Course Title: Introduction to Flow Assurance

**Discipline** Surface Facilities Design and Engineering
**Level** Foundation
**Duration** 5 Days
**Delivery Mechanism** Classroom

**Prerequisites** A basic knowledge of petroleum exploration and production.

The fluid journey from reservoir pore to process facility involves many disciplines using advanced technologies. Even long-producing fields develop flow assurance problems as time goes by and ever-deeper fields bring new challenges that extend the envelope our industry can safely and economically produce.

Optimum flow assurance design and operation requires the evaluation of all disciplines interfacing flow assurance, as well as careful consideration of the interactions between the fluid, reservoir, wells, pipelines, surface facilities, and the surrounding environment. Through the detailed understanding of these disciplines, combined with the unique fluids capabilities and integrated approach, participants will learn the capability of bringing all of these together.

The goal of this course will be to increase, in participants, an understanding of the major problems associated with flow assurance, such as asphaltenes, paraffins, emulsion, scales, corrosions, and hydrates. The class will review the conventional methods and new approaches to prevent, control, and remediate the major problem causes to assure the flow. A comparative analysis on the technology available and the advantages and disadvantages of each will be discussed. Participants will learn how to identify the causes and mechanisms of flow impediment, along with the methods and technologies that can be applied for prevention, control, and remediation of the depositions.
Day 1

Introduction and Inorganic Oilfield Scale

- The flow assurance problem
- Inorganic oilfield scale principles and fundamentals
- Compound types

This day will begin with a basic introduction into flow assurance, to include topics over the impact of inorganic and organic deposition, along with corrosion in oil and gas production systems. Next, participants will learn about the principles and fundamentals of flow assurance. The day will end with participants learning about the impact of the mechanism, control and remediation of the main scales in the oilfield, such as Calcium Carbonate, Barium and Strontium Sulfate, Calcium Sulfate, and Sodium Chlorite can have on flow assurance.

Day 2

Inorganic Oilfield Scale and Hydrates

- Prediction and modeling of inorganic scales
- Recent development in the scale prevention
- Hydrates

Day two will focus on inorganic oilfield scale and hydrates. Participants will learn about exotic mineral scale, prediction and modeling of inorganic scales, the design of a field scale management program, and recent developments in scale prevention. The problem, deposition site, impact, composition and structure, and detection of hydrates will also be covered in detail on this day.
Day 3

Paraffins (Waxes) and Asphaltenes

- Characteristics
- Mechanisms
- Control, prevention, and remediation

On this day, participants will learn about the characteristics, mechanisms, control, prevention, and remediation of paraffins and asphaltenes. Specific topics that will be covered include the different paraffin tests, paraffin factors affecting deposition, operation problems, control, remediation, and monitoring. Participants will also learn about asphaltenes key properties, effect of variable on deposition, deposition causes, operational problems, prevention, and remediation.

Day 4

Organic Deposition Prediction Model and Emulsions

- Wax thermodynamic prediction
- Modeling Asphaltene Behavior
- Hydrate prediction model
- Formation of emulsions
- Emulsion destabilization processes

Day four of this course will teach participants about the organic deposition prediction model. This will include topics such as wax thermodynamic prediction, modeling asphaltene behavior, thermodynamic modeling, polarization type association model, and the kinetic rate of hydrate formation. The hydrate prediction model and the types of software used to predict hydrate formation and plugging with also be covered. The day will end with a discussion on emulsions, to include crude oil natural surfactant, characteristics, formations, treatment, and the emulsion destabilization processes.
Day 5

Corrosion

- Corrosion classification and mechanism
- CO\textsubscript{2} and H\textsubscript{2}S corrosion
- Corrosion control
- Corrosion inhibitor guidelines
- Oilfield corrosion management guidelines

The last day will focus on corrosion. Participants will learn about corrosion types and their mechanism, along with control and prevention methods. Special emphasis will be on CO\textsubscript{2} and H\textsubscript{2}S corrosion. The day will end with corrosion inhibitor and oilfield management guidelines.