Weatherford®

Production Systems Training Program

Production systems
- Artificial lift
- Control systems
- Flow measurement
- Reservoir monitoring
- Software
- Subsea production
About Weatherford’s Catalog

The information in the Production Systems Training Program catalog will help you in searching, selecting, and registering for an appropriate training program to meet your personal development and technical requirements.

Weatherford is committed to providing useful and practical training to professionals in a variety of formats. To obtain further information on any of these courses or other training opportunities, contact us directly or through your regional Weatherford representative.
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General Information

Training Overview

Weatherford has developed a comprehensive training program to ensure maximum benefit from our production enhancement solutions, including products and services. Our training programs are widely recognized as a key element of technology transfer, ensuring the sustainability of performance improvements achieved via the implementation of technology, products, and services.

Each course features basics on technology, product features, and operations, as well as case studies and examples, which vary from hand calculations to the use of interactive software packages. The courses are characterized by their practical engineering nature as well as their theoretical content. Qualified product leaders and trainers present the courses, and each has an established reputation in teaching petroleum engineering, as well as retaining a fully operational role in production projects.

All of our training courses are conducted in English; therefore, a sound understanding of the language is required. With prior arrangement, some of the courses can be customized for presentation in other languages for your audiences. Contact us for a customized quote.

On-site training

Any one of Weatherford’s production systems training courses can be provided at your location, which offers a cost-efficient and versatile method for teaching a large group of individuals within your organization. The timing of in-house courses is flexible to accommodate our client’s requirements and often the content of the course can be tailored to meet specific requirements or applications.

In addition, clients can invite individuals from other companies to participate in the on-site training courses. This option of sponsoring a course reduces the costs.

For additional information on any program, contact us at PO-Training@weatherford.com.
How to Register

Go to http://www.ep-weatherford.com/training/ to register online or obtain the most current information regarding our training program. From the course listing, click the register button next to the selected course to start the registration process. To register offline, click the PDF form button next to the selected course to download the registration form or use the appropriate form located in the back of this catalog. After filling out the registration document, fax or mail it to our offices. Please register as early as possible—at least four weeks before the course begins.

The course fees (when available) are indicated by each course and on the registration form. Course fees include trial software license (where applicable), manuals, and documentation. Users are encouraged to bring their laptops, if indicated.

Payment for courses should be made in advance by sending a check with the application form, providing a credit card number with the registration, or an invoice can be issued if a work or purchase order reference has been supplied by the candidate or his company. Without payment, enrollment in the course cannot and will not be confirmed.

Travel, meals (except for lunch), and accommodation expenses are the responsibility of the attendee.

If an individual needs to cancel an enrollment, the full fee less an administration fee (5 percent) will be refunded, provided that the cancellation is received in writing 21 days before the start of the course. No refunds are made for cancellations received less than 21 days before the course begins, but companies can transfer the registration to another employee.

If an individual cancels a booked course in favor of another course within the same calendar year and of the same duration, there is no administration charge—provided the notification is received in writing at least 21 days before the start of whichever course commences first. If the change of course is requested within 21 days before the start of whichever course commences first, we reserve the right to charge an additional 5 percent administration fee.

If an individual transfers to a course in a following calendar year, and there has been an increase in fees, then payment of the difference should be made to us before the commencement of the course. No other transfer options are available.

Weatherford reserves the right to cancel a course for reasons of insufficient registration or force majeure, in which case any payments made are fully refunded.
Course Overviews
Course Overviews

Advanced Electric Submersible Pumping (ESP) Analysis in LOWIS™ Software

Objective
This course solidifies understanding of advanced concepts for ESP installation optimization using LOWIS software. Taught at client venues while using clients’ well data on their LOWIS servers, this highly interactive and hands-on course is aimed at clients who want to continue and enhance benefits derived from ESP analysis that is performed by their engineers and well analysts using LOWIS software.

Course description
This course consists of interactive (one-on-one) sessions analyzing real ESP wells. Each student is trained individually, one at a time. A trainer spends about 2 hours with each student.

Target audience
Production engineers, artificial-lift engineers (ESP), well analysts

Prerequisites
Engineers attending this course must have at least 12 months of hands-on experience with LOWIS ESP.

Course contents
- Day one
  - Lecture: A brief overview of LOWIS ESP
  - LOWIS software: Analysis of ESP wells selected by trainees
- Day two
  - LOWIS software: Analysis of ESP wells selected by trainees
Advanced Gas-Lift Design and Troubleshooting

Objective
The objective of this course is to provide the most advanced and complete gas-lift design and diagnostics training package available to the industry. The course provides a comprehensive review of common gas-lift techniques and concentrates on the downhole aspects of gas-lift performance and diagnostics. It also emphasizes emerging technology in the form of actual gas-lift valve performance and dynamic gas-lift simulation, which advance the practice of gas lift from a black art to a true engineering discipline.

Course description
The course offers a quick overview of production systems analysis and justification of gas lift as a means of increasing well productivity, followed by an introduction to gas-lift principles, surface installations, and downhole equipment. The three basic elements of continuous gas-lift design—operating valve positioning, unloading valve positioning, and valve sizing—are covered thoroughly. Actual, detailed valve performance is examined, with an overview of methods and techniques used to predict valve behavior under actual flowing conditions. This forms the basis for modeling and analyzing problematic gas-lift behavior using DynaLift™ software, a proprietary program developed by Weatherford in association with Decker Technologies. Other topics covered in the course include gas-lift operations, multiwell lift-gas allocation and optimization, and a special section devoted entirely to intermittent gas lift.

Target audience
The course is targeted toward engineering staff involved in the design, performance, and monitoring of gas-lift installations. The course also proves valuable to experienced gas-lift engineers, who would benefit from exposure to some of the newer methods currently being developed and tested by the industry.

Prerequisites
While previous experience or knowledge of gas lift is not a prerequisite, students are expected to be familiar with the basic principles of well modeling and nodal analysis.

Course contents
- The production system
  - Reservoir inflow performance
  - Vertical lift performance
  - Pressure traverse
  - Operating point
  - Nodal analysis
  - Justification for gas lift
- Introduction to gas lift
  - Principles of gas lift
  - Overview of gas-lift installations
  - Introduction to gas-lift valves
  - Gas-lift completions
  - Gas-lift design: Positioning the operating valve
  - System design/sensitivity analysis
  - Gas-lift performance: reservoir/completion/lift-gas parameters
  - Worst case and expected case designs
- Gas-lift design: Positioning the unloading valves
  - Valve spacing
  - Fluid and casing controlled valves
  - Transfer margins
  - Shut-in fluid column
- Gas-lift design: Valve sizing
  - Simple force balance model for valve operation
  - Dome pressure setting
  - Manufacturers’ valve data
  - Test-rack opening/closing pressures
  - Temperature adjustments
  - Valve spread
- Valve performance
  - Dynamic flow testing
  - Gas throughput operating point
  - Valve performance curves
  - Valve performance modeling
  - Gas throughput operating point
  - Sensitivity: Port size, gas rate, casing/tubing pressures
- Gas-lift operations
  - Unloading procedures
  - Running tools/mandrels
  - Gas conditioning
  - Gas compression requirements
- Lift-gas allocation and production optimization
  - Prerequisites for lift-gas allocation and optimization
- Well performance curves
- Multiwell networks
- Manual lift-gas allocation example
- History matching and tuning to field data
- Nonhierarchical networks
- Gas-lift troubleshooting
- Dynamic gas-lift simulation
  - Pressure instabilities
  - System response to lift-gas variables
  - Cycling and multipointing
  - System response to changing reservoir behavior
- Intermittent gas lift
  - Intermittent gas-lift installations
  - Fallback
  - Valve positioning
  - Plunger assisted intermittent gas lift
  - Chambers
  - Regulating intermittent gas lift
  - Intermittent gas-lift troubleshooting
Advanced Gas-Lift Analysis in LOWIS™ Software

Objective
This course solidifies understanding of advanced concepts for gas-lift well optimization using LOWIS software. Taught at client venues while using clients’ well data on their LOWIS servers, this highly interactive and hands-on course is aimed at clients who want to continue and enhance benefits derived from gas-lift well analysis performed by their engineers and well analysts using LOWIS software.

Course description
This course consists of interactive (one-on-one) sessions analyzing real gas-lift wells. Each student is trained individually, one at a time. A trainer spends about 2 hours with each student.

Target audience
Production engineers, artificial-lift engineers (gas lift)

Prerequisites
Engineers attending this course must have at least 12 months of hands-on experience with LOWIS gas lift.

Course contents
- Day one
  - Lecture: A brief overview of LOWIS gas lift
  - LOWIS software: Analysis of gas-lift wells selected by trainees
- Day two
  - LOWIS software: Analysis of gas-lift wells selected by trainees

Advanced Gas Reservoir Engineering

Objective
Participants gain excellent experience in solving reservoir engineering calculations by using many practical examples.

Course description
The advanced gas reservoir engineering training teaches attendees to solve reservoir engineering calculations. Particular emphasis is placed on gas condensates and reservoir performance. Weatherford’s PanSystem® and WellFlo® software tools are used during the presentations and practical sessions.

Target audience
The course is intended for reservoir and petroleum engineers, geologists, and others interested in the behavior and performance of gas and gas condensate reservoirs.

Prerequisites
None

Course contents
- Classical material balance
- Inflow performance
- Gas condensates
- Gas-well test analysis
- Horizontal wells
- Temperature modeling
- Pressure/volume/temperature (PVT) modeling
- Vertical lift
- Complex material balance
- Well completions
- Reservoir monitoring repeat formation tester (RFT), mean downtime (MDT)
- Super wells

“Good basic intro to gas reservoir engineering – good instructor – pleasant venue.”

BP
Advanced LOWIS™ Administration

Objective
LOWIS servers form the backbone of operational and engineering functions in client enterprises. Efficient and right-sized administration of the LOWIS server ensures optimum use and high-end user satisfaction. Taught at our software product center, this course educates trainees in advanced concepts for LOWIS servers.

