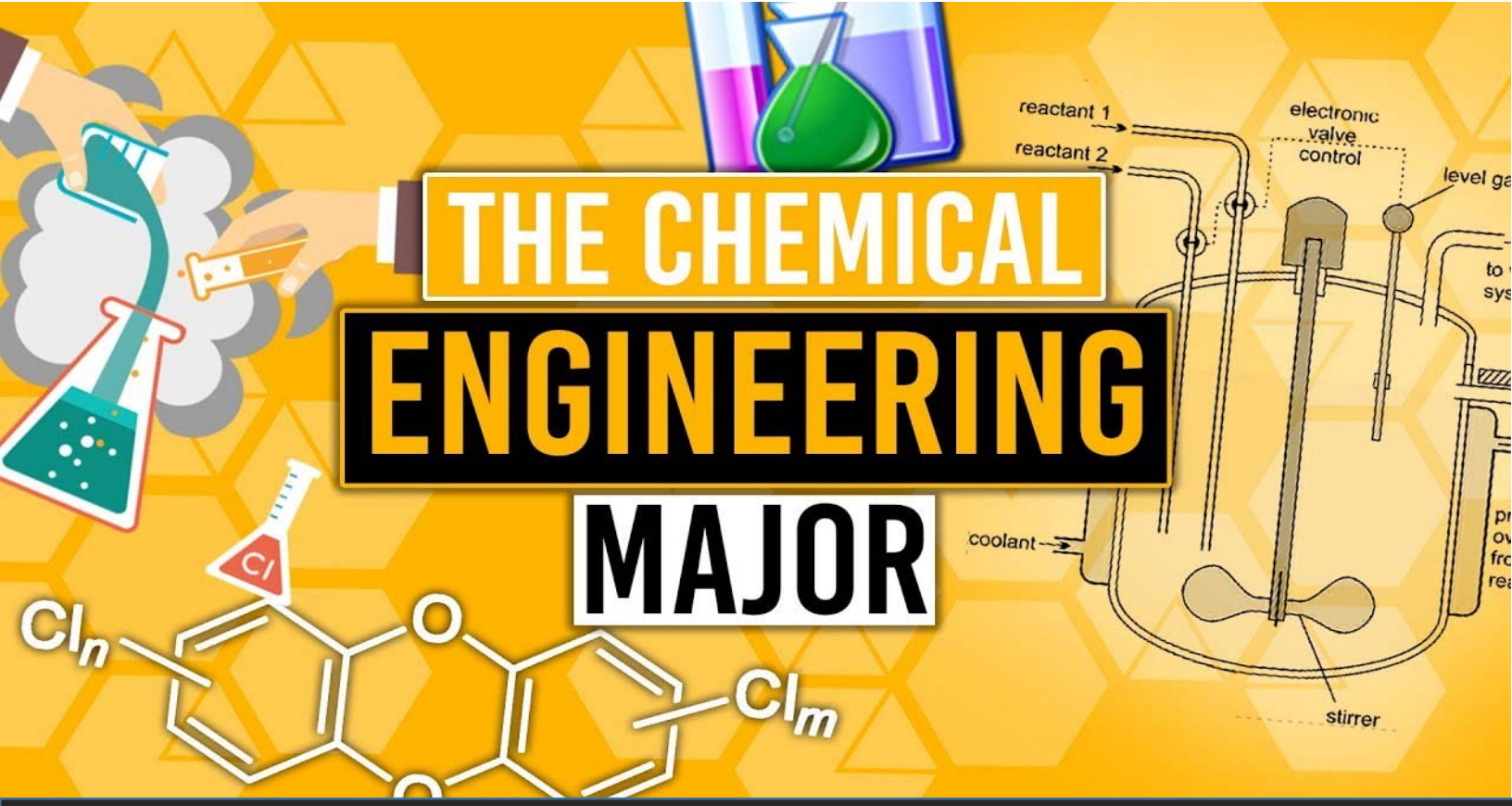

Subsurface Production Operations and Artificial Lift Technologies

BTS
Training & Consultancy

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COURSE OVERVIEW

The main elements of the subsurface production system include the reservoir, wellbore, tubing, perforation techniques, packer, SSSV, artificial lift equipment and wellhead. Understanding the integration between the elements of the subsurface production system along with the principles of the Inflow and outflow relationships is very important to be familiar with the well productivity and production optimization. Formation damage has a great impact on the productivity of oil and gas wells. Therefore, stimulation operations are used to remove the formation damage and enhance the productivity of the well. However, the artificial lift techniques are used to decrease the bottom-hole pressure and increase the production rate from the well. The various types of artificial lift systems along with their selection criteria should be studied to achieve production optimization.

