FLOW ASSURANCE. SOLID DEPOSITION CONTROL

General:

Discipline: Production, Facilities
Level: Basic / Intermediate
Duration: 4 days
Instructor: Carmen García Carreño

Purpose:

This course covers the multidisciplinary process of Flow Assurance, for the prevention of the blockages caused by organic and inorganic solids, ensuring an optimal and uninterrupted production of crude oil and gas. To achieve this purpose, we will begin by familiarizing the participant with everything related to the Flow Assurance, starting with its basic concepts and definitions, continuing with the analysis of the factors that affect it, with emphasis on those responsible for obstructions throughout the production system (from the reservoir to the surface). The physicochemical characteristics of these deposits, the causes and mechanisms of their formation and the negative impact of this phenomenon on the flow of crude oil and gas will be thoroughly analysed. Once all these fundamentals are known, the methodology to be followed for prevention / mitigation / management of these problems will be described step by step. Next, real cases will be discussed, in which to apply the presented methodology, covering all types of solid deposits (organic and inorganic), including combined cases. 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, you can use the knowledge acquired in this course to take appropriate decisions in the selection of strategies to control these problems, based on an integral knowledge of its causes and consequences, considering the prevention as the most efficient method.

Designed for:

This course is addressed to Production Engineers, Facilities Engineers, Production Operators and all personnel responsible of oil and gas production wells.

You will learn:

- To understand Flow Assurance, in terms of productivity losses, plugging of production tubing, flow lines and other facilities, giving special attention to the reservoir
- To become familiar with organic solid and scale management in oil and gas production, from the reservoir to surface facilities
- To interpret and use sampling and laboratory testing results of reservoir fluids in Flow Assurance Assessments
- To evaluate the basic properties and composition of reservoir fluids and how they are related to their behaviour during production, transportation, treatment and storage
- To select strategies to control these problems, based on an integral knowledge of their causes and consequences, considering prevention as the most efficient method.
- To apply the acquired knowledge in real cases, with appropriate problem identification and recommendations

Course Content:

Fundamentals

- Flow Assurance: Definitions and Basic Concepts
- Crude oil composition and organic deposits
- Organic solid families
  - Asphaltenes
  - Paraffins
  - Sodium and calcium naphthenates
  - Natural gas hydrates
- Causes of organic solid deposition
  - Compositional
  - Environmental
  - Flow regime
  - Surface characteristics
- Mechanism of organic solid deposition
- Impact of organic solid deposition

Organic Solid Deposition Diagnosis and Control

- General Methodology
- Predictive Evaluation
- Preventive Methods
- Corrective Methods
- Case Studies (Organic Solids)
  - Asphaltene Control
  - Paraffin Control
  - Hydrate Control
  - Flow Assurance (Integrated Application)
  - Management of asphaltene prone fields

Inorganic Scales

- The water in crude oil production
  - Origen and cycle
- Scales
  - Types and characteristics
    - Calcium carbonate
    - Calcium sulphate
    - Barium Sulphate
    - Iron salts
  - Causes of scale formation
    - Temperature
    - Pression
    - Water composition
  - Associated problems
    - Detection and placement
    - Impact
- Methodology

    - Sampling
    - Analytical Methods
    - Options
        - Prevention
        - Inhibition
        - Removal
- Case studies
- Final considerations

Software applications

- Microsoft Office

Consulting books:

- Oliver C. Mullins, Eric Y. Sheu, Ahmed Hammami, Alan G. Marshall "Asphaltenes, Heavy Oils, and Petroleomics", Springer, 2007
- 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

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., Carbognani, L., Orea, M., Urbina, A. "The influence of alkane class-types on crude oil wax crystallization and inhibitors efficiency", J. Pet. Sci. and En. 25, 99-105 (2000)
- García, M. C. "Crude Oil Wax Crystallization. The Effect of Heavy n-Paraffins and Flocculated Asphaltenes", En. & Fuels, 14, 1043-1048 (2000)
- García, M. C., Carbognani, L. "The Effect of Paraffinic Fractions in Crude Oil Wax Crystallization", Pet. Sci. and Technol. 19(1&2), 198-496 (2001)
- García, M. C., Carbognani, L. "Asphaltene-Paraffin Structural Interaction. Effect on Crude Oil Stability", En. & Fuels. 15(5): 2021-1027 (2001)
- García, M. C., Urbina, A. "Effect of crude oil composition and blending on flowing properties", Pet. Sci. and Technol., 21 (3&4), pp. 863 - 878 (2002)
- 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.
- Wattana, P., Fogler, H. S., Yen, A., García M. C., Carbognani, L. "Characterization of Polarity-Based Asphaltene Subfractions", En. and Fuels, 19, 101-110, (2005)