Course description
The advanced administrator training provides the system manager with the skills necessary to diagnose communications, manage the database, install hot fixes, and customize the LOWIS client. Other topics covered include basic scripting theory and practice, generic upgrade process, and service pack installation process.

Target audience
The course is intended for system administrators and support engineers who are involved in the set up and support of a LOWIS server.

Prerequisites
It is advisable to attend the basic LOWIS administration course before enrolling in this advanced course.

Course contents
- Advanced topics
  - Bfile management and MsqI
  - Communication setup and diagnosis
  - LOWIS customization
  - Upgrade process (generic)
  - Service packs
  - Hot fixes
  - Export/import (integration)
  - Basic scripting

Advanced Progressing Cavity Pumping (PCP) Analysis in LOWIS Software

Objective
This course solidifies understanding of advanced concepts for PCP well optimization, using LOWIS software. Taught at a client venue while using clients’ well data on their LOWIS servers, this highly interactive and hands-on course is aimed at clients who want to continue and enhance benefits derived from PCP analysis performed by their engineers and well analysts on their LOWIS server and field wells.

Course description
This course consists of interactive (one-on-one) sessions analyzing real PCP wells. Each student is trained individually, one at a time. A trainer spends about 2 hours with each student.

Target audience
Production engineers, artificial-lift engineers (PCP)

Prerequisites
Engineers attending this course must have at least 12 months of hands-on experience with LOWIS PCP software.

Course contents
- Day one
  - Lecture: A brief overview of LOWIS PCP
  - Lecture: A brief overview of WellFlo® software
  - LOWIS software: Analysis of PCP wells selected by trainees
- Day two
  - LOWIS software: Analysis of PCP wells selected by trainees
**Course Overviews (continued)**

**Advanced Production Optimization**

**Objective**
This advanced-level course provides instruction regarding the new methodologies available for maximizing production from oil fields under artificial lift. The course includes the sequential linear programming method as implemented in the ReO⁰ software package.

**Course description**
The course is based on case studies of actual field optimization and enables engineers to realize the typical target of a 5 to 10 percent increase in production rate, usually achievable by constructing and optimizing a ReO production model.

**Target audience**
Experienced production engineers

**Prerequisites**
A familiarity with conventional nodal analysis methods and design techniques for gas lift and electrical submersible pump systems is assumed.

### Course contents

- **Mechanistic models of multiphase flow and heat transfer**
  - Flow regime maps
  - Transition criteria
  - Pressure drop and holdup models
  - Turner critical velocity
  - Heat-loss calculations
  - Critical and subcritical chokes

- **Specification and solution of network problems**
  - Network topology
  - Flow sheets
  - Flow sheet components
  - Source and sink functions
  - Wellhead performance curves
  - Tuning of well models
  - PVT models

- **Gas compression**
  - Multistage centrifugal compression
  - Compressor characteristics
  - Reciprocating compressors
  - Gas turbine drivers
  - Fuel consumption

- **Sequential linear programming**
  - Linearized objective function
  - Linear constraints
  - Setting up a production optimization problem

- **Advanced gas lift**
  - Optimum single-well problem
  - Deepest point of gas injection
  - Multiple gas-lifted wells
  - Allocation of lift gas
  - Hierarchical systems
  - Gas-lift valve performance
  - Design of kickoff sequences
  - Dynamic simulation of kickoff
  - Well stability
  - Use of sea-level pressure (SLP) for gas allocation in general networks
  - Influence of surface production system on wellhead pressures
  - Constraints on gas supply

- **Advanced electrical submersible pump systems**
  - Modeling of ESPs
  - Choice of number of stages
  - Allowable gas at inlet
  - Dunbar correlation
  - Pump reliability
  - Choice between gas lift and ESP
  - Pump performance monitoring
  - Hybrid systems
  - Hydraulic submersible pumps

- **Smart wells**
  - Definition of smart wells
  - Use of bottomhole chokes
  - Downhole separation
  - Water shutoff
  - Dual pumps for oil and water
  - System reliability
  - Multilateral completions
Advanced Well Test Analysis

Objective
This advanced-level course is designed for petroleum and reservoir engineers who may be required to interpret nonroutine well tests.

Course description
The course provides many examples from across the world, which are used to illustrate various techniques. Participants take from the course clear and systematic methodologies to tackle the more demanding types of well tests commonly encountered.

Target audience
Petroleum and reservoir engineers

Prerequisites
It is advisable to have already attended the Well Test Analysis, Well Test Analysis in Complex Reservoirs, or Well Test Analysis Using PanSystem® Software course.

Course contents
- Horizontal wells
- Extended drawdown testing
- Permanent downhole gauges (PDHG)
- Post-hydraulic fracture analysis
- Slug test analysis
- Injection wells
- Gas condensate well

“Knowledge of the instructor and the ease with which he made us understand things was great.”
Enron Oil & Gas India Ltd.

Artificial-Lift

Objective
This course provides attendees with a thorough introduction to the theory behind all forms of artificial lift. During 3-1/2 days, the advantages and limitations of each system, application considerations, and sample performance predictions are discussed for each lift method.

Course description
The course introduces the concepts used by our engineers in evaluating the best form of lift in individual cases. The student should leave the course with a solid foundation in all forms of lift and the concepts of the selection process to maximize production and return on investment.

Target audience
Production and field operations engineers, junior and senior petroleum engineers, and field technicians; also geoscientists and reservoir engineers who want to understand the implications of production systems on their field reservoirs. Significant benefits are realized by majors, independents, and international state companies alike. This course helps ensure a broad view of artificial lift, particularly when in-house expertise is limited to one- or two-lift systems.

Prerequisites
None

Course contents
- Gas-lift theory
- Plunger-lift theory
- Hydraulic-lift theory
- Progressing-cavity pump theory
- Electric submersible pump systems
- Rod-lift systems
- Production optimization
- Wellsite automation
- Capillary foam lift
- Gas-well deliquification
Course Overviews (continued)

Awareness of Production Automation

Objective
This advanced-level course provides a basic introduction to each form of artificial lift and its associated production-automation system. Participants gain a strong appreciation of the purposes and value of these systems, as well as the equipment and staffing needed to implement and support these systems.

Course description
This course teaches the purposes and values of production automation for artificial lift and operations, as well as the equipment and staffing needed to implement and support these systems. The importance of properly equipping, staffing, planning, and training to support these systems also is taught.

Target audience
• Any person involved in oilfield or gasfield production operations that use automation and artificial-lift systems should have this basic level of competency as a minimum.
• Typically, this level of competency is sufficient for managers or supervisors who oversee production operations that use automation and artificial-lift systems.
• Those who are interested or involved in oilfield or gasfield production operations that currently do or can use automation and artificial-lift systems.
• Those who oversee production operations that use automation and artificial-lift systems.
• It is not sufficient for persons who are directly involved in performing or supervising others who perform production-automation or artificial-lift operations, including selection, design, installation, operation, optimization, troubleshooting, and surveillance of automation and artificial-lift operations.

Prerequisites
None

Basic LOWIS™ Administration

Objective
The course is intended for system administrators and support engineers who are involved in the set up and support of a LOWIS server.

Course description
The administrator training provides the system manager with the skills necessary to back up a server, implement security, customize the navigator, install a license, and monitor system health. Other topics covered include file/directory structure, underlying application processes, setting poll schedules, and system troubleshooting.

Target audience
System administrators and support engineers

Prerequisites
This course requires a good understanding of computer system administration concepts.

Course contents
• LOWIS server installation
• Server architecture and folder structure
• LOWIS Admin tool and gauge off
• Licensing
• User security
• Backup/restoration and staging servers
• LOWIS client installation and setup
• Troubleshooting

Course contents
• Automation history
• State-of-the-art systems
• Automation objectives
• Automation applications
• Justification, notional costs
• Components
• Staffing
• Training
• Project planning
• Automation trends
• Automation exercise
• Questions and answers
• Course exam
• Aware competency-level certification process
CygNet® SCADA Configuration

Objective
The CygNet SCADA configuration course provides an operational foundation for basic CygNet system operators and is an introductory prerequisite for advanced courses designed for CygNet administrators and advanced users. This course introduces students to the components of the SCADA system and teaches them how to add field devices, set up control commands, define polling schedules, add points, setup alarm and history reporting, and define notifications. Students also learn how to create basic HMI screens and to define reports.

Course description
CygNet configuration is a three-day, hands-on course that will provide each student with the skills necessary to configure their own SCADA system. Simulated RTUs will be used for polling data, viewing alarms, configuring notification and viewing historical data. At the end of the third day of training each user will have created and managed a small CygNet system installation complete with automated polling and templated HMI screens (detail, alarm and summary screen).

Target audience
CygNet SCADA system operators, advanced users and administrators

Prerequisites
- Use of standard Microsoft® applications such as Word® and Excel®
- Remote terminal unit (RTU)/programmable logic controller (PLC) experience preferred

Course contents
- Understand service functionality
- Add communication devices
- Add and configure remote devices
- Create custom commands
- Create points
- Understand alarm and history reporting
- Schedule tasks
- Create and use groups
- Create notifications
- Learn CygNet studio design basics
- Learn reporting applications
- Learn basic configuration utilities

CygNet SCADA Advanced Configuration

Objective
The CygNet advanced configuration course introduces students to scripting in points and HMI screens, group rollups, device template files, the CygNet ODBC interface, importing/exporting data and the OPC and FIX interface services.

Course description
The CygNet SCADA advanced configuration course is a two-day, hands-on course. Each student will have a small CygNet SCADA system in which to configure advanced CygNet features such as library, group rollup and studio scripts. The student will also import, export and edit from various CygNet services using ODBC, OPC, text import and EIS.

