IADC Introduction to Well Servicing

Course Curriculum

Chapter 1 Servicing Fundamentals

1.1 Intro to Servicing

Examines the different reasons for well servicing and intervention operations; Discusses acidizing, sanding problems, hydraulic fracturing (fracking), plugging, and gravel packing.

1.2 Math

Provides links to valuable online Math resources to learn and refresh before you start the course.

1.3 Fluid Properties

Explores fundamental properties of fluids. Examines density at the molecular level and introduces the equation for density. Looks at the consequences of density when different substances are mixed together, such as oil, water, and gas.

1.4 Pipes & Manifolds

Uses the real-life example of a highway system to introduce valves and manifolds on a drilling rig. Walks through the definition, function, and importance of the pump, standpipe, and choke manifolds through vibrant animations. Introduces the adjustable choke and briefly goes into its importance in well control operations.

Chapter 2 Pressure

2.1 Pressure

Examines pressure through several different, real-life examples. Introduces students to pressure differentials and the concept of equilibrium; setting the stage for later discussion on pressure in the wellbore.

2.2 Formation Pressure

Offers a comprehensive look at Formation Pressure deep underground. First, introduces the concept of porosity- taking a look at formation rocks at a molecular level. Then, examines underground pressures both before and after drilling begins, taking a look at what pressures are removed during drilling operations. Lastly, examines the Formation Pressure Gradient and walks through how formation pressure can be mathematically calculated. Student must interact with and answer a question to complete lesson.

2.3 Hydrostatic Pressure

Examines the pressure exerted by a column of fluid, both in and out of the wellbore. Derives the generally accepted equation for hydrostatic pressure in a well and walks students through examples. Interactive, in-module questions require student to read, answer, and think about question while going through the lesson.

2.4 Pump Pressure

Introduces friction and examines how frictional losses act against any movement along a surface. Identifies Pump Pressure as the pressure needed to overcome the frictional losses throughout the entire system. Lastly, explains how Annular Friction Loss can contribute to bottomhole pressure.

2.5 Balancing Well Pressures

Discusses how pressure differentials are relevant in balancing well pressures in a producing well. Specifically, introduces the concept of underbalance and overbalance and examines the consequences.

2.6 U-Tube Effect

Uses animation to indicate the exact location of the U-Tube within the wellbore. Then, introduces the U-Tube effect with an example.

2.7 Surface Pressure

Explains the pressure felt on rig surface equipment and the consequences of exceeding the maximum surface pressure limits of well equipment. Creates an analogy to compare wellbore surface pressure with surface pressure felt on the cap of a shaken soda bottle.

Chapter 3 Well Processes

3.1 Intro to Drilling

Using animation, introduces students to the basic fundamentals of the drilling process. Introduces the drill bit, drill collar, drill pipe, and derrick. Then, introduces casing pipe and the cementing process. All concepts taught and explained to be accessible to students with no prior drilling knowledge.

3.2 Intro to Completions

Provides an animated look at the well completions process and all fundamental well completions equipment. Introduces downhole safety valves, landing nipples, side pocket mandrels, and multiple completions.

3.3 Intro to Production

Introduces the fundamental objectives of well production operations, including an animated and graphical look at the Christmas Tree, tubing hanger, and tubing and casing pressure gauges.

3.4 Intro to Wireline Operations

Introduces e-line, slickline, and braided line wireline operations, explaining fundamental wireline equipment including the reel, sheaves, and wireline measuring devices.

3.5 Intro to Servicing

Examines the different reasons for well servicing and intervention operations; Discusses acidizing, sanding problems, hydraulic fracturing (fracking), plugging, and gravel packing.

Chapter 4 Kicks

4.1 Kicks during Servicing

Looks at kicks during well servicing operations, examining the difference between a kicking well and a producing well.

4.2 Insufficient HP

4.3 Swabbing

Uses powerful, downhole animation to let students visualize the suction effect of Swabbing and how it can pull formation fluid upwards into the well. Introduces Swab Pressure and explains how it acts against bottomhole pressure.

4.4 Surging

Uses powerful, downhole animation to let students visualize the water hammer effect of Surging and how it can create significant downward pressure that causes fracturing or lost circulation. Introduces Surge Pressure and explains how it acts against bottomhole pressure.

