Continuing Education Program

Multiphase Flow Fundamentals

Monday, June 2nd, 2025

Instructor: Dr. Eduardo Pereyra

Business Impact

This course/workshop aims to provide an understanding of different multiphase flow behaviors occurring in horizontal wells. Experimental videos acquired at the University of Tulsa facilities are used to demonstrate the phenomena. Practical design examples using multiphase flow models are also presented. The course also provides an introduction to different flow assurance issues.

Course Description

This one-day course covers basic concepts of multiphase flow, such as flow pattern, pressure drop, and liquid holdup. The second part describes the current knowledge of flow behavior in unconventional horizontal wells. The last part introduces different flow assurance issues, such as slugging, oil-water flow, hydrates, paraffin deposition, asphaltenes, scales, and corrosion.

Learning Outcomes

After completing the course, participants will have a further understanding of the multiphase flow behavior occurring in horizontal wells.

Training Method

The course is taught in person. The didactic material is designed to explain graphically all the presented phenomena. Practical cases are also utilized to explain the application of the concepts.

Who Should Attend?

This intermediate level course is primarily intended for operators, artificial lift, production, and facilities engineers, as well as students, to enhance their knowledge base and increase awareness of different multiphase flow behaviors.

Prerequisites

- Understanding of petroleum production system operation and configuration.

Course Content

- Multiphase Flow Fundamentals
  - Introduction of multiphase

- Two-phase flow variables
- Practical exercises

- Flow Patterns Gas/Liquid Two-Phase Flow
  - Physical phenomena
  - Transition mechanism
  - Flow pattern prediction
  - Barnea unified model
  - Practical exercises

- Pressure Gradient in Gas/Liquid Two-Phase Flow
  - Physical phenomena
  - Mechanistic model vs. correlations
  - Practical exercises

- Flow Behavior in Horizontal Wells
  - Flow patterns
  - Liquid loading
  - Severe slugging
  - End of tubing location
  - Foam flow

- Introduction to flow assurance issues
  - Introduction to slugging
  - Introduction to oil-water flow
  - Introduction to hydrates
  - Introduction to paraffine deposition
  - Introduction to asphaltene deposition
  - Introduction to scale deposition
  - Introduction to corrosion

Instructor Profile

Dr.Eduardo Pereyra is F.F. "Mick" Merelli/Coterra Energy Chair Professor in Petroleum Engineering at the University of Tulsa. He holds two B.S. degrees from the University of Los Andes, Merida, Venezuela; one is in Mechanical Engineering and the other in System Engineering. He started his career at the R&D center of the Venezuelan oil company PDVSA-Intevep working on the evaluation of separation systems and surface facilities for heavy oil applications.

Afterward, Eduardo received his M.S. and Ph.D. degrees in Petroleum Engineering from The University of Tulsa. He also worked for Multiphase System Integration (MSI) and at Chevron's Advanced Production Technology Unit as a Research Scientist Intern.

Eduardo serves as Associate Director of Tulsa University Fluid Flow Projects (TUFFP.org) and Tulsa University Horizontal Well Artificial Lift Projects (TUHWALP.org). He also participates in the TU Center of Research Excellence (TUCoRE) in production systems and is one of the professors involved with the University of Tulsa North Campus Research Facilities. This campus contains unique facilities and state-of-the-art instrumentation for oil and gas-related research. Eduardo has been awarded the 2015 SPE Cedric K. Ferguson Certificate, the 2019 SPE Midcontinent Production and Operation Award, the 2020 University of Tulsa College of Engineering, Natural Sciences' Zelimir Schmidt Outstanding Researcher Award, the 2022 The University of Tulsa College of Engineering and Natural Kermit Brown Outstanding Teacher Award and the 2023 International Society of Petroleum Engineers (SPE) Production and Operations Award.

Eduardo is an active researcher and consultant in the area of multiphase flow and its applications to flow assurance, pipelines, surface facilities, artificial lift, separation, and metering systems. He has taught both university classroom and industry short courses on various aspects of multiphase flow applications. He has also published about 99 peer-reviewed papers and presented 66 conference papers in his area of expertise.