

Second Laureate Invention

◆ **Project title:** Open Hole Packer

◆ **Representative:** Behnam Khodayar

Abstract:

Drilling operations often encounter hindrance due to numerous problems such as backing off, getting stuck or breakage of drill string tools within the well. In such circumstances, one solution is to fill the well up to a small depth above the unwanted object with cement. After the cement is hardened, using either of the following configurations:

- two or three joints of drill pipe above drilling bit and sufficient drill collar joints above drill pipes
- drilling bit together with directional drilling motor

drilling will be resumed with a slight weight on bit to open an inclined path above the constructed cement foundation. This operation will take a long time called "Time Drill" which is a drawback. Also, sometimes due to problems like forming of discontinuous cement bond, bad cement quality, cement being lost in formation fractures, reaching very hard formations while drilling ..., the above solution does not work.

The new solution put forward is using an OPEN-HOLE WHIPSTOCK EXPANDABLE ANCHOR system which will considerably lower directional drilling time and increase the dependability of operation. An open-hole whipstock expandable anchor system is a combination of the following tools:

- Whipface: a solid shaft which is cut at a small angle over its length and its cut sloped area is concaved
- Anchor: a cylindrical tool made up of fixed and movable parts. There are some blades on anchor which are free at one end to expand into formation.
- Mill Assembly: an arrangement of usually three hard bodies dressed with Tungsten-Carbide stripes for milling both metal and formation

Whipface is attached to the top of anchor through a strong bolt and mill assembly is attached to the top of whipface with a screw weaker in shear strength than the above-mentioned bolt. The whole system is sent to target depth into the hole. After the bottom of Anchor sits on the well bed a compressive force is exerted on the string which activates a mechanism ending in the expansion then fixation of anchor blades into formation. An additional weight will shear the screw and the mill assembly will slide over the concaved surface in the azimuth determined by the whipface concave angle. The system will no more go down in the well as the anchor blades keep it in place, so mills will be able to cut through formation and finally a directional hole will be opened. Advantages of using OPEN-HOLE WHIPSTOCK EXPANDABLE ANCHOR system are as follows:

No cementation will be needed. This will save costs and time and no space from the previous route will be lost.

Well will be deviated at most in three days for the hardest formations while other methods will take weeks but months.