Target audience
CygNet SCADA advanced users and administrators

Prerequisites
- CygNet configuration course
- Use of standard Microsoft applications such as Word and Excel
- Familiarity with VB Script or other scripting/programming language preferred

Course contents
- Create scripted tags
- Understand group rollups
- Add scripted functionality to CygNet studio screens
- Understand device template files
- Understand CygNet’s ODBC driver and its uses
- Import data into the system
- Import points into the system
- Configuring and using software interface services
- Learn advanced configuration utilities

Microsoft, Word and Excel are registered trademarks of Microsoft Corporation.
Course Overviews (continued)

CygNet® SCADA Administrator

Objective
The CygNet administrator course provides students with a thorough understanding of CygNet services and their inter-relationships. Students will also learn about service configuration, adding services, client-to-service and service-to-service communication, system security, managing UDCs, version management, backup and restore procedures, installing upgrades, license management, system maintenance and system troubleshooting.

Course description
The CygNet SCADA administrator course is a three-day, hands-on course. Each student will have a small CygNet SCADA system in which to configure administrative level functions such as domain settings, security implementation, creating backup and restore functions, as well as installing and updating the latest CygNet patches. Students will look at different ways to implement and view logging and the setup of intersystem replication.

Target audience
- CygNet SCADA advanced users and administrators
- Prerequisites
  - CygNet configuration course
  - Use of standard Microsoft applications such as Word and Excel
  - Familiarity with VB Script or other scripting/programming language preferred

Course contents
- Understand service configuration options
- Understand service relationships
- Troubleshooting CygNet component communication problems (client-service and service-service)
- Understand the use of service monitoring service points
- Understand error and log messages
- Learn to setup applications for version management
- Implement system security
- Configure data replication
- Backup and restore services
- Install upgrades/patches
- Learn administrator utilities

CygNet Gas Measurement Repository

Objective
The CygNet gas measurement repository (GMR) course teaches students how to setup and configure the GMR, upload client application files, configure remote devices for GMR data retrieval, add and delete meters from GMR, configure poll schedules, add and use groups and implement security.

Course description
The gas measurement repository course is a three day, hands-on course. Each student will have a small CygNet SCADA system in which to configure gas measurement data. Students will add and configure meters, automate polling, implement security and configure reports. Students will also use various measurement utilities to upload gas analysis data, historical data, configuration data, meters and groups.

Target audience
CygNet SCADA administrators, measurement administrators, measurement technicians

Prerequisites
- CygNet SCADA configuration course
- Use of standard Microsoft applications such as Word and Excel

Course contents
- Understand the relationship between the SQL server and GMR
- Understand gas measurement repository system components
- Add meters
- Create data retrieval schedules
- Export data
- Understand configuration detail sets
- Edit data
- Copy data
- Recalculate values
- Run reports
- Import data
CygNet® Web

Objective
The CygNet Web course teaches students how to create and maintain a CygNet website by creating Web pages to display both HMI screens and group service data.

Course description
The CygNet Web course is a one-day, hands-on course. Each student will have a small CygNet SCADA system in which to retrieve CygNet data for their CygNet website. Students will install CygNet Web, configure IIS for the CygNet website, create groups and implement security. Students will also view various .asp pages geared towards troubleshooting.

Target audience
CygNet SCADA administrators and advanced users

Prerequisites
- Use of standard Microsoft applications such as Word and Excel
- CygNet SCADA configuration course

Course contents
- Installing CygNet web
- Using CygNet vision screens
- Creating group hierarchies specifically for a CygNet website
- Group rollups
- Creating index pages
- Security

ESP Optimization Using LOWIS™ Software

Objective
This course shows how to use real-time data along with nodal analysis to prevent failures and thereby increase ESP run life and production using analysis workbench in LOWIS software.

Course outline
This 3-day intermediate-level course enables trainees to learn concepts of ESP installation optimization with their own wells in their environment.

Target audience
Production engineers, artificial-lift engineers (ESP), well analysts

Prerequisites
Engineers attending this course should have a basic understanding of production engineering and ESP operations.

Course contents
- Day one
  - LOWIS software
    - Overview of surveillance, analysis, and control modules
    - Catalogs
    - Well configuration
    - ESP well performance analysis
    - Total dynamic head
  - Day two
    - LOWIS software
      - Pressure traverse plot
      - Operating point analysis
      - Pump performance analysis
      - Normalized single-stage analysis
      - Inflow performance analysis
  - Day three
    - LOWIS software
      - Analysis report
      - Automated analysis
      - ESP diagnostic workflow
      - Real-time trend analysis
Course Overviews (continued)

ESP Real-Time Monitoring

Objective
This course shows how real-time trending and alarming modules of LOWIS™ ESP software enables detection of unwanted ESP operating conditions, preventing premature failures and nuisance shutdowns. It also provides an insight into ESP operating parameters that ensure best run-life results.

Course description
Taught at client venues while using clients’ well data on their LOWIS servers, this highly interactive and hands-on course provides entry-level instructions in ESP surveillance.

Target audience
Field programmers

Prerequisites
Field programmers attending this course should have a basic understanding of the oil well, ESP, and ESP surface controller.

Course contents
- Day one
  - Introduction to the oil well
  - Introduction to ESP
  - Introduction to ESP automation
- Day two
  - ESP alarms
  - ESP operating parameters
  - ESP real-time trends
  - Exercises: Detection of ESP problems using real-time trends

Fundamentals of Well Service Management (WSM)

Objective
This course is part of the LOWIS software training series and provides students with a basic understanding of LOWIS tools and techniques used for well service management. Students learn the fundamental skills for managing wells and the services necessary to maintain those wells during their production lifetime. During the course, students learn how to build and maintain wells; plan, execute, and track service jobs and events; generate reports and perform analysis; and create and modify wellbore diagrams that document the state of the wellbore at different stages of the well life cycle.

Course description
The emphasis of this course is to teach students how to use software tools and features found in LOWIS software and complete specific tasks related to well service management. During the course, attendees learn basic concepts and steps to complete these tasks and also view demonstrations of the tools and concepts being applied to real world conditions. Finally, students work hands-on with LOWIS software to complete exercises and projects that reinforce what they have been taught and enhance their learning experience.

Target audience
Planners, analysts, supervisors, and field engineers involved in well servicing operations

Prerequisites
This course requires an understanding of well-servicing operations and basic navigation in LOWIS software.

Course contents
- Well service management fundamentals
- Working with the job plan wizard
- Managing job backlogs
- Managing pull tickets
- Document management
- Working with the tour sheet wizard
- Working with scorecards
- Managing wellbores
- Managing wellbore diagrams
- Applying the concepts: Class project
Gas-Lift Applications

Objective
This course presents a thorough introduction about the theory of gas lift to professionals involved in oil and gas production; demonstrates the advantages and limitations of gas-lift systems; and acquaints students with system evaluation, design, installation, operation, and troubleshooting.

Course description
Weatherford’s artificial-lift systems are unique within the oilfield service industry and cover all forms of technology for artificial lift. As a complete solution provider—from wellbore to surface hardware, measurement/control systems and software—Weatherford is uniquely positioned to offer the best solution for operators’ production needs. The course provides practical instructions for design and analysis of gas-lifted wells. Practical problems are solved using WellFlo® software.

Target audience
This course provides students and experienced engineers who are entering production operations with the knowledge necessary for professional growth. Managers, engineers, operators, and field technicians can expand their understanding of the effects of gas lift on the producing system.

Prerequisites
None

Course contents
- Introduction
- Application and basic operating principles
- Gas-lift equipment
- Well evaluation
- Review of fundamentals
- Productivity index and inflow performance relationship
- Static and flowing pressure gradients
- Calculation of gas-lift production rate
- Gas-lift model
- Injection-pressure valve design
- Valve mechanics
- Graphical design and valve calculations
- Analysis and design software
- Example problems
- Operation and troubleshooting
- Unloading and optimizing production rate
- Troubleshooting tools and techniques
Course Overviews (continued)

Gas-Lift Asset Optimization–ReO® User

Objective
All key aspects of ReO software are covered in this 5-day course.

Course description
The course provides practical instructions for using ReO software for gas-lift network optimization. In this course, gas-lift performance data from well modeling integrates with the surface network. ReO software provides simulation and optimization solutions for surface networks incorporating practically every piece of equipment from wellhead to the processing plant. The application simulates the total production system behavior and concurrently optimizes the production honoring the user-defined economic model, which typically results in substantial production increases and/or reductions in operating costs.

Target audience
The course is designed for participants who have at least a basic knowledge of production simulation and optimization methods and nodal analysis for gas-lift wells, and who are required to gain expertise in the operation of ReO software for gas-lift asset optimization.

Prerequisites
This course requires a basic knowledge of nodal analysis and simulation methods for gas-lift wells and Wellflo® software.

Course contents
- ReO overview
  - Key ReO features
  - How ReO software works
- Constructing and running a ReO model
  - ReO files and administration
  - ReO fluids
  - ReO links and pipes
  - ReO network objects
  - Objectives and constraints
  - Optimization
  - Bulk data entry and editing tools
- WellFlo software
  - Well modeling
  - Generate the well performance curve
  - Advanced gas-valve modeling
  - Transfer of data to ReO software
- Open/closed-loop gas-lifted well modeling in ReO software
  - Gas-lifted well objects
  - Gas-lifted wellhead performance data
  - Qgi thresholds
  - Gas-lift optimization
- Gas-lift network example model
  - Building, validating, and optimizing the model from scratch
  - Creating and running different scenarios
  - Result discussion
Gas-Lift Optimization Using LOWIS™ Software

Objective
This course shows how to use real-time data along with nodal analysis in LOWIS software to detect possible deviations from optimal production. Is the well producing what it is supposed to produce, and is the lift-gas volume what it should be?

Course outline
This 3-day, intermediate-level course enables trainees to learn concepts of gas-lift installation optimization with their own wells in their environment.

Target audience
Production engineers, artificial-lift engineers (gas lift)

Prerequisites
Engineers attending this course should have a basic understanding of production engineering and gas-lift operations.

