Applicability of Automation and Drilling Optimization in pre-salt operations

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Abstract

Much has been published about the importance of the Brazilian and Angolan Pre-salt fields for the energy market. Considering the still growing demand for Oil & Gas due to increase of the energy demand in a worldwide scale, it has become necessary to explore more consistently unconventional hydrocarbon reserves. It brings the petroleum sector to have some focus directed to these carbonate reservoirs located in the subsalt (Pre-salt) of the South Atlantic Ocean. These carbonate formations have some presence of silica nodes in it, which is the driver to make the drilling operations in such formation quite challenging. This is due to its abrasiveness, reflecting in a low rate of penetration (ranging from 0.5 to 7 [m/h]), and general complexities (ultra-deep water reaching up to 2.000 [m], costal distance reaching up to 300 [km], among others). In this sense, implementation of drilling automation and software helping in efficiency improvements during drilling operations has a considerable benefit. Pre-salt drilling operations are very costly at approximately US$ 1.3 million per day. Rather than just focusing in rate of penetration maximization, it has become known the importance of driving operations to the minimization of the mechanical specific energy (MSE), what can be achieved by selecting best set of drilling mechanics parameters (weight-on-bit, rotary speed and flow-rate) which can be adjusted for the scenario in play. Appliance of drill-rate tests, as a pre-operational drilling test, in order to select the best set of parameters for drilling is a common task in the industry. But, considering that one may drill 50 [m], 100 [m], up to 160 [m] of pre-salt carbonate reservoir, it is important to have such tests being carried out during the drilling operation, what is not much feasible, given the time consuming it last to the operation. Solution can be a closed loop through programmable routines capable of being updated in real-time by acquired data while drilling, guaranteeing that best set of parameters keep being mathematically calculated and displayed for the 03 (three) main segments (drilling contractor, drilling operator and service companies) during the operation, allowing real-time actions. Not just that, pre-operational drilling tests must start driving attention to a way of deciding for a start set of parameters by analyzing the mechanical specific energy (MSE) implicit and not just the rate of penetration (ROP), as is still usually performed along the industry. Thus, these presented results details in how would be possible to have such implementations, by means of Pre-salt field data as a case study with a more automated orientation.