

CHEMISTRY FOR OIL & GAS INDUSTRY. *Upstream*

General:

Discipline: Production Engineering / Facilities Engineering / Upstream Chemistry

Level: Advanced

Duration: 4 days

Instructor: Carmen García Carreño

Purpose:

This course covers the chemistry as part of the upstream industry, including oil and gas chemistry, laboratory techniques for characterization and control, as well as the chemical products used in its processes, from the reservoir to the surface end point, taking special care with the environment. To achieve this purpose, we will begin by familiarizing the participant with everything related with the chemistry involved in the oil and gas upstream value chain processes, starting with its basic concepts and definitions. Reservoir fluids, including their types and chemical composition (hydrocarbon families), as well as and their properties will be described, with emphasis in the chemical / analytical techniques for fluid evaluation and characterization. The course will continue with the description of the chemistry involved in the different stages of oil and gas exploration, production, transport and final fluid treatment, including the oilfield chemicals generally used in each case. A general oilfield laboratory for these purposes, including equipment, techniques, quality control, international standards and safety, will be described. The participant will be able to track the comprehension of the information received during the course, through several self-evaluations that will be carried out after each module / topic. Finally, the participant can use the knowledge acquired in this course to take appropriate decisions in the selection, use and result interpretation of the chemical analysis and evaluation, as well as the selection of oilfield chemicals for each process.

Designed for:

This course is addressed to Production Engineers, Facilities Engineers, Production Operators and all personnel responsible of upstream laboratory operation and management.

You will:

- Understand the chemical concepts used in the oil business value chain (Upstream), including exploration, drilling / well construction, O&G production and transport, and surface treatments.
- Know the reservoir fluid types, behaviour and properties, including oil, gas and produced water
- Know and understand the specific problems in O&G exploration, production, transportation and storage (e.g. formation damage, flow assurance, corrosion, etc.)
- Know the diverse chemical and analytical techniques for fluid evaluation and characterization
- Become familiar with oilfield laboratories (general equipment for characterization and evaluation, international standards, toxicology and chemical handling)

- Realize the importance of the Oilfield Chemicals for the exploitation of natural resources (O&G), considering that they are continuously decreasing, and more sophisticated methods are demanded
- Be familiar with the Oilfield Chemicals commonly used for Upstream, applications, starting with drilling, proceeding with production, and ending with hydrocarbon and produced water wastes

Course Content:

Chemistry in the upstream processes

- Chemistry principles and fundamentals in the O&G industry
- Reservoir fluids: types, properties, behaviour and chemical characterization
 - Chemical composition
 - Hydrocarbon families
 - Crude oil physical and chemical properties
 - Water in oil production (types, analysis and problems)
 - Chemical / analytical techniques for fluid evaluation and characterization
- The chemistry in the O&G business value chain (Upstream)
 - Exploration
 - Reservoir characterization (core analysis)
 - Fluid geochemistry
 - Drilling and well construction
 - Drilling fluid types, characterization and properties
 - Best practices / International standards
 - Cementing chemical process and general problems (Chemical characterization and evaluation techniques)
 - Production and transport
 - Chemical stimulation
 - Flow assurance
 - Separation, treatment and storage processes
 - Oilfield laboratories (Methods, international standards and safety issues)

Oilfield Chemicals

- The importance of the Oilfield Chemicals in the O&G industry
- Chemicals for well construction
 - Drilling
 - Water-based and oil-based muds
 - Additives for drilling operations
 - Cementing
 - Primary and secondary cementing
 - Cement repairing
 - Fracturing and well completion
 - Formation damage control
- Chemicals for production and treatment
 - Oil recovery (EOR)
 - Polymers, surfactants and alkalis
 - Solid deposition control
 - Solid deposition inhibitors and dispersants
 - Water / oil separation

- Gas dehydration
- Oil and gas transport and storage
 - Drag reducers, pour point depressants and surfactants
 - Corrosion control
- Chemicals for environment care
 - Oil-spill-treating agents
 - Surface and soil remediation jobs
 - Waste management (hydrocarbon wastes, produced water and drilling cuts)

Software applications

- Microsoft Office

Consulting books:

- James G. Speight “The Chemistry and Technology of Petroleum”, Fifth Edition, CD&W Inc., Laramie, Wyoming, CRC Press, Taylor & Francis Group, 2014
- Johannes Karl Fink “Oilfield Chemicals”, Gulf Professional Publishing, an imprint of Elsevier Science, 2003
- Johannes Karl Fink “Petroleum Engineer's Guide to Oil Field Chemicals and Fluids”, Second Edition, Gulf Professional Publishing, an imprint of Elsevier Science, 2015
- Oliver C. Mullins, Eric Y. Sheu, Ahmed Hammami, Allan G. Marshall “Asphaltenes, Heavy Oils, and Petroleomics”, Springer, 2007

Consulting references:

- García, M. C., Carbognani, L., Urbina, A., Orea, M., “Paraffin Deposition in Oil Production. Oil Composition and Paraffin Inhibitors Activity”, Pet. Sci. Technol., 16(9&10), 1001-1021, (1998).
- García, M. C., Henríquez, M., Orta, J. "Asphaltene deposition prediction and control in a Venezuelan North Monagas oilfield" SPE paper 80262, SPE International Symposium on Oilfield Chemistry. Houston, TX, 2003.
- The Freedonia Group “World Oilfield Chemicals”,
<https://www.freedoniagroup.com/industry-study/world-oilfield-chemicals-3249.htm>,
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