Paraffin and Asphaltene in the Oil and Gas Industry: Physical Characteristics, Causes of Problems and Possible Solutions

Course Price

£3050

Course Description

This course discusses the physical characterization of crude oil, gas liquids and gas. Discussions of the causes of problems in all types of wells to include oil, gas, shale oil, coal bed methane, gas storage, injection, EOR produced wells and all types of surface equipment are included. The type of problems encountered in oils from 8 ° API to 90°API caused by paraffin and asphaltenes will be discussed. Field strategies for the production of these oils from these wells and practical solutions to produce these oils are presented. Testing methods for characterizing the physical characteristics of these oils and selecting possible treatment methods are covered. Discussions of current treatment methods, Mechanical, Thermal, Chemical and Others, to reduce or eliminate problems are included. A section will be included on effects of paraffin and asphaltenes on emulsion, corrosion and scale problems. A section on selecting Cost Effective treatment methods will be included. Formation damage removal of paraffin and asphaltenes from new and mature wells will be included. Questions will be taken throughout the course and discussion of the participants own problems will be encouraged. Laboratory and Field case histories are a large part of this course.

Course Objectives

To learn what Paraffin and Asphaltenes are and their role in determining the physical characteristics of the oil they are in. Learn the effect of an oils physical characteristics on the problems that occur when drilling, completing and producing all types of oils. Understand the possible solutions to these problems and the most cost effective approaches to controlling them.

- Discussion of the History of Paraffin and Asphaltene treating from removal to inhibition and the economic impact of Paraffin and Asphaltenes in the industry.
- To learn modern characterization of Paraffin and Asphaltenes.
- To study the practical use of all the methods available in operations for control/elimination of Paraffin problems.
- To understand reasons for Paraffin Deposition.
- To understand the tests used to determine cloud point (wax appearance temperature) and pour point and what they really mean in oil production.
- To study the physical characteristics of Asphaltenes and how formation and tubing conditions can affect their stability and deposition tendencies.
- Answer all questions as they come up to make material presented completely understandable to student.
- Discuss influence of the API gravity of an oil, production method and production conditions as
they relate to problems that will be encountered

- Review course material based on student requests.

Who Should Attend

This course is designed for Production, Reservoir Engineers, their Supervisors, Chemical Engineers, Geophysical and Technical field personnel from oil companies or Service companies that need to gain or increase their understanding of paraffin and asphaltene problems associated with field operations.

Course Content

Topic 1: Introduction

Objective: Discussion of the history of the technology to control deposition and the economic impact of Paraffin and Asphaltenes in the industry.

- Introduction and scope of course
- Brief history of paraffin and asphaltene problems in crude production
- Economic Impact of the problems
- Economic Case History
- Significant breakthroughs in the field of paraffin/asphaltene treatment

Topic 2: Paraffin Chemistry and Physical Properties

Objective: To learn characterization of Paraffin

- Chemical Composition and physical characteristics
- Cloud point techniques and potential paraffin deposition range
- Viscosity-temperature relationship in crude oils based on paraffin
- Relationship of paraffin type and Pour Point of Paraffinic oils
- Paraffin Solubility based on chain length

Topic 3: Asphaltene Chemistry and Physical Properties

Objective: To learn Characteristics of Asphaltenes

- Introduction and Definition of Asphaltenes
- Asphaltene Structure
- Colloidal Model for asphaltenes
- Peptization and depeptization process
- Electrical charge on asphaltenes

Topic 4: Causes of Paraffin Problems
Objective: To learn causes of paraffin deposition

- Temperature Gradient in Well
- Joule-Thompson Cooling
- Production Levels
- Ambient Temperature Conditions
- Aquifers
- Cooling Equipment
- Water Injection
- Gas Injection / Gas Lift
- Heated Equipment
- Gas Separation
- Hot Oiling
- Case Histories

Topic 5: Causes of Asphaltene Problems

Objective: To learn causes of Asphaltene deposition

- Destabilization of Micelle
- Charged Surfaces
- HCl treatments
- Light Crude Blending
- CO2 Floods
- NGL Floods
- Heavy Oils
- Case Histories

