

Technical issues toward supercritical geothermal drilling

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Supercritical geothermal fluids are expected as next generation, frontier geothermal resources in Japan. Extremely high formation temperature has been recognized as one of the critical issues in drilling supercritical geothermal wells. From the previous experiences such as at Kakkonda WD-1a or IDDP wells, downhole temperature should be maintained below at most 200 degree C by effectively circulating drilling fluid during drilling because of the relatively low temperature limits in downhole equipment and materials that are currently available. In this presentation, the authors raise another possible critical issue that has not been pointed out so far. Subnormal formation pressure, and frequent and severe lost circulations are encountered in typical geothermal fields. The low formation pore pressure in supercritical geothermal formation implies that the formation fracture pressure can be also considerably lower than expected. Our estimate is that the downhole circulating pressure of cooled drilling fluid may possibly exceed the fracture pressure at depth beyond brittle-ductile transition. The fracturing of formation induced by higher downhole circulating pressure than the formation fracture pressure is a potential risk of borehole instability, packoff, stuck pipe and unsuccessful termination of the drilling in the worst case.

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