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Monitoring Wells in Real-time using Depth- and Time-based Data

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During drilling, abrupt or unexpected changes in pore pressure and wellbore stability can cause substantial problems leading to costly drilling delays, unsafe incidents and potential loss of data or the well. Monitoring the state of a well both for pore pressure and its stress state, while drilling, is critical for providing a measure of the local conditions. This is especially important as many offset wells that are used for the basic information of a pre-drill model often have data gaps (e.g. short wireline and LWD logging runs) and may not be representative of the conditions experienced in the wellbore being drilled. Additionally, the more complex the geological environments are, the more uncertain the pore pressure and fracture pressure predictions can be. Experience has shown time and again that predrill pore pressure prognoses are incorrect to some extent and a plan has to be in place to allow the well owners to understand at what depths, and by how much, the predrill is incorrect so that timely action can be taken.

To help reduce these uncertainties, real-time measurements assessed from both depth- and time-based drilling data can supply key information for mitigating drilling risks. Lots of data is generated during the drilling process that can be used to make quick operational focused decisions without any costly delays. Useful information includes drilling parameters, gas and gas peak data, mud logs, analysis of rate of penetration, logging while drilling (LWD) and wireline data such as gamma ray, resistivity and sonic, and information about the well condition and how it changes during drilling.

We present in this paper a workflow for real-time pore pressure and fracture pressure predictions. We highlight the importance of deploying a real-time approach in drilling all wells to reduce the uncertainties inherent in all pre-drill models, leading to reduced well costs - particularly pertinent in today's climate.