Topic 6: Formation Damage Caused by Paraffin

Objective: To learn causes of Paraffin Deposition in Formation

- Gas Expansion Cooling
- Injection of Cold Fluids
- Hot Oiling
- Water Injection

Topic 7: Formation Damage Caused by Asphaltenes

Objective: To learn causes of Asphaltene Deposition in Formation

- Mineralogy of Formation
- Flow induced charge on Formation Minerals
- Injection of >40? API Crude Oil
- Hot Oiling
- HCl Injection
- Case Histories

Topic 8: EOR Related Formation Damage Paraffin Problems
Objective: To learn causes of EOR Related Formation Damage Paraffin Problems

- CO2 Floods
- Natural Gas Injection
- Nitrogen Injection

Topic 9: EOR Related Formation Damage Asphaltene Problems

Objective: To learn causes EOR Related Formation Damage Asphaltene Problems

- CO2 Floods
- Steam Injection
- NGL Floods

Topic 10: Paraffin Problem in Producing Wells

Objective: To learn about Paraffin Problem in Producing Wells

- Deposition in Pump
- Deposition in Casing
- Deposition in Tubing

Topic 11: Asphaltene Problems in Producing Wells

Objective: To learn problems with Asphaltenes in Producing wells

- Deposition in slotted liners
- Deposition in pumps
- Deposition in ESPs
- Deposition in Tubing

Topic 12: Paraffin Problems in Surface equipment

Objective: To learn problems with Paraffin in surface equipment

- Deposition in Chokes
- Deposition in Flowlines
- Deposition in Line Heaters
- Deposition in Separators
- Deposition in Gunbarrel
- Deposition in Heater Treaters
- Problems in Dump Lines from Vessels
- Problems in Stock Tanks
- Problems in LAC Units
- Problems in Pipelines

Topic 13: Asphaltene Problems in Surface Equipment

Objective: To learn problems with Asphaltenes in Surface equipment
• Deposition in Chokes
• Deposition in Flowlines
• Deposition in Line Heaters
• Deposition in Separators
• Deposition in Gunbarrel
• Deposition in Heater Treaters
• Problems in Dump Lines from Vessels
• Problems in Stock Tanks
• Problems in LAC Units
• Problems in Pipelines

**Topic 14: Types of Paraffin Treatments**

**Objective:** To learn Types of Paraffin treatments available

• Mechanical
  o Cutting
  o Pigging
  o Rod Scrappers
• Thermal
  o Hot Oil
  o Hot Water
  o Steam
  o Chemical Reactions
  o Jet Engines
  o Electrical Heaters
• Chemical
  o Solvents
  o Dispersants
  o Detergents
  o Crystal Modifiers
  o Reactive Chemicals
• Bacterial
• Magnetic

**Topic 15: Types of Asphaltene Treatments**

**Objective:** To learn Types of Asphaltene Treatments that have been used

• Solvents
• Cutting
• Chemical

**Topic 16: Cost Effective Treating of Paraffin and Asphaltene Problems**

**Objective:** Process to find Cost Effective Treatment Methods to Solve Oil Industry Organic Problems

• Information Needed
○ Crude Oil Information
○ Well Information
○ Formation Information
○ Economic Information
○ Present Treatment and Cost

• Effective vs Ineffective Treatments
• Monitoring of Results
• Modifying Program

**Topic 17: WORKSHOP**

**Objective:** The main objective of the workshop are as follows:

• Review Course material based on student request
• Further Group discussion of the following topics:
  ○ Paraffin and Asphaltene impact on injection facilities-reservoir-production-well-surface units
  ○ Review Methods of Control of paraffin and Asphaltene deposition and recommendation for field applications
• Presentation of field production/reservoir problems by the participants
• Establish and suggest work plans to be implemented in field operation
• Discuss team work done by other companies in other countries in relation to problems of paraffin/asphaltene
• Discuss student’s specific field problems and methods that have been applied to solve paraffin/asphaltene deposition that have failed
• OTHERS

**CPD Unit**

**Continuing Professional Development**

**35 HOURS CPD**