# WellSHARP Introduction to Drilling Operations

## Online Course Outline

**WILD WELL UNIVERSITY**

**IADC Accrediated**

## Lesson 1: Impact of Well Control and Basic Rig Math
- Negative impact of well control incidents
- Well control training and assessments
- Basic rig math
  - Length, area, volume, pump output, weight, density, viscosity, hydrostatic pressure, pressure gradient
  - Rounding rules and special rounding rules
- Pressure control equipment

## Lesson 2: Introduction to Well Control
- Hydrostatic Pressure and the U-Tube Effect
  - Pressure concepts
  - Density
  - TVD
  - Hydrostatic pressure
  - Pressure gradient
  - U-Tube Effect
  - Bottom hole pressure
- Formation Properties and Influx
  - Porosity
  - Permeability
  - Overburden
- Formation pressure
- Formation strength
- Drilling margin
- Pressure & Well Control Equipment
  - Well control equipment
  - BOP
  - Choke and kill lines
  - Manifolds
  - Flanges
  - Gate valves
  - Return flow lines
- Mud pumps
- Accumulator system
- Ring gaskets
- Wellhead and casing
- Drillstring
- Land-Based vs. Subsea

## Lesson 3: Risk Management
- Barriers/Barrier Philosophies
- Principles of Risk Management
- Purpose of Emergency Drills
- Early Kick Detection
- Safety Meetings

## Lesson 4: The Causes of Kicks
- Formation Pressures and Drilling Fluid
  - Why kicks occur
  - Importance of maintaining proper fluid density
  - Normal, abnormal, and subnormal formation pressures
- Warning signs of a kick
- Kick prevention
- Mud weight
- Viscosity
- Gas-Bearing Formations, Subsea BOPs, and Disconnected Risers
  - Background gas
  - Removal of gas
  - Subsea riser
  - Gas in riser
  - Gas expansion
  - Riser margin
  - Riser margin formula
- Swabbing and Surging
  - Pulling out of hole operations
  - Running in hole operations
  - Fluid loss
  - Pit gains
  - Subsea swabbing and surging
  - Motion compensators
  - Subsea flow checks
  - Wireline operations
- Pumping Slugs, Filling Hole, Trip Sheets
  - Tripping
  - Pipe displacement
  - Slugs & slug calculations
  - Tripping calculations & trip sheets
  - Flow checks

## Lesson 5: Blowout Preventers
- Annular Preventers
  - Accumulator pressures
  - Stripping through annulars
  - Annular operations
  - Annular maintenance
  - Annular testing
  - Ram Preventers
    - Ram operations
    - Hang off
- Pressure testing
  - Shut in on tool joints
  - Ram locks
  - Types of ram preventers
  - Remote-Operated Side Outlet Valves
  - Diverter Operating Principles

## Lesson 6: Associated Well Control Equipment
- Valve Types
- Valve Functionality
- Valve Storage

## Lesson 7: Choke Manifolds and Chokes
- Mud Flow
- Choke Line Flow Path
- Choke Manifold
- Choke and Bottom Hole Relations
- Choke Redundancy
- Manual Chokes
  - Pressure Testing Chokes
  - Remote Choke Panel

## Lesson 8: Auxiliary Equipment
- Mud-Gas Separator
- Shale Shakers
- Vacuum Degasser

## Lesson 9: Barriers
- Barrier Classifications
  - Primary barrier
  - Secondary barriers
  - Tertiary barriers
- Barrier Types
  - Hydrostatic pressure
  - Annular
  - Ram preventers
  - Types of rams
  - Blind rams
  - Shear & blind/shear rams
  - Variable bore rams

## Lesson 10: Pressure Testing
- Closing Times
  - Land Recommended Pressure Test Practices
  - Subsea Recommended Pressure Test Practices

## Lesson 11: BOP Control Systems
- Operating Principles
  - Hydraulic operations
  - Manual operations
  - Accumulator handles
  - Remote bop control panel (rig floor)
  - Subsea accumulators (sea floor)
  - Subsea bop stack
Lesson 11 continued
- Accumulator System
  ■ Provides hydraulic fluid to operate the BOP
  ■ Regular checks and maintenance required for system
  ■ Multiple sizes and capabilities
  ■ Number of accumulator bottles varies dependent on BOP needs
  ■ Subsea accumulators

Lesson 12: Kick Warning Signs and Flow Checks
- Understanding Kicks
  ■ Kick indicators
  ■ Connection gas
  ■ Trip gas
  ■ Gas detectors
  ■ Cuttings
  ■ Flow check
- Positive Kick Indicators and First Actions
  ■ Return flow with pumps off
  ■ Increased pit gains
  ■ Increased flow rate

Lesson 13: Shut-In Procedures
- Shut-In Procedures while Drilling
- Subsea vs. Surface Shut-In
- How Shut-In Pressure Relates to Formation Pressure

Lesson 14: Tophole Drilling
- Challenges
  ■ Shallow gas
  ■ Shallow water flows
  ■ Mitigation steps

Lesson 15: Circulating System
- Understanding the Circulating System
  ■ Circulating system overview
  ■ Active mud pit
  ■ Centrifugal pumps
  ■ Mud pumps
  ■ Dampeners
  ■ Standpipe manifold
  ■ Kelly hose
  ■ Drill string
  ■ Annulus
  ■ Decanting centrifuge
- Drilling Fluid
  ■ Functions of drilling fluids
  ■ Types of drilling fluid
  ■ Fluid expectations
- How Pump Properties Affect a Well
- Effects of the Circulating System on Formation Pressure
  ■ Pressure changes
  ■ Changes in mud density
  ■ Changes in pump speed
  ■ Determining ecd
  ■ Pressure loss
  ■ Frictional pressure loss
  ■ Annular pressure loss

Lesson 16: Slow Circulating Rates
- Well Control Operations Using SCRs
- Understanding SCRs Using a Subsea BOP

Lesson 17: Fracture Pressure and Maximum Pressures
- What is Fracture Pressure?
- Understanding Integrity Tests
  ■ Formation Integrity Test
  ■ Leak Off Test
- Maximum Allowable Mud Weight
- Maximum Allowable Annular Surface Pressure

Lesson 18: Influx Characteristics and Behavior
- Influx Fluids and Related Hazards
- Changes Caused by Influxes
  ■ Basic Gas Law
  ■ Influx Migration

Lesson 19: Well Control Methods
- Well Control Methods
  ■ Circulating
  ■ Non-circulating
  ■ Driller’s Method
  ■ Wait & Weight Method
  ■ Volumetric
  ■ Lube and Bleed

Lesson 20: Completing a Killsheet