

#### SOFTWARE PRESENTATION
Presentation of the different pieces of equipment: pumps, compressors, heat exchangers, turbines, turbo expanders, separators, valves, pipes.
Choice of the thermodynamic model: PR, SRK...
Definition of components, pseudo-components, heavy cuts.

#### SIMULATION OF A CRUDE OIL FIELD TREATMENT UNIT
Main field treatments for crude oils: stabilization, sweetening, desalting and dehydration, associated gas compression and treatment.
Study of an offshore crude oil field treatment unit, based on Multiple Stage Separation (MSS).
Influence of the number of separators on the quality (API°, RVP…) and quantity of stabilized oil.
Optimization of the operating parameters: pressures and temperatures of separators, suction and discharge condition of compressors, pumping needs for export by pipe.
Identification and adjustment of the controlling parameters.

**SIMULATION OF A NATURAL GAS FIELD TREATMENT UNIT**
Main field treatments for natural gases: dehydration, sweetening, LNG extraction/recovery, compression and export...
Study of an offshore natural gas dehydration, liquids extraction and compression unit.
Optimization of the operating parameters: primary separator operating conditions, dehydration parameters, cooling temperature for a sufficient liquid extraction, compression needs upstream the export pipe.
Identification and adjustment of the controlling parameters.
Analysis of hydrate formation risks.

**SIMULATION OF A GAS DEHYDRATION UNIT BY PHYSICAL ABSORPTION (TEG)**
Simulation of the glycol loop: contactor, flash separator, regenerator (still), circulation pumps, glycol/glycol exchanger.
Adjustment of controlling parameters: dry gas residual moisture content versus purity of lean TEG, moisture flow to be removed versus TEG circulation flow.

**SIMULATION OF A NATURAL GAS LIQUIDS (NGL) EXTRACTION/RECOVERY UNIT**
Progressive build up of the PFD of a Natural Gas Liquids (NGL) extraction unit.
Three processes are studied:
External refrigeration loop (cryogenic loop).
Joule Thomson expansion valve.
Turbo Expander.
Illustration of the results on phase envelope diagram.

**SIMULATION OF A PROPANE CRYOGENIC LOOP**
Study of a simple loop.
Improvement of loop performances by addition of an intermediate expansion.
Use of propane enthalpy diagram to validate the software results.
Influence of propane purity and consequences of air ingress.

**SIMULATION OF NATURAL GAS LIQUID FRACTIONATION UNIT - DISTILLATION PROCESS**
Principle of separation by distillation process and main operating parameters.
Simulation of a LNG fractionation unit using distillation columns.
Characteristics and operating conditions of the main equipment. Specific constraints.