This course provides an overview of well-performance evaluation leading to the determination of well conditions necessitating the application of artificial lift and stimulation operations. All causes of the formation damage (during drilling, cementing, production) and the remediation techniques will be presented. The practical aspects of the most important artificial lift methods will be covered. Several case studies including guidelines, approaches and procedures will be also presented for better understanding of the subsurface production operations and the artificial lift technologies.

LEARNING OBJECTIVES

Upon the successful completion of Subsurface Production Operations and Artificial Lift Technologies course, participants will be able to:

- Apply and gain in-depth knowledge on subsurface production operations
- Discuss the inflow and outflow performances
- Make analysis & evaluation of formation damage and its effect on production performance
- Improve the technical background about formation damage in terms of causes, prevention and finding remedies & solutions.

- Describe perforation methods, formation damage, matrix acidizing and hydraulic fracturing
- Apply and gain proper techniques on artificial lift systems and optimization technology
- Discuss gas lift systems, ESP systems, sucker rod pumping, jet pumps, hydraulic pumps and progressive cavity pumps.
- Discuss criteria for artificial lift system selection and artificial lift screening methods
- Select the appropriate artificial lift system
- Compare systems to determine what system is most economically feasible.
- Specify components and auxiliary equipment needed for each system
- Classify best practices available to extend the life of equipment and installed lift systems
- Design system features that allow for gassy production, production with solids, viscous production, and for other harsh environments

TARGET AUDIENCE

- Petroleum and production engineers
- Completion, reservoir and drilling engineers concerned with well performance & production enhancement facilities
- Supervisors, field operators and technicians
- Other company staff involved in subsurface production operations
- Petroleum engineers who are new to the profession
- Managers and government officials and others involved with the production systems
- Technical and operations staff from other disciplines, who require a cross-training to or a basic understanding of the subsurface production operations

COURSE CONTENTS

Module 1 - Reservoir performance: inflow and outflow relationships

- **KeyTopics:**
    - Reservoir performance: wellbore and reservoir performance overview
    - Pressure loss in the wellbore
    - Well productivity
    - Concepts of the productivity index
    - Inflow and outflow relationships

Module 2 - Formation Damage

- **KeyTopics:**
    - Formation damage overview
    - Well production problems: asphaltenes, waxes, hydrates, inorganic, scale formation, corrosion
    - Drilling-induced formation damage
    - Types of Damage Mechanisms and detailed review
    - Various formation damage causes and their insights

Module 3 - Stimulation operations / Why and when do we need an artificial lift?

- **KeyTopics:**
    - Damage prevention
    - Evaluation of damage – production performance, and pressure analysis review
    - Damage removal: two basic acidizing treatments and acidizing materials and methods
    - Damage removal by chemical solvents
    - Acid type and concentration
    - Evaluation of acid treatments
    - Impact of changing well conditions and the need for artificial lift
    - Overview of artificial lift technology: sucker road pump design, hydraulic pump design, jet pump, gas lift, ESP
    - Application of artificial lift technology and its limitations

Artificial lift screening methods

Module 4 - Sucker rod pumping and gas lift system

- **KeyTopics:**
    - Sucker rod pump concept
    - Limitations and advantages of the sucker rod pumping system
    - Components of the sucker rod pump
    - Design of the sucker rod pump
    - Troubleshooting of the sucker rod pump systems
    - Gas lift concept
    - Gas lift types: continuous and intermittent gas lift
    - Main components of the gas list system: mandrels and valves
    - Gas lift design
    - Effects of temperature and chokes
    - Valve spacing
    - Equilibrium curve and continuous flow design
    - Injection gas requirements
    - Limitation and advantages of the gas lift system

Module 5 - ESP System, Hydraulic & Jet Pumping and PCP systems

- **KeyTopics:**
  - The concept of the ESP system
  - Equipment and accessories of the ESP systems
  - ESP design: pump performance curves, pump intake curves, typical problems, installation, troubleshooting; best practices for installation and maintenance;
  - Steps to correctly size an electric submersible pump (ESP) system. basic sizing principles for the pump, motor and cable
  - Importance of correctly matching well productivity to pump performance
  - Use of data to diagnose well/equipment problems
  - Limitation and advantages of the ESP system
  - The concept of the hydraulic pumps
  - Limitation and advantages of the hydraulic pumps
  - The concept of the jet pumping
  - Limitation and advantages of the jet pumps
  - The concept of the PCP pumps
  - Limitation and advantages of the PCP pumps
  - Best practices for installation and maintenance
  - Criteria for selection of artificial lift systems and artificial lift screening methods