4.5 Lost Circulation & Fracturing

Explains the second part of Kick Theory; the consequences of letting Bottomhole Pressure become too much larger than Formation Pressure. Through animation, demonstrates how Lost Circulation can cause True Vertical Depth to fall and cause a kick to occur.

4.6 Gas Properties

Explains some of the most dangerous gases experienced during oil and gas operations, exploring the properties that make them dangerous to rig personnel. Explains the low density of gas and how it can lead to gas migration when mixed together with other liquids. Introduces Boyle's Law and the concept of gas compressibility.

4.7 Gas Kick

In an interactive, engaging way uses the example of one gas kick to demonstrate the consequences of two different approaches to dealing with a gas kick: 1) Taking a very long time to respond to the gas kick and 2) Letting the gas kick migrate without expansion. At each stage of the kick's movement upwards, the student must engage in many calculations.

Chapter 5 Kick Detection

5.1 Blowouts

Defines the blowout and introduces the terrible consequences of an uncontrolled blowout on causing injury to personnel, loss of rig, and harm to the environment. Then, introduces the kick and examines how a kick is caused by pressure differentials and how a kick can turn into a blowout.

5.2 Fluid Recording

Explains the importance of fluid measurement in detecting problems in the wellbore. Introduces the Pit Level Indicator, used to measure the amount of fluid returning to the mud tanks, the Mud Return Indicator, used to measure the speed of fluid returning to the mud tanks, and the Mud Pump Stroke counter, used to count how many strokes of fluid have been pumped into the well.

5.3 Tripping

Introduces the Trip Sheet and its importance in monitoring the Trip Tank during tripping operations. Walks through a specific example of pipe being pulled out of the well and the details that would be recorded on a trip sheet.

5.4 Other Signs

Chapter 6 Blowout Prevention System

6.1 Introducing the BOP

Conceptually introduces the BOP stack and its importance in shutting-in the well to prevent kicked fluid from reaching the surface.

6.2 Annular & Ram Preventers

Discusses the differences between annular and ram preventers, using 3D animations to visually demonstrate the unique attributes of each preventer. Ram elements are discussed as well as the role of the drilling spool.

6.3 Stripping

Looks at the fundamental calculations and procedures involved in Stripping Operations, both with and without volumetric control.

6.4 Safety Valves

Explains the need to shut-in the drillpipe in addition the annulus. Introduces the Inside BOP, the Float Valve, and the Full Opening Safety Valve.

6.5 Wireline BOP

Introduces the greasehead, stuffing box, lubricator, and the Wireline BOP system.

6.6 Wireline Deployment

Explores, in detail, the wireline rig-up, deployment, and rig-up process including the testing procedures involved.

6.7 Safety Systems

Looks at the surface operated surface and subsurface safety valves set in a producing well.

6.8 Equipment Testing

Walks through pressure ratings of fundamental Well Control equipment, including an examination of pressure testing and function testing.

Chapter 7 Kick Procedures

7.1 Shut-in Concept

Provides a detailed, step-by-step conceptual understanding of the impact of well shut-in on underground pressures. Using the example of a bottle cap, explains how shutting-in the well makes bottomhole pressure automatically equal to formation pressure.

7.2 Shut-in Procedure & Verification

Defines the importance procedures involved in the well shut-in process, during several different types of well operations. Also explains the importance and procedure involved in verifying that the well has successfully been shut-in.

7.3 Recording parameters

Explains the three most important parameters that need to be recorded after shut-in: Shut in Tubing Pressure (SITP), Shut in Casing Pressure (SICP), and Estimated Pit Gain. Walks through the importance of SITP and SICP in understanding Formation Pressure and explains why SITP is generally lower than SICP. Also introduces the procedure involved in recording slow pump rates or slow circulating rates.

7.4 Recording Well Information

Examines the importance of recording well information during all well servicing operations, looking specifically at some of the information that must be recorded.

Chapter 8 Well Control Complications

8.1 Trapped Pressure Complications

Visualizes the different locations where trapped pressure can become trapped in a completed well and looks at some of the methods of trapped pressure resolution.

8.2 Pressure on Casing

Examines some of the different ways pressure can become trapped in the casing string during well production.

8.3 Tubing Complications

Takes a look at a few different complications with the tubing string including a hole in the tubing, washouts, and fishing operations.

8.4 Human Factors

Looks at the different well-servicing crew roles during well control operations and the associated drills