Course contents
- Day one
  - LOWIS software
    - Overview of surveillance, analysis, and control modules
    - Well configuration
    - Gas-lift well performance analysis
    - Determination of the actual point(s) of injection—single or multipoint injection?
- Day two
  - LOWIS gas-lift analysis workbench (GL AWB)
    - Pressure—depth plot
    - Injection point analysis
    - Generating lift-gas performance (LGR) curve
- Day three
  - LOWIS GL AWB
    - Analysis report
    - Automated analysis
    - Gas-lift diagnostic workflow
    - Real-time trends analysis

Gas-Lift Real-Time Monitoring

Objective
This course shows how real-time alarming and trending modules of LOWIS gas-lift software enables detection of problems with gas-lift installations. It also provides an insight into the basics of oil production by means of gas lift.

Course description
Taught at client venues while using clients’ well data on their LOWIS servers, this highly interactive and hands-on course provides entry-level instructions in gas-lift surveillance.

Target audience
Field programmers, well analysts, engineers

Prerequisites
Field programmers attending this course should have a basic understanding of oil wells, gas lifts, and the associated equipment—downhole as well as at the surface.

Course contents
- Day one
  - Introduction to the producing oil well
  - Introduction to the oilwell production by gas lift
  - Introduction the controls associated with gas lift
  - Introduction to the optimum gas-lift allocation
- Day two
  - Gas-lift alarms
  - Gas-lift operating parameters
  - Gas-lift real-time trends
  - Exercises: Detection of possible gas-lift problems using real-time trends
Course Overviews (continued)

Gas-Well Deliquification

Objective
This course illuminates the importance of gas-well deliquification lift technologies and techniques.

Course description
Proper application of artificial-lift technology to a loaded-up gas well can be one of the most profitable ventures that a company undertakes in its overall investment opportunity portfolio. This one-day course gives students a review of gas-well deliquification lift technologies and techniques. Weatherford’s artificial-lift systems are unique within the oilfield service industry and cover all forms of technology for artificial lift; therefore, in addition to providing the products, we can also offer the best solution for operators’ production needs. Using a combination of lectures, videos, and demonstrations, we introduce participants to the basic concepts of gas-well deliquification. The course is taught at Weatherford’s worldwide facilities by our qualified and experienced instructors.

Target audience
This course provides students and experienced engineers who are entering production operations with the knowledge necessary for professional growth. Well analysts, artificial-lift analysts, production engineers, and other technical personnel—who are interested in selection, design, and analysis of lift-pumping systems applicable to gas wells—learn principles directly applicable to their job functions. Managers, engineers, operators, and field technicians expand their understanding of the effects of lift systems on the gas wells.

Prerequisites
Basic understanding of gas-well production

Course contents
• The gas-well deliquification problem: Basic fundamentals of the gas-well liquid-loading phenomena and importance of critical-velocity calculations using Turner and Coleman equations
• Overview of the most commonly used lift techniques for deliquification: Plunger lift, foam injection, gas lift, and reciprocating rod lift
• Unique applications of other lift methods for deliquification: Progressing cavity pumps, hydraulic jet-lift, and electrical submersible pumps
• Challenges and considerations for successful run life in high-gas-cut-fluid applications
• Introduction to new technology for extended perforation intervals: CVR™, iCVR+™ and XtraLift™ systems
• Specific challenges in producing horizontal completion applications
• Lift selection using the unloading selector
Gas-Well Deliquification as Applicable to Offshore or Inland-Water Wells

Objective
Introduction to gas-well deliquification lift technologies and techniques applicable for offshore or inland-water wells.

Course description
Proper application of artificial-lift technology to a loaded-up offshore or inland-water gas well can be one of the most profitable ventures that a company can undertake in its overall investment portfolio. The subsurface safety valve (SSSV) presents numerous challenges or eliminates many of the conventional artificial-lift techniques needed for deliquifying such gas wells. This one-day course gives students a review of deliquification-lift technologies and techniques specifically applicable for such wells. Weatherford’s artificial-lift systems are unique within the oilfield service industry and cover all forms of technology for artificial lift; therefore, in addition to providing the products, we also offer the best solution for operators’ production needs. Using a combination of lectures, videos, and demonstrations, we introduce participants to the basic concepts of gas-well deliquification. The course is taught at Weatherford’s worldwide facilities by our qualified and experienced instructors.

Target audience
This course provides students and experienced engineers who are entering production operations with the knowledge necessary for professional growth. Well analysts, artificial-lift analysts, production engineers, and other technical personnel—who are interested in selection, design, and analysis of lift systems applicable to gas wells—learn principles directly applicable to their job functions. Managers, engineers, operators, and field technicians expand their understanding of the effects of lift systems on gas wells.

Prerequisites
Basic understanding of gas-well production

Course contents
- The gas-well deliquification problem: Basic fundamentals of gas-well liquid-loading phenomena and importance of critical-velocity calculations using Turner and Coleman equations
- Challenges posed by the SSSV in selection of conventional artificial-lift techniques
- Overview of the most commonly used lift techniques for deliquification: Gas lift, foam injection, hydraulic lift, and velocity strings
- WCS—a Renaissance™ family product—specifically designed for producing through the tubing-retrievable SSSV
Hydraulic Pumping Applications

Objective
This course provides a thorough introduction about the theory and application of hydraulic pumping; demonstrates the advantages and limitations of hydraulic pumping systems; provides knowledge to participants about the hydraulic pumping system and components; and familiarizes attendees with concepts of design, installation, operation, and troubleshooting of hydraulic pumping systems.

Course description
This 5-day course gives students a full review of artificial-lift hydraulic pumping systems. Weatherford’s artificial-lift systems are unique within the oilfield service industry and cover all forms of technology for artificial lift; therefore, in addition to providing the products, we also offer the best solution for operators’ production needs. Using a combination of lectures, videos, and demonstrations, we introduce participants to basic as well as advanced concepts of hydraulic pumping. The course is taught at Weatherford’s state-of-the-art technology and training centers in Houston, USA, and Abu Dhabi, UAE, by our qualified and experienced instructors.

Target audience
This course provides students and experienced engineers entering production operations with the knowledge necessary for professional growth. Well analysts, artificial-lift analysts, production engineers, and other technical personnel—who are involved in selection, design, and analysis of hydraulic-pumping systems—learn principles directly applicable to their job functions. Managers, engineers, operators, and field technicians expand their understanding of the effects of hydraulic pumping on the producing system.

Prerequisites
Basic understanding of oilwell production

Course contents
• Introduction to various forms of artificial-lift systems
• Hydraulic pumping system comparison to other lift systems
• Hydraulic-lift system overview
• Jet pumps: How they work, why they are used
  – Nontraditional applications
• Hydraulic piston pumps: How they work, why they are used
• Types of subsurface configurations
• Surface components of hydraulic system
• Auxiliary components
• Design and analysis using software
• Installation examples
Knowledge of Production Automation

Objective
This course provides a thorough introduction to each form of artificial lift and its associated production-automation system. It includes a more detailed understanding of production-automation and artificial-lift technology and operations. People who take this course gain a strong appreciation of the value of these systems and the equipment, staffing, training, coordination, and supervision necessary to implement, maintain, and operate production-automation systems for artificial lift. They learn how to select, motivate, and evaluate the staff that operates these systems.

Course description
This course teaches the:
- Purposes of production automation for artificial lift and operations
- Value of these systems
- Equipment and staffing needed to implement and support these systems
- Importance of properly equipping, staffing, planning, and training to support these systems

Target audience
Typically, this level of competency is required for any person who is directly involved in supervising production-automation and artificial-lift engineering or operations, including selection, design, installation, operation, optimization, troubleshooting, and surveillance of automation and artificial-lift equipment and/or operations.

This course should be taken by:
- Personnel who provide direct supervision to staff who are actually involved in hands-on work with automation systems for artificial-lift and production operations.
- Those who are interested or involved in oilfield or gasfield production operations, which currently do or can use production-automation and artificial-lift systems.
- Those who need to have a basic level of competency in the subject.
- Those who oversee production operations that use automation and artificial-lift systems.
- This course is not sufficient for any person who is actually performing these operations.

Prerequisites
None

Course contents
- Production-automation certification process
- Purpose of the course
- Production automation
- Production-automation applications
- Value of production automation
- Components
- Costs
- Justification
- Life cycle of automation systems
- Project management
- Staff requirements
- Staff development
- Making the most of automation systems
- Case histories
- Questions and answers
- Knowledgeable, competency-level certification process
Course Overview (continued)

K-Series Products Technical Training

Objective
For effective operation of Weatherford’s supervisory control and data-acquisition (SCADA) systems, it is beneficial for a company to implement and provide employees periodic training to enhance their knowledge and proficiency to maximize the company’s return on investment. To this end, Weatherford is pleased to offer a variety of training programs designed to educate and enhance the benefits of your automation system.

Course Description
• DACC remote terminal unit (RTU) course series
• K-series product training course

This 4-day course builds on a basic understanding of RTU operation and use, and covers the system overview, detailed RTU components, RTU configuration, and instrumentation hookup, calibration concepts, Weatherford PROControl ™ concepts, and advanced troubleshooting.

This course prepares the student for the calibration, PROcontrol, and application course.

Target Audience
Field operators and well analysts who needs to understand K-series controllers and how to set them up for efficient production optimization.

