Temperature Logging in Drillholes in Domal Salt

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INTRODUCTION

The *in situ* temperature and temperature gradient in salt formations are important design quantities for development of solution-mined hydrocarbon storage caverns for several reasons. First, the creep response of salt is highly temperature-dependent. Accurate calculations of stresses and deformations for liquid hydrocarbon or natural gas caverns cannot be made without accurate *in situ* salt temperature knowledge. Second, the amount of gas that can be stored in an underground natural gas cavern is directly related to the *in situ* salt temperature [e.g., Osnes, 1994].

It is well-recognized in the storage industry that temperature logging performed soon after the cavern drillhole is completed results in an underestimate of the downhole temperature and the calculated *in situ* temperature gradient. However, the cost of delaying temperature logging for a day, a week, or a month can be significant. Therefore, the cavern owner or developer is faced with determining the optimum time to perform logging to (1) minimize additional cost and (2) determine reasonably accurate *in situ* temperature information.

Little information exists in the literature that provides cavern owners or developers with information on how long to wait after drilling is completed to obtain accurate *in situ* salt temperature information. It is unclear as to whether one should wait an hour, a day, a week, or even a month. The objective of this paper is to provide guidance to cavern owners and developers for determining the logging delay time after drilling and the procedures for accurate temperature logging. We have performed a detailed heat transfer simulation of the drilling, completion, and temperature logging of a well in a salt dome. Through this simulation, we are able to illustrate the calculated *in situ* temperature gradient resulting from temperature logging at various times after drilling completion.