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Impact of Geological and Geo-Mechanical Controls in Creating Various Drilling Problems

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ABSTRACT

The exploration and exploitation of oil and gas resources of the Middle East by creating boreholes into the earth's crust often trigger various drilling problems such as borehole instability, pipe sticking, loss of circulation, etc. These drilling hazards often resulted in high non-productive time with a drastic increase in well construction cost. Hence, elimination or mitigation of the severity of these drilling challenges is very important for safe and economic drilling operation. Loss of circulation is one of the major drilling challenges of this region. Some of the loss circulation events may be associated with large vugs and pre-existing cavities and thus may not be controlled by fluid design alone. In this case a mechanical or chemico-mechanical solution may be necessary to control such losses. However, review and analyses of drilling information and the onsite observations made by the mud and drilling engineers suggest that some of the loss circulation problems can be recognized and demarcated by analyzing the geological, geophysical and geo-mechanical signatures associated with the troublesome formations and their neighborhoods. For example, unconformities, consolidation history, poorly consolidated and over-consolidated formations, presence of open and closed fractures, narrow MW window etc in the post-Jurassic succession may provide an apparent relation to lost circulation and borehole problems encountered while drilling. This papers describes the geological, geophysical and geo-mechanical controls and their likely effect in causing various drilling problems with emphasis on loss circulation problems of Aramco fields.