Prerequisites
None

Course contents
• System overview
• Wellsite equipment
• RTU system
• Software tools
• RTU configuration
• Board replacement
• Firmware upgrade
• Extract RTU history
• Extract RTU trends
• Clear and test memory (return to factory default)
• See RTU setup procedure document
• Multivariable transmitter
• I/O CIM
• Honeywell PPT-R
• History settings
• Communications
• Analog fail
• Cryout (report on alarm)
• Clear and test memory
• Program overview
• Installation
• Database
• Administration
• Navigation
• Data retrieval
• Reports
• Excel data reporting and graphing
• Input circuitry
• Channel numbering
• N/O and N/C definition
• Typical wiring techniques
• Failsafe configuration
• Hardware channel versus software record display
• Digital input record configuration
• Display hardware channel and software records
• Example setups
• Connection definition
• Channel numbering
• N/O and N/C definition
• Typical wiring techniques
• Failsafe configuration
• Disable switch (K-3512)
• Record configuration
• Display hardware channel and software records
• Input circuitry
• Channel numbering
• RTDs
• Power supply, wiring
• Display hardware channel and software records
• Analog record configuration
• Tank gauging, scaling, and specific gravity correction
• Scaling calculations and examples
• Scaling nonstandard transmitter signals
• Display hardware channel and software records
• Example setups
• Output circuitry
• Channel numbering
• 4 to 20 mA and 1- to 5-volt standards
• Typical wiring techniques
• Display hardware channel and software records
• Accumulator record configuration
• Example setups
• Tank gauging
• Inputs
• Review turbine meter concepts

Other uses
• Example setups
• What is a flow computer?
• AGA 3, 1985, and 1992 equations, Orifice meters
• AGA 7, turbine, pulse meters
• NX19 and AGA8 supercompressibility
• V-Cone, gas, and liquid
• Review orifice meter concepts
• Scaling
• Input types
• Other uses
• Water meter
• Tachometer
• Example setups
• EFM data
• Analog history
• Production history
• Analog record trending
• Data communications
• RS232
• RS485
• Converters
• Wiring
• Siemens and advanced telemetrics, level probe interface
• Bristol flow computer interface
• Baker FTI downhole instrument interface
• Cooper Entronic
• PLC interface
• MODBUS RTU interface
• MODBUS ASCII interface
• Firmware types
• Example setups
• Communications tools
• K-2000
• KD-500 and K-500
• CIM Modules
• PROControl (brief description)
• Calibration (brief description)
• Other Equipment
• K-series RS232 to RS485 Instrumentation hookup and wiring
• Troubleshooting

Instrument hookup, wiring, and troubleshooting are discussed throughout the course.
MatBal® Software

Objective
This course explains the various functions that are available in the MatBal application for performing each stage of material balance analysis.

Course description
The course covers the theory behind the calculations used in the MatBal application, which includes basic material balance equations and various reservoir drive mechanisms, such as solution drive, gas-cap drive, compaction and connate water expansion, and water drive.

Attendees obtain hands-on experience using the MatBal application by building various example models. The example models cover many aspects of the program, including how to:
• Build a model with strong water drive
• Model reservoirs with different objectives to determine the size and strength of the aquifer
• Perform history matching

Target audience
Production and reservoir engineers, asset modelers

Prerequisites
This course requires a basic understanding of production well analysis.

Course contents
• Model building: Specify well, reservoir, and aquifer data
• Production allocation: Allocate production to various reservoirs and wells
• History matching: Tune material balance equations using historical production data and a nonlinear regression solver
• Simulation: Simulate production using the history matched model
• Relative permeability tuning: Using fractional flow modeling
• Forecasting

PanSystem® and PanMesh™ Software

Objective
This course provides an introduction to well test (pressure transient test) interpretation software and covers PanSystem (analytical models) and PanMesh (numerical models) applications. At the end of the course, the student can: import raw sensor data; prepare data for analysis; use all the analytical methods, selecting an appropriate reservoir model; ascertain reservoir parameters for the model; and generate a simulated response to compare with actual data.

Course description
The course focuses on training about the use of the software, not on the underlying engineering concepts. The main topics are covered with a brief refresher on the underlying principles.

Attendees become familiar with PanSystem software by using the application on a series of worked examples, covering data preparation, basic analysis, and a set of the most common well and reservoir analysis models.

Target audience
The course is designed for engineers who intend to use PanSystem software to analyze and design well tests.

Prerequisites
Attendees need to have a basic knowledge of well test analysis techniques and methods.

Course contents
The following summarizes the main subjects to be covered during the course:
• Data preparation through to analysis
• Basic analysis workflow
• Faults and boundaries
• Variable wellbore storage, non-uniqueness of models
• Closed reservoirs
• Horizontal wells analysis
• Basic gas-well test analysis
• Inflow performance and production forecasting
• Partial completions
• Hydraulically fractured wells
• Basic numerical analysis with PanMesh software
• Pinch-out numerical analysis
• Boundaries and heterogeneities numerical analysis
• Interference tests numerical analysis
• Layered horizontal well numerical analysis

Except for the Edinburgh location, attendees need to bring their own laptop with local administrator’s privileges to install PanSystem software.
PanSystem® Software

Objective
This course provides an introduction to well test (pressure transient test) interpretation software, and covers the PanSystem (analytical models) application. At the end of the course, the student can: import raw sensor data; prepare data for analysis; use all the analytical methods; select an appropriate reservoir model; ascertain reservoir parameters for the model; and generate a simulated response to compare with actual data.

Course description
The course focuses on training in use of the software, not on the underlying engineering concepts. The main topics are covered with a brief refresher on the underlying principles.

Attendees become familiar with PanSystem software by using the program on a series of worked examples, covering data preparation, basic analysis, and a set of the most common well and reservoir analysis models.

Target audience
The course is designed for engineers who intend to use PanSystem software to analyze and design well tests.

Prerequisites
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Course contents
The following summarizes the main subjects to be covered during the course:

• Data preparation through to analysis
• Basic analysis workflow
• Faults and boundaries
• Variable wellbore storage, non-uniqueness of models
• Closed reservoirs
• Horizontal wells analysis
• Basic gas-well test analysis
• Inflow performance and production forecasting
• Partial completions
• Hydraulically fractured wells

 Except for the Edinburgh location, attendees need to bring their own laptop with local administrator’s privileges to install PanSystem software.

PanSystem User Workshop

Objective
This course assists users of PanSystem software to analyze well test data from their own fields. To achieve this goal, the course is presented in a seminar fashion, where engineers are guided through the different stages of well test analysis, using PanSystem software.

Course description
If a client wants to examine data relevant to their own operations, Weatherford recommends the PanSystem workshop, a 5-day seminar which can be tailored to use the client’s well test data. Two days are spent reviewing PanSystem software; and 3 days are used to analyze previously prepared client data. Time can also be spent doing one-on-one training during the second part of the workshop. The client furnishes data used in this workshop; hence the quantity and quality of the data available dictates the conduct of the course.

Target audience
Well test analysts, reservoir engineers, production engineers

Prerequisites
This course requires an understanding of well test analysis operations and PanSystem software.

Course content
The course is customized to meet client needs using their well examples.
PCP Optimization Using LOWIS™ Software

Objective
This course solidifies understanding of advanced concepts for PCP well optimization using LOWIS software. Taught at a client venue while using the clients’ well data on their LOWIS servers, this highly interactive and hands-on course is aimed at clients who want to continue and enhance benefits derived from PCP well analysis performed by their engineers and well analysts using LOWIS software.

Course description
The course provides practical understanding of using a nodal analysis well modeling tool with real-time data to analyze PCP pump and well performance to extend run life and increase production.

Target audience
Well analysts, artificial-lift analysts, production engineers, and other technical personnel

Prerequisites
Students taking this course should be working in a production engineering or artificial-lift analyst position. They should have a basic knowledge of progressing cavity pump equipment, its theory, and be exposed to LOWIS and WellFlo® software fundamentals.

Course contents
• Day one
  – LOWIS software
    • Overview of surveillance, analysis and control modules
    • Well configuration
  – WellFlo model configuration
  – PCP well performance analysis
• Day two
  – LOWIS software
    • Pressure traverse plot
    • Operating point analysis
    • Pump flow and torque performance analysis
    • Inflow performance analysis
• Day three
  – LOWIS software
    • Analysis report
    • Automated analysis
  – PCP diagnostic workflow
  – Real-time trend analysis

PCP Real-Time Monitoring

Objective
The course provides a practical understanding of capabilities created by LOWIS software in managing PCP well performance.

Course description
The course covers practical aspects of PCP basic equipment along with LOWIS configuration and surveillance.

Target audience
Field programmers, operators, production engineers, well analysts, artificial-lift analysts, and other technical personnel

Prerequisites
Students taking this course should be working in a production engineering or operations position. They should have a basic knowledge of progressing cavity pumps and be exposed to LOWIS software fundamentals.

Course contents
• Day one
  – Introduction to PCP
  – Introduction to WellFlo software
  – Introduction to LOWIS PCP
  – PCP well configuration
• Day two
  – PCP surveillance
  – PCP alarms
  – PCP performance analysis through trends
Course Overviews (continued)

Production Logging

Objective
The course provides a practical understanding of the physical phenomena involved, measurement principles, equipment types, and the analysis of production logging surveys.

Course description
The course covers practical and theoretical aspects of modern production logging operations in terms of tool selection and data requirements, measurement limitations, analysis, and its pitfalls. In the practical sessions, real field data are analyzed and the results discussed in depth.

Target audience
The course is designed for engineers and other technical personnel who are involved at any stage in the specification, acquisition, or interpretation of cased-hole wireline measurements.

Prerequisites
None

Course contents
• Introduction
  – Overview of layered reservoir behavior in producers/injectors as measured by wireline tools
• Flow-rate measurement
  – Measurement of flow rate by spinner, spinner flowmeter calibration
  – Case study: Spinner calibration and interpretation in an inclined well, shut in and flowing, layered inflow performance
• Fluid identification
  – Phase hold up by pressure gradient, radioactive fluid density, and dielectric (capacitance) based methods
• Temperature measurement
  – Main features of temperature profiles in producing and injecting wells
  – Anomalous temperature profiles
• Pressure measurement
• Caliper, gamma ray, casing collar locator (CCL), and depth control: Modern production logging toolstrings
• Two-phase flow
  – PVT properties, flow regimes, simplistic slip velocity model
  – Case study cont; two-phase interpretation, shut in and flowing, complicating factors, well deviation misleading responses
  – Three-phase flow
  – Horizontal wells: Problems encountered with conventional logging sensors
• Recent developments
  • Probe tools
  • Hold-up imaging
  • Phase-velocity measurement
• Miscellaneous sensors
  – Fiber optics
  – Downhole video
  – Noise logging

“A very good overview of PLT interpretation techniques. Excellent instructor, pace of delivery fine.”

