First Ever Autonomous Esp Workflow Successfully Completed In South America Via Edge Computing

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Abstract

Objectives/Scope: The connected assets, instrumentation and control systems and the digital solutions have enabled us to create a novel solution in South America to adjust the speed of ESP autonomously. If the engineers don’t monitor flowrate head value, sometimes there is a deviation of the injection rate and it can take days, weeks until they found out that they are injecting more or less than they are supposed to; affecting the reservoir and the flow/pressure that costumer is looking on the injection wells for secondary recovery. So, this algorithm will change frequency for compensating any abnormality, variation of the target of the VFM for the injection, thus allowing manual work to be replaced by automated work and allowing the user to visualize all the charts on the digital platform. Abnormal changes in ESP parameters such as motor winding temperature, the formation of emulsions, and the gas lock conditions are leading to potential ESP failures leading to deferred production and unplanned replacement cost.

Methods, Procedures, Process: The solution using Edge computing, was done in 3 steps: Real Time Monitoring: All the parameters of an ESP, like Frequency, amperage, pressures, and temperatures, were monitored in real time, including their protection settings (values and configurations). Smart Operational Workflows: Once we got all the data, we created edge workflows that will detect deviations from injection and pressure objectives, previously set, like flow at surface, calculated by Virtual Flow Meter (VFM). The edge based VFM workflow is a physics-based flow rate estimation that provides a unique insight into the inflow from the reservoir and the ESP. Autonomous workflow: With the calculated flow at surface, deviation detection, and protection monitoring, we can act and modify the ESP frequency, in a safe manner, to compensate for any deviation in the surface flow objective. Also, ESP uptime is increased using Optimized Chemical Treatment programs on Delphi with real-time monitoring, analysis, and autonomous chemical injection.

Results, Observations, Conclusions: For the first time in this customer, frequency of the ESP’s is adjusted autonomously by an edge app to regulate the flow at surface. The compensation or any deviation in the flow is done automatically, resulting in reduction in the production losses from +42BO/1000BOPD to +37 BO/1000BOPD; reduce field visits from people to location by 58% avoiding HSE exposure and reduce CO2 emissions by 55%. With over 2 million ESP wells worldwide, we have established a unique opportunity for Digital & Integration and our partners.
Novel/Additive Information: ESP edge algorithms are successfully deployed in South America. With this solution, the change in flow is detected by the edge app algorithm and it will automatically start regulating the frequency to compensate for the change in flow, without anyone going to the wellsite.