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The Rationality of Employing a Depressurisation Rate Limit to Regulate the Export Capability of Gas Storage Salt Caverns

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Abstract

Underground gas storage consultants typically recommend to their UK clients to restrict the loading conditions for injection, or withdrawal, processes to pressure rates of less or equal to 10 barg/day (145 psig/day). It is understood that this value results from a German wide accepted regulation and is often mentioned in international publications. There is a large body of positive experience of long term safe operations under such conditions and this recommendation is of major importance especially for gas withdrawal, which is considered as a loading process in contrast with the gas injection which is an unloading action.

This paper presents the results of the series of analyses that were carried out to investigate the rationality of employing a specific depressurisation rate to limit the export capability of the gas storage salt caverns that are currently operated in the UK by SSE.

To investigate the effect of the depressurisation rate, a series of coupled thermo-mechanical analyses were carried out to study the response of the salt caverns during the gas withdrawal operations. The following factors were taken into consideration during the assessment of the influence of the limiting daily pressure rates:

- the potential hydrate formation at the last cemented casing shoe (LCCS) and/or the wellhead,
- the minimum allowed pressure at the LCCS,
- the geomechanical stability of the cavern and the integrity of the LCCS, and
- the potential pressure reduction to the point where the production trains limit the export capacity of the cavern.

The work presented in this paper has proven the importance of using a coupled thermo-mechanical analysis to assess the rationality of applying a de-pressurisation rate for the SSE gas storage salt caverns. Moreover, it was shown that in adopting a rational depressurisation rate it is possible to implement operational parameters that satisfy the operator's requirements with respect to:

- flexibility of gas withdrawal, and
- optimisation of withdrawal rates and working gas volumes.

Key words: Bedded salt deposits, Cavern operation, Caverns for gas storage, Computer modelling, Rock mechanics, United Kingdom.