BHP
Production Optimization Using Systems Analysis

Objective
The course provides practical instructions on design and analysis of naturally flowing oil and gas wells, as well as gas-lift and ESP systems based on systems analysis—also known as nodal analysis concepts.

Course description
Practical problems are solved using the WellFlo® software package. Upon completion of this course, participants can:

- Explain major factors in the artificial-lift selection process
- Analyze cessation of the natural flowing period of an oil well
- Identify conditions in which a gas well ceases to flow because of liquid loading
- Identify components of a gas-lift and an ESP system
- Design and analyze gas-lift and an ESP system
- Use WellFlo software to:
  - Develop a well model for a well under naturally flowing, gas-lift, or ESP conditions
  - Conduct sensitivity analysis on various components of well system for a robust design
  - Adjust input parameters based on field measurements

Target audience
This course is intended for well analysts, artificial-lift engineers, production engineers, and other technical personnel who are involved in the analysis and design of naturally flowing oil wells, gas wells, and high-rate artificial-lift systems, such as gas-lift and ESP systems.

Prerequisites
None

Course contents
- Production optimization
- Need for and selection of artificial-lift methods like gas lift and ESP
- Gas-lift system components
- ESP system components
- WellFlo software introduction
- Systems analysis for flowing wells
  - Inflow performance relationship
  - Outflow performance relationship
  - Liquid loading in gas wells
  - Selection of design parameters based on field measurements
- Gas-lift wells
  - Systems analysis
  - Design
  - Analysis
- ESP Wells
  - Systems analysis
  - Design
  - Analysis
- Preliminary automation concepts
- Network Optimization Basics

Except for the Edinburgh location, attendees need to bring their own laptop with local administrator’s privileges to install WellFlo software.
Real-Time Production Optimization of Beam Wells

Objective
The course provides a practical understanding of capabilities created by LOWIS™ software in managing SRP well performance.

Course description
The course covers practical aspects of automation concepts as applied to sucker rod pumping systems. Upon completion of this course, you can:

• Understand basic concepts of automation and how it is used in an oil field
• Explain basic components of a reciprocating SRP system
• Explain underlying theory behind well performance applicable to SRP wells
• Understand surveillance and optimization concepts applicable to SRP systems
• Explain the importance of well tests and how to use them to diagnose problems with SRP wells
• Use LOWIS software to:
  – Configure an SRP well for data capture from an automation system
  – Monitor well performance
  – Analyze SRP well performance using real-time measurements
  – Validate a well test based on results of analysis

Target audience
This course is intended for well analysts, artificial-lift analysts, production engineers, and other technical personnel who are involved in optimization of reciprocating sucker rod pumping systems using LOWIS software.

Prerequisites
None

Course contents
• Automation basics
  – Terminology
  – Devices used
  – Field-sensing devices
• Basic components of a sucker rod pumping system
• Inflow and outflow performance as applicable to SRP wells
• LOWIS software introduction
• SRP well surveillance
• SRP performance analysis and interpretation of dynamometer cards
• Well testing methodology and test data interpretation for SRP wells

This course is not an open course. It is presented during 3-1/2 days on-site at client locations using live data on existing LOWIS systems, and can be tailored to suit client needs. For more information on this course or to schedule a session at your facility, please contact a Weatherford representative.
Real-Time Production Optimization of ESP Wells

Objective
The course provides a practical understanding of capabilities created by LOWIS™ software in managing ESP well performance. The course takes 3-1/2 days.

Course description
The course covers practical aspects of automation concepts as applied to ESP systems. Upon completion of this course, you can:

• Understand basic concepts of automation and how it is used in an oil field
• Explain basic components of an ESP system
• Explain underlying theory behind well performance applicable to ESP wells
• Understand surveillance and optimization concepts applicable to ESP systems
• Explain the importance of well tests and how to use them to diagnose problems with ESP wells
• Use LOWIS software to
  – Configure an ESP well for data capture from an automation system
  – Monitor well performance
  – Analyze ESP well performance using real-time measurements
  – Validate a well test based on results of analysis

Target audience
This course is intended for well analysts, artificial-lift analysts, production engineers, and other technical personnel who are involved in optimization of ESP systems using LOWIS software.

Prerequisites
None

Course contents
• Automation basics
  – Terminology
  – Devices used
  – Field-sensing devices
• Basic components of an ESP well
• Inflow and outflow performance as applicable to ESP wells
• LOWIS software introduction
• ESP well surveillance
• ESP performance analysis
• Well testing methodology and test data interpretation for ESP wells

This course is not an open course. It is presented during 3-1/2 days on-site at client locations using live data on existing LOWIS systems, and can be tailored to suit client needs. For more information on this course or to schedule a session at your facility, please contact a Weatherford representative.
Real-Time Production Optimization of PCP Wells

Objective
The course provides a practical understanding of capabilities created by LOWIS™ software in managing PCP well performance.

Course description
The course covers practical aspects of automation concepts as applied to PCP systems. Upon completion of this course, you can:

• Understand basic concepts of automation and how it is used in an oil field
• Explain basic components of a PCP system
• Explain underlying theory behind well performance applicable to PCP wells
• Understand surveillance and optimization concepts applicable to PCP systems
• Explain the importance of well tests and how to use them to diagnose problems with PCP wells
• Use LOWIS software to
  – Configure a PCP well for data capture from an automation system
  – Monitor well performance
  – Analyze PCP well performance using real-time measurements
  – Validate a well test based on results of analysis

Target audience
This course is intended for well analysts, artificial-lift analysts, production engineers, and other technical personnel who are involved in optimization of progressing cavity pumping systems using LOWIS software.

Prerequisites
None

Course contents
• Automation basics
  – Terminology
  – Devices used
  – Field-sensing devices
  – Basic components of a PCP well
• Inflow and outflow performance as applicable to PCP wells
• LOWIS software introduction
• PCP well surveillance
• PCP performance analysis
• Well testing methodology and test data interpretation for PCP wells

This course is not an open course. It is presented during 3-1/2 days on-site at client locations using live data on existing LOWIS systems, and can be tailored to suit client needs. For more information on this course or to schedule a session at your facility, please contact a Weatherford representative.
ReO® Software

Objective
All the key aspects of ReO software are covered in this 5-day course.

Course description
Each participant has access to a computer for use during the course so that the maximum time possible is spent on working through the example datasets. This benefit ensures that all participants have good exposure to the software and are fully conversant with it on completion of the course. Attendees receive a course manual for future reference (the manual is also accessible from the online help menu of the software).

Target audience
Production engineers, well and asset modelers.

Prerequisites
The course is designed for participants who have at least a basic knowledge of production simulation methods and need to gain expertise in the operation of ReO software.

Course contents
- ReO overview (Module 1)
  - Key ReO features
  - How ReO software works
- Constructing and running a ReO model (Modules 2 and 3)
  - ReO files and administration
  - ReO network objects
  - Objectives and constraints
  - Optimization
  - Bulk data entry and editing tools
- Detailed compressors in ReO software (Module 4)
  - Gas turbine and gearbox connectivity
  - Turbine performance
  - Compressor performance
  - Detailed compressor constraints
- Gas-lifted wells in ReO software (Module 5)
  - Gas-lifted well objects
  - Gas-lifted wellhead performance data
  - Compositional issues
  - Gas-lift optimization
  - Flow groups
- WellFlo® software (Module 6)
  - Well model tuning
  - Advanced gas-valve modeling
  - Transfer of data to ReO software
- History matching a ReO model (Module 7)

Reservoir Engineering—Integration of Wireline Formation Testing and Production Log Data

Objective
This course explains formation testing and production log data for a better understanding of the reservoir.

Course description
Beginning with an introduction to the geological model of reservoir structures, the course then demonstrates how formation tests and production log measurements can be used to improve understanding of the reservoir behavior, particularly in the case of layered and compartmentalized reservoirs. Field examples are used to illustrate how this integrated approach leads to improved reservoir description essential to the efficient management of the reservoir.

Target audience
This course has been developed for geologists, reservoir engineers, and other petroleum technologists who are interested in the application of logging and distributed pressure measurements to enhance their understanding of the relationship between the geological model and the actual reservoir behavior.

Prerequisites
The course requires a basic understanding of the geological model and reservoir.

Course contents
- Distributed pressure measurements
- Wireline formation testing
- Pressure profiles in unproduced and producing reservoirs, observed pressure gradient intersections
- Effect of filtrate invasion on measured pressure, supercharging
- Capillary pressure effects, permeability from test pressure response
- Differential depletion, barrier transmissibility
- Effective vertical permeability
- Field examples
- Distributed flow measurements
- Production logging devices, measurements, and calibration
- PL profiles—field examples, two-phase flow, deviated wellbore
- Identification of fluid entries, thief zones, plugged perforations
- Inflow performance of multilayer systems
- Use of flowmeter in well testing
- Identification of reservoir structure
- Integration of distributed pressure and flow measurements
- Material balance for a complex reservoir
- History matching of a reservoir model
- Prediction of long-term pressure response, parameter estimation
Course Overviews (continued)

Rod-Pumping Applications

Objectives
This course provides a thorough introduction about the theory and application of rod pumping; demonstrates the advantages and limitations of sucker-rod pumping systems; provides knowledge to the participants about the entire rod-pumping system and its components; and familiarizes attendees with concepts of design, installation, operation, and troubleshooting of rod-pumping systems.

Course description
This 5-day course gives students a full review of the sucker-rod pumping system of artificial lift. Weatherford’s artificial-lift systems are unique within the oilfield service industry and cover all forms of technology for artificial lift; therefore, in addition to selling the products, we can also offer the best solution for operators’ production needs. Using a combination of lectures, videos, and demonstrations, we introduce participants to the basic and advanced concepts of the rod-pumping chain from downhole to the surface—pump, rods, surface-unit, controller, and real-time optimization software.

