

# Directional Drilling.

# Vocabulary

1. directional - направленный
2. straight – прямой
3. Subsequent - последующий
4. deflect – отклоняться
5. slant – уклон
6. erect – устанавливать
7. kick off – резко искривиться
8. downhole – подземный (об оборудовании)
9. thread – нарезать (резьбу)
10. bent – изогнутый, коленчатый
11. sub, substitute – переходник, переводник (для соединения разного диаметра)
12. angle – угол
13. turbine blade – лопасть турбины
14. fan – вентилятор, лопасть

# Translate the words and word combinations:

reservoir, well, vertical, bottom, top, surface, device, drill string, pipe, drilling mud, to drill on a slant, offshore drilling platforms, subsequent well, as many as, downhole tools and techniques, an angle of 20 degrees, to trip into the hole, to point in the direction, readout device, to check angle of deflection.

# Directional Drilling

Usually the crew tries to drill the hole as straight as possible. However, at times it's desirable to deflect the hole from vertical and drill it on a slant. Perhaps the most dramatic example of slant, or directional drilling is on offshore drilling platforms. There a platform is erected over the drilling site, and several wells are drilled from this single platform without having to move it. The technique used is directional drilling.

Only the hole drilled into the reservoir may be vertical; every subsequent well may be drilled vertically to a certain depth, then kicked off (deflected) directionally so that the bottom of the hole ends up perhaps hundreds of meters away from its starting point on the surface. By using directional drilling, as many as twenty or more wells may be drilled into the reservoir from one platform.

Directional drilling involves the use of some rather interesting downhole tools and techniques. For example, some means of kicking the hole off vertical must be used. This might be accomplished with a bent sub and a downhole motor.

A sub (short for substitute) is a special device that is threaded so that it can be attached to or made up in the drill string. A bent sub is simply a short piece of pipe, threaded on both ends, that has a bent in the middle. The bent has an angle of from one to three degrees. A downhole motor is a tool shaped like a piece of pipe that has turbine blades (a turbine is like a series of electric fan blades spaced on top of each other on a shaft), or it can be a multicurved steel shaft that turns inside an elliptically shaped opening in a housing. In practice, the bit is made up in the bottom of the downhole motor and the bent sub on the top.

When tool reaches bottom, it must be oriented (pointed in the direction necessary to get to the hole to go in the desired direction). To orient the tool, various types of compasses or directional gyroscopes, coupled with photographic or electronic readout devices, are employed. Once the tool is oriented, drilling begins. However, the drill string is not rotated. Instead, drilling mud flowing through the directional motor causes the turbine blades to turn, or the multicurved shaft to turn, which causes the bit to rotate. Because of the bent sub, the hole starts off at an angle, a relatively small angle (1 to 3 degrees) at first, but the angle is increased as drilling progresses - up to almost 90 degrees from vertical if necessary. Periodically, the hole is surveyed; that is using the compass or electronic readout device, its direction and angle of deflection are checked. The angle and direction of the hole are carefully maintained until total depth is reached and the pay zone is penetrated.

# Fill in the gaps:

1. Sometimes it's necessary to \_\_\_\_\_ the hole from vertical and drill it on a slant.
2. On offshore drilling the technique which is called \_\_\_\_\_ often used.
3. \_\_\_\_\_ is a device that can be attached to the drill string.
4. \_\_\_\_\_ is a tool shaped like a piece of pipe that has turbine blades.
5. At the bottom the tool must be \_\_\_\_\_.