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Evaluation of Drilling Performance through Bit-Rock Interaction Using Passive Vibration Assisted Rotation Drilling (PVARD) Tool

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Abstract : Drilling performance is an essential goal in petroleum and mining industry. Drilling rate of penetration (ROP), which is inversely proportional to the mechanical specific energy (MSE) is influenced by numerous factors among which are the applied parameter: torque (T), weight on bit (WOB), fluid flow rate, revolution per minute (rpm), rock related parameters: rock type, rock homogeneousness, rock anisotropy orientation, and mechanical parameters: bit type, configuration of the bottom hole assembly (BHA). This paper is focused on studying the drilling performance by implementing a passive vibration assisted rotary drilling tool (pVARD) as part of the BHA through using different bit types: coring bit, roller cone bit, and PDC bit and various rock types: rock-like material, granite, sandstone, etc. The results of this study aim to produce a pVARD index for optimal drilling performance considering the recommendations of the pVARD's spring compression tests and stress-strain analysis of rock samples conducted prior to drilling experiments, analyzing the cutting size distribution, and evaluating the applied drilling parameters as a function of WOB. These results are compared with those obtained from drilling without pVARD, which represents the typical rigid BHA of the conventional drilling.

Keywords : BHA, drilling performance, MSE, pVARD, rate of penetration, ROP, tensile and shear fractures, unconfined compressive strength
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