Target audience
This course provides students and experienced engineers who are entering production operations with the knowledge necessary for professional growth. Well analysts, artificial-lift analysts, production engineers, and other technical personnel—who are involved in selection, design, and analysis of reciprocating sucker-rod pumping systems—learn principles directly applicable to their job functions. Managers, engineers, operators, and field technicians expand their understanding of the effects of sucker-rod pumping on the producing system.

Prerequisites
None

Course contents

• Introduction to various forms of artificial-lift systems
• Sucker-rod pumping system comparison to other lift systems
• Rod-pumping components
• Downhole assembly:
  – Pumps
    • Types
    • Components
    • API nomenclature
    • Specialty pumps
  – Anchors
  – Separators
• Sucker rods
  – Types
  – API nomenclature
  – Sinker bars
• COROD® continuous rods
• Surface pumping units
  – Overview
  – Types
  – API nomenclature
  – Special application units
    • Long-stroke units
    • Hydraulic units
    • Strap-jacks
• Prime-mover types, selection considerations
• Automation in rod-pumping systems
  – Rod-pump controllers
  – Load cells
  – Position sensors
• Real-time optimization using LOWIS™ software
• Pumping-system design using commercial software
• Designing rod string
• Designing for special applications
  – Gas interference
  – Deviated wells
  – High temperature
  – Corrosive applications
• Daily operations and troubleshooting
  – Fluid pound
  – Gas interference
  – Dynamometer cards
  – Fluid level
• Sucker-rod care and handling during installation and servicing
• Pumping-unit service and safety
Rod-Pumping Optimization

Our rod-pumping optimization training is not a product-based course. Instead these classes focus on learning and enhancing engineers’ skills in production optimization by introducing new and reviewing time-proven methods for optimizing production. The classes we offer and the estimated length of the sessions are listed below.

Well optimization
In the well optimization class, students learn various time-proven methods for optimizing production of oil wells. The instructors have decades of field experience in production optimization. The well optimization class can be customized to your particular needs.

Estimated class time: Custom

Applied rod pumping
This class is structured for the person who needs a basic foundation in rod pumping. It also touches on the concepts that are addressed in the self-paced modules, but it is focused on the person who wants to gain a sound understanding of rod pumping artificial lift. In the applied rod-pumping class, students also learn various time-proven methods for optimizing production of rod pumped wells. Using these well-analysis methods in a field provides the operator with the following benefits:

• More efficient well and field analysis
• Increased production
• Increased mean time between failures
• Reduced utility costs
• More efficient use of technology

Estimated class time: 3 days

Rod-pumping optimization
In the rod-pump optimization class, instructors use their 25-plus years of experience in oilfield production to create a high-level class that is beneficial to advanced users with experience in rod-pump optimization and an understanding of the rod-pumping software. They bring a unique combination of experience and expertise to the classes, which are taught in an open, interactive format that provides the students with advanced methods for analyzing well performance. This class lasts for 3 days and covers in depth the methods discussed in the self-paced modules.

Estimated class time: 3 days

Self-paced training modules
Weatherford has instituted a system aimed at users who want to hone their skills by working on the detail of recognition, correction, and optimization of production problems. The training classes are offered at your site or Weatherford’s office in Houston. These modules enable you to work at your own pace and your own schedule to gain advanced training for optimizing production and decreasing expenses. You can choose one or several modules to attend and then try some of the methods discussed in the field. Later on, when you are ready, you can schedule other modules. Because these classes are moderately priced, attending them does not take a large chunk out of your budget.

• Use of rod-pumping software for proactive recognition of optimization opportunities
• Electrical cost reduction through optimization of system efficiency
  – Counterbalance
  – Pumping unit size
  – Prime mover size
  – Runtime
  – Rod design
• Card interpretation surface and downhole cards
• Why use pump-off control?
  – Justification
  – Benefits
• RPC idle-time methodology
  – RPC based
  – Trial and error
  – Fluid-level based
• Calibration
  – RPC load and position
  – Strain gauges versus load cells for load
  – Real position versus proximity switches
  – How to recognize calibration problems
  – Calibration methodology
  – Calibration methods for calculated fluid level/PIP from the rod pumping software
• Use of rod-pumping software

Estimated class time: Half day for each module
Sendra Software

Objective
This course provides students with the knowledge and hands-on practice needed to learn how to use Weatherford’s Sendra software and to become comfortable with its most important features. The main feature of Sendra is based on determining relative permeabilities and capillary pressure that reconcile the experimental data by simulation. Using your own computer, you can work independently on a problem or in groups of two attendees.

Course description
The course is directed towards the interpretation of core analysis data that is used to determine accurate relative permeability and capillary pressure functions for use by field applications. Relative permeability provides important input parameters to reservoir simulators, as well as MatBal®, WellFlo®, and PanSystem® software.

- Upon completion of this course, you can:
  - Determine relative permeabilities and/or capillary pressure
  - Simulate and QA experiments for a given set of laboratory data
  - Reconcile experimental data by matching history
  - Use parameters to represent flow functions

Target audience
This course is designed primarily for people who use Sendra software for solving special core analysis problems. Laboratory personnel involved with SCAL measurement and interpretation find this course especially useful by learning how their experiment results are interpreted and how laboratory routines are improved by using Sendra.

Prerequisites
The course requires an understanding of core analysis.

Course contents
The following summarizes the main subjects to be covered during the course:

- Simulation of core flood experiments
- Estimation of flow functions
- Assessment of accuracy
- Design of experiments

Attendees need to install Sendra on their own laptop computer or other training computers at the client’s site. This must be done before the training.

We provide training material with a number of exercises. However, we prefer that attendees have available their own SCAL experiments that can be analyzed during the training.

The client should ensure that each attendee has a printed version of the user guide before the training.
SRP Real-Time Monitoring, Basic

Objective
This course aims at showing how the real-time status and alarming function of the LOWIS™ beam software allows users to detect SRP wells that are down or wells with alarm conditions based on data collected from each wellsite rod pump controller (RPC). The course also provides an insight into ROC operating parameters that ensure best SRP operation.

Target audience
Field programmers.

Prerequisites
Field programmers attending this course should have basic understanding of SRP wells and the surface rod pump controller.

Course contents
- Day one
  - Basic LOWIS
    - Menus and views, use of the navigator
    - Well Status and alarms
  - Day two
    - Basic LOWIS
      - RPC parameters access
      - Dyno card collection, card libraries, and downhole cards
      - Trends and reports

SRP Real-Time Monitoring, Intermediate

Objective
This course is meant to show how to use the analysis of real-time data to understand current SRP operating conditions, identify and help prevent failures, increase SRP well runtime without failure, and thereby increase/maintain production.

Target audience
Production engineers, artificial-lift engineers (beam).

Prerequisites
Course attendees should have a basic understanding of SRP production and RPC operations.

Course contents
- Day one
  - LOWIS
    - Overview of the configuration, surveillance and analysis workflow tabs
    - Basic navigation review
    - Add/Delete well process
    - Beam well configuration
    - System configuration
  - Day two
    - LOWIS
      - Beam catalogs
      - Beam well status
      - RTU Read-Write functionality
      - Beam analysis workbench functionality
  - Day three
    - LOWIS
      - Downhole pump card interpretation
      - Performance data and history
      - The diagnostic process

SRP Real-Time Monitoring, Advanced

Objective
This course consists of interactive (one-on-one) sessions analyzing operating SRP wells. Each student is trained individually, one at a time. A trainer spends about two hours with each student.

Target audience
Production engineers, artificial-lift engineers (beam).

Prerequisites
Engineers attending this course must have at least twelve months of hands-on experience with LOWIS beam.

Course contents
- Day one
  - Lecture: A brief overview of LOWIS beam
  - LOWIS: Real-time analysis of SRP wells selected by trainees—alarms, runtime history, downhole cards, gearbox torque, structure load, rod stress, pump efficiency, etc.
- Day two
  - LOWIS: Real-time analysis of SRP wells selected by trainees—alarms, runtime history, downhole cards, gearbox torque, structure load, rod stress, pump efficiency, etc.
Well Test Analysis

Objective
This course covers the basic theory and practice of well testing.

Course description
The course covers the basic elements of well test analysis methodology and the theory on which it is based. The major parameters derived from well tests are introduced for the principal classes of reservoirs that the student will encounter. The course contains many practical, hand-worked examples to develop skill and confidence in performing simple routine analyses. The course also reflects the universal acceptance of computer-aided interpretation methods. Participants analyze field examples using state-of-the-art PC-based software.

Target audience
The course is intended for engineers, geologists, and other technical staff who are or can become, involved in the design, supervision, or interpretation of well tests. It is valuable for those with no previous experience in well testing and also as a refresher for those whose experience does not include modern analysis techniques.

Prerequisites
None

Course contents
- Introduction (reservoir performance, basic concepts, need for testing)
- Steady state, semisteady state, and transient well performance
- Drawdown testing
- Buildup testing
- Semilog analysis
- Diagnostics and derivative analysis
- Wellbore storage and type curve matching
- Linear discontinuities (sealing faults, stratigraphic pinchouts)
- Late-time boundary and depletion effects
- Vertically fractured wells
- Naturally fractured reservoirs
- Variable rate analysis methods
- Gas-well testing
- Skin factor analysis and well deliverability
- Reservoir limit testing
- Well test operations
- Test design

“The instructor has a good ability to make complicated things easier to understand.”
Conoco

“The course guided us beautifully through the logic of well test interpretation. Complicated stuff was dealt with very simply.”
Enron Oil & Gas
Well Test Analysis in Complex Reservoirs

**Objective**
The course tackles well testing situations that are rarely covered in textbooks and are commonly found in fields around the world.

