World Academy of Science, Engineering and Technology
International Journal of Energy and Power Engineering
Vol:16, No:07, 2022

Thermal Effects on Wellbore Stability and Fluid Loss in High-Temperature Geothermal Drilling

Authors : Mubarek Alpkiray, Tan Nguyen, Arild Saasen

Abstract : Geothermal drilling operations contain numerous challenges that are encountered to increase the well cost and nonproductive time. Fluid loss is one of the most undesirable troublesome that can cause well abandonment in geothermal drilling. Lost circulation can be seen due to natural fractures, high mud weight, and extremely high formation temperatures. This challenge may cause wellbore stability problems and lead to expensive drilling operations. Wellbore stability is the main domain that should be considered to mitigate or prevent fluid loss into the formation. This paper describes the causes of fluid loss in the Pamukoren geothermal field in Turkey. A geomechanics approach integration and assessment is applied to help the understanding of fluid loss problems. In geothermal drillings, geomechanics is primarily based on rock properties, in-situ stress characterization, the temperature of the rock, determination of stresses around the wellbore, and rock failure criteria. Since a high-temperature difference between the wellbore wall and drilling fluid is presented, temperature distribution through the wellbore is estimated and implemented to the wellbore stability approach. This study reviewed geothermal drilling data to analyze temperature estimation along the wellbore, the cause of fluid loss and stored electric capacity of the reservoir. Our observation demonstrates the geomechanical approach's significant role in understanding safe drilling operations on high-temperature wells. Fluid loss is encountered due to thermal stress effects around the borehole. This paper provides a wellbore stability analysis for a geothermal drilling operation to discuss the causes of lost circulation resulting in nonproductive time and cost.

Keywords : geothermal wells, drilling, wellbore stresses, drilling fluid loss, thermal stress
Conference Title : ICGTRE 2022 : International Conference on Geothermal Technologies and Renewable Energy
Conference Location : Dubai, United Arab Emirates
Conference Dates : July 28-29, 2022