

Horizontal well profiles

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Table 2: Horizontal Well Profiles

Classification

BUR,(x/100-ft)

Radius of Curvature, (ft)

Long radius

1-8

5727-716

Medium radius

8-30

716-191

Short radius

30-60

191-95

Ultra-Short radius

60-200

95-29

Table (2) illustrates different horizontal well profiles where each well profile is associated with specific bottom hole assembly, which must be carefully

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selected in order to choose the required horizontal profile at the desired depth. Another important factor to consider before choosing a good candidate for horizontal well is know the build rate (BUR), which is a measure of the wellbore curvature (usually specified in $x/100$ -ft). The first type is long radius having a build rate from 1° to $8^\circ/100$ -ft as shown in figure 3. The second type is the short radius with a build rate from 1.5° to $3^\circ/100$ -ft. Lastly, medium radius, which has from 8° to $20^\circ/100$ -ft build rate. Therefore, the horizontal well profile is long radius since the depth of our well is 7582 ft. Moreover, it is important to consider the various factors that favor the development of the horizontal well. These factors include remote surface location, high viscosity oils, multiple vertical fractures, and low anisotropy ratio, the template slots for offshore development, thin oil rims, unknown geology, exploration drills, and formation thickness.

The advantages of horizontal wells surpass their limitations, and for that reason, they have gained global acceptance. These wells have high productivity, high revenue yielding, broad range of application and high recovery. On the other hand, the aspect of geology is also important to the techniques used in well-drilling. It is important to study the geology of a reservoir to select a good reservoir. For instance, the properties of rocks and fluids vary in petroleum resources, thus, their performance should be detected and its future productivity determined using their geological features. The following factors are considered crucial in geology planning, structural map, electronic logs, oriented core data, seismic data and mud logs. Various considerations are taken when inceptions of what is best for the process is projected. Consistency of the factors is also among the most

predictive features that must be analyzed in order to give an insight of what must be done at every stage and the predictive nature of the various prospects in well drilling.

From the daily drilling report provided, the central objective was to drill a horizontal well for oil. The activities commenced on the 8th June 2012 and proceeded to 2nd July 2012. Following the events that were recorded the team aimed at drilling a long radius horizontal well. The differences between the medium, short and long radius drills are defined by the tilt angle between the upper and lower stabilizers. The size and distance of the bit are the key determinates of build tendency. If first deflection point is close to the bit, a small deflection causes a build tendency that is similar to the larger deflection that is far from the bit. In other words, this mechanism can be explained as the near bit deflection causing lower side forces and a less bit offset. Moreover, the DDR categorizes information to include mud transferred, mud dumped and the mud losses and mud cost. The daily mud cost was 21, 400. 25 dollars and the cumulative mud cost was 57, 642. 20 dollars.

Figure 1 shows schematic of a whole section of the long radius borehole, which has an inclination of 1 to 8 degree per 100 feet. The steerable motor used for selecting a sliding mode was used safely rotated in the section to achieve the desired angle. The maximum rate of building a large hole size was kept lower than the maximum building rate for a smaller hole. Since the length of the horizontal well was significantly extended, the right path was determined at the start of the project to avoid a change of course or need to redesign. The good profile was modified to achieve a relative level of

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flexibility with an aim preventing any lithological change or preventing unexpected behavior of the whole bottom assembly. A tangent section between kickoffs was also placed. The upper curve was built with a slow build rate and a high build rate at the lower curve section where the impact is relatively small. The building assembly was replaced with an angle hold assembly as the curve approached the tangent. The configuration of the bottom hole assembly should minimize torque, drag and weight, rotation of the drill string kept the cutting cut to the minimum. A final clean-up process was conducted; it included mechanical staving and high viscosity sweeps to allow casing and the production equipment to run (Samuel O. Osisanya, 2016).

The time breakdown table presents the systematic process of drilling. The depth is increased at specific scheduled dates, the maximum depth that was achieved 7916 feet. In drilling the horizontal section, the standard circulating system is equated to the achieved depth. A plot was established to define a linear state as well as detect deviation from the linear signals, which may occur as the cutting builds up. In cases where the drilling process was impacted by the inability to extend the length of the hole, the following measures were employed, rotating the casing to the bottom. Other measures included increasing the lubricity of the hole, using lighter casing in the lower part of the string, using heavier cases at the top of the string, increasing the drilling fluid's density and using a denser centralizer spacing. These measures ensured that the depth of the hole could be increased when various setbacks were encountered. The coiled tubing conveyed logging tools were used to acquire accurate depth control as this is an important

parameter in horizontal drilling. Holes depths were measured as from the surface along the hole path that follows the initial geological survey of the reservoir. Even before the total depth was achieved, some oil could be extracted though not enough to cater for the drilling expense.

To achieve excellent goal cleaning, mud properties should be properly evaluated, the yielding point of the mud is an important parameter in hole cleaning. The stability of the borehole was enhanced by increasing the mud weight with high regard to the sticking problem. The highest mud weight achieved 83, while the lowest was 65, the mud weight shifted along with the changes in depth.

The highest viscosity level achieved was 43 while the lowest was 38.

Viscosity is mainly considered the drilling process because this parameter affects sand failure. Horizontal length and the perforated heights in a vertical well were crucial figures in determining the mean flow velocity in the well. The forces were directly proportional to the velocities of the fluid flow. In our geological survey for identifying a suitable reservoir, the formations that consisted heavy oil, with high velocities and density were considered uneconomical. High-velocity oils were among the conditions that facilitated the development of a horizontal well.

Information regarding mud type was an important tool for our geologists. The type of mud also played a role in controlling the drilling course with a rotary steerable system. The mud type changed along with the depth of the well. Brine type was first encountered, followed by the polymer, KCL, NDF and then brine again. During the early stages of drilling the type of mud was

not recorded, this surface is composed of a mixture of various mud types. Another parameter that was considered is the Ph, according to the provided report, the Ph level maintained at 9.5 through the good path, an indication that the well was acidic.

The inclination was kept at 86 to 89 degrees for a significant distance, which indicates that the drill is a horizontal well, whose angle should be 90 degrees for a great distance. A medium radius should range between 45 to 60 degrees. Azimuth correction at a high inclination angle was perilous and hence the direction was controlled before a high inclination angle was reached. The geometry of well was controlled. The Azimuth depended on the stress of the reservoir.