**Course description**
Emphasis is placed on recognition of the behavior of typical models through use of the pressure derivative. Lectures and practical work is allocated equal time in the course. A wide range of field examples are tackled in the practical sessions which are conducted using Weatherford’s PanSystem® well test analysis software. This format, which has been successful in previous courses, enables participants to work with many field examples and thus gain a deeper understanding of the subject in a short time. Participants are encouraged to bring samples of data from their own well tests for use in the practical sessions.

**Target audience**
The course is intended for engineers who already have grounding in the basics of well test analysis.

**Prerequisites**
The well test analysis course should be taken before this course.

**Course contents**
- Review of conventional methods—derivative analysis
- Effect of sealing and partially communicating faults
- Dual permeability model
- Vertical interference testing
- High-permeability lens intersecting a well
- Limited entry effects
- Dual porosity reservoirs—effective wellbore connection
- Layered systems—use of production logging measurements
- Pressure response in linear reservoirs—channel sands, fault blocks, etc.
- Material balance analysis of pressure depletion in complex reservoirs
- Compartmentalized systems
- Numerical well testing and integration with geology

“Good organization in every aspect, from the basic models to the more complex systems giving an easy-to-follow course.”

LASMO

“I learned a great deal and it will certainly help me in my well testing future.”

Crestar Energy Inc.
Course Overviews (continued)

Well Test Analysis Workshop

Objective
The objective of this course is to assist users of PanSystem® software to analyze well test data from their own fields. To achieve this goal, the course is presented in a seminar fashion, where engineers are guided through the different stages of well test analysis, using PanSystem software.

Course description
If a client wants to examine data relevant to their own operations, Weatherford recommends the PanSystem workshop, a 5-day seminar that can be tailored to use the client’s well test data. Two days are spent reviewing PanSystem software; and 3 days are used to analyze previously prepared client data. Time can also be spent doing one-on-one training during the second part of the workshop. The client furnishes data used in this workshop; hence the quantity and quality of the data available dictates the conduct of the course.

Target audience
Well test analysts, reservoir engineers, production engineers.

Prerequisites
This course works with data provided by the participants; Weatherford needs to have the data at least two weeks in advance to prepare the course material. It is available in 2- or 3-day modules too. The latest version of PanSystem/PanMesh™ software is used. It is necessary for all participants to be familiar with PanSystem software.

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WellFlo® Software

Objective
This course provides the knowledge and hands-on practice needed to use WellFlo software as an engineering tool for oil and gas production optimization applications. Using WellFlo software simulations that are based on nodal analysis that are performed under steady-state multiphase flow conditions, you learn the skills that enable you to solve design problems and to perform various analysis tasks.

Course description
The course provides practical training in the use of WellFlo software. It focuses on design and analysis of naturally flowing oil and gas wells, as well as gas-lift and electric submersible pumping systems that are based on systems analysis (also known as nodal analysis) concepts, not on the underlying engineering concepts. The main topics are covered with a brief refresher on the underlying principles.

Attendees become familiar with WellFlo software by using the program on a series of hands-on worked examples, covering data preparation, PVT tuning, selection of multiphase flow correlations, pressure and temperature profile matching, basic analysis and a set of natural flow, gas-lift and ESP well analysis models.

Upon completion of this course, you can:

- Design, construct, and analyze natural flowing gas-lift and ESP well models
- Identify or predict conditions in which a well stops producing
- Perform production optimization via system analysis on each component
- Identify underperforming wells
- Conduct sensitivity analysis on various components of a well system to ensure a robust design
- Evaluate liquid loading in gas wells
- Identify bottlenecks in production system
- Select tubing, flowline, and choke sizing
- Enable wells that do not produce naturally
- Determine potential depth of a gas-injection valve
- Select a pump for maximum production, best pump efficiency, or optimum well-flow conditions
- Generate VLP curves over a range of flowrates
- Determine ESP suction and discharge conditions over a range of frequency (Hz)
- Troubleshoot an underperforming well
- Increase production as a result of overall production system analysis
- Evaluate liquid loading in gas wells
- Identify bottlenecks in production system
- Select tubing, flowline, and choke sizing
- Enable wells that do not produce naturally
- Determine potential depth of a gas-injection valve
- Select a pump for maximum production, best pump efficiency, or optimum well-flow conditions
- Generate VLP curves over a range of flowrates
- Determine ESP suction and discharge conditions over a range of frequency (Hz)
- Troubleshoot an underperforming well
- Increase production as a result of overall production system analysis
- Select tubing, flowline, and choke sizing

Target audience
The course is designed for engineers who intend to use WellFlo software to analyze, troubleshoot, design, and optimize well production.

Prerequisites
This course requires attendees to have at least a basic knowledge of nodal analysis techniques and production optimization using artificial-lift methods.

Course contents
The following summarizes the main subjects to be covered during the course:

- Data preparation and validation
- Nodal analysis concept and software
- Building a well model
- PVT correlations and data tuning
- Flow correlations
- Inflow and outflow performance relationship
- Oil- and gas-well analysis
- Liquid loading in gas wells
- Erosional velocity
- Basic gas-lift design methods
- Basic ESP design and analysis
- Sensitivity analysis on natural flow, gas-lift, and ESP wells
- Production optimization and forecasting

Attendees need to bring their own laptop computer with local administrator’s privileges to install WellFlo software.
Objective
This course has been developed for geologists, reservoir engineers, and other petroleum technologists who are interested in the application of logging and distributed pressure measurements to enhance their understanding of the relationship between the geological model and the actual reservoir behavior.

Course description
The course examines the application of wireline formation tester (WFT) distributed pressure data in appraisal (unproduced field) and development (produced field) wells. In addition the determination of permeability, horizontal and vertical, using new generation, pump-out tools is addressed fully. Finally an extensive coverage of the sampling aspects of the new generation tools is given. Software packages for analyzing data are used with field examples.

Target audience
Geologists, reservoir engineers, and petroleum technologists.

Prerequisites
The course requires a basic understanding of the geological model and reservoir.

Course contents
- Distributed pressure measurement (DPM)
  - Wireline formation tester (WFT)
  - New generation WFT (NGWFT)
- Pretest
- Supercharging mechanism
- Time of observable buildup
- Supercharging index (SI)
- Exploration applications of DPM
  - Gravity-capillary equilibrium
  - Pressure-depth diagrams
  - Effect of a residual oil saturation
  - Paleocontacts
  - Oil-wet behavior
- Field examples
- Forced gradient technique
- Multiple-well analysis
- Detection of gas and water oil contacts
- Compositional reservoirs
- Perched contacts and isolated water
- Naturally fractured reservoirs
- Dynamic aquifers and tilted contacts
- Field examples of such effects
- Overpressured reservoirs
- SEC attitude to NGWFT
- Field-development applications of DPM
  - Fields under production
  - Introductory field examples
  - Supercharging diagnosis
  - Single-phase flow
  - Uniform vertical permeability
  - Fictional (Darcy) component of pressure gradient
  - Vertical pressure equilibrium
  - Barrier detection
  - Semi-steady-state differential depletion
  - Compartmentalized material balance
  - Interpretation through reservoir simulation
  - Two-phase flow
- Interpretation of observed pressure gradients
- Vertical saturation equilibrium
- Counter-current, two-phase flow
- Gravity drainage
- Percolation
- Co-current upward two-phase flow
- Accuracy in gradient determination
- WFT interpretation for reservoir description
- Dual-porosity strata example
- Parabolic pressure profiles
- Early field examples from North Sea reservoirs
- Etive-Rannoch problem
- Partially communicating faults
- High-slit wells
- Potential versus true-horizontal-length diagrams
- Permeability from WFT and NGWFT
- Pretest permeability
- Spherical flow
- Steady-state drawdown behavior
- Stewart and Wittman flow-shape factor
- Finite element modeling
- Buildup permeability
- Tandem reciprocal root of time plot
- Extrapolation to local pressure
- Pump-out systems
- Straddle packer arrangement
- Limited entry model
- Mini-drillstem tests (DSTs)
- Problem of thickness estimate
- Depth of investigation
- Value of information (VOI) analysis
- Potential to replace conventional DST
- Impulse tests
- Prefrac testing in tight reservoirs
- Vertical observation probe
- Analytical model from Carslaw and Jaeger
- Derivative response of vertical interference test
- Parameter estimation from specialist plots and nonlinear regression
- Combined sum of squares
- Interference buildup response
- Time delay to pressure reversal at observation point
- Derivative spikes
- Active probe response
- Effect of anisotropy
- Calibration of analytical model with FEM simulation
- Slant well situations
- Field examples of interference tests
- Sampling
  - Dynamics of mud filtrate invasion
  - Near wellbore saturation profile
  - Simulation of pump-out process
  - Downhole fluid analysis
  - Optical spectroscopy
  - Contamination of sample
  - Real-time monitoring
  - Downhole fluid density and viscosity measurement
  - Prediction of fluid producing cgr or gor
  - Compositional reservoirs
  - Variation of bubble and dewpoint through the hydrocarbon column
  - Intelligent sampling beneath a shale
  - Guard ring sampling
  - Importance for reserve estimation
  - Detection of compartmentalization
  - Fluid finger printing
- Capillary Pressure Effect
  - Simulation of the invasion process
  - Pressure and saturation profiles
  - Capillary transition zones
  - Shifting of hydrocarbon fluid pressure with water-based mud
  - Field examples from Pakistan and Middle East
  - Shell technique for detecting a shift
  - Tentative oil-wet field example
  - Effect of oil-based mud on water-phase pressure
  - North Sea field examples
  - Halford field example
  - Implication for reserve estimates and unitization
- Integration with production logging
  - History matching of layered reservoir simulators
  - Differential depletion
  - Compartmentalized material balance models
  - Adjustment of layer skin factors to force agreement with production logging
  - Determination of distributed pressure in existing development wells
  - Selective inflow performance
- Review of selected SPE and SPWLA key papers
- Demonstration of pressure—depth-plotting software
- Demonstration of pressure-transient analysis software for NGWFT
  (PanSystem® software)
To learn how our Production Systems training programs can help you or your organization, contact an authorized Weatherford representative or visit weatherford.com.