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Wellbore spiraling induced through systematic micro-sliding

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Stick Slip is a term that is often overused and commonly diagnosed from surface drilling parameters of torque and differential pressure, but the actual magnitude of the condition is rarely captured at the BHA level as the necessary measurements are seldom deployed. Deployment of an accurate stick slip measurement down-hole has led to an interesting discovery that goes against long held traditional drilling lore. A divide has been identified between stick slip as independent bit and BHA conditions. This phenomenon in horizontal laterals is common but few M/LWD systems have been able to capture it. Utilizing measurements of down-hole RPM bore pressure, high speed magnetometer data, bending moment, and continuous inclination, the well-bore spiraling phenomenon is able to be captured, quantified, and intimately tied back to systematic effects of BHA stalling and mirco-sliding. An operator in the Permian Basin has identified that this phenomenon is contributing to increased tortuosity and drag. Utilizing down-hole torque measurements the root causes of the stick slip and spiraling phenomenon were identified and able to engineered out of the system.

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Optimization and control of flow in the Autonomous Inflow Control Valve (AICV)

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The influx of water and or gas into the wellbore is a problem which diminishes oil recovery, increases separation costs and drastically reduces well production life. The current solution to this problem is the use of an Autonomous Inflow Control Valve (AICV) developed through the EU FP7 project called REVIVAL. The valve works to prevent water and or gas breakthrough into the wellbore and only allow oil to flow into the wellbore by detecting viscosity differences amongst the fluids which create varied pressure drops used to control the valves opening or closing. The current research follows the same concept aims on optimisation and control of flow in the inflow control valve by considering various geometries and cases using computational fluid dynamics, CFD to discover more efficient ways to operate the valve. The cases selected are based on fluid flow, oil in particular through various conduits at various Reynolds numbers. The cases are a straight pipe, a coil pipe, a swirl pipe, a slinky type coil and a coil with an internal coil. The results show that there is a significant increase in pressure drop with the new designs which means the opening and closing of the piston in the inflow control valve would be more efficient hence achieving better valve response. The results obtained from this investigation could be extended to other applications in fluid mixture separation.

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