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Geological 3D-Model for Predicting New Cavern Locations

Wilke, F.*), Schweinsberg, J.**), Behlau, J.***), Bornemann, O.***)

*) DEEP. Underground Engineering GmbH, Bad Zwischenahn, Germany
**) IVG Logistik GmbH, Etzel, Germany
***) Federal Institute of Geosciences and Natural Resources (BGR), Hannover, Germany

Abstract/Summary

This paper outlines recent improvements on the interpretation and visualization of internal geological structures in north European salt domes. The development of this technique falls back on very detailed observations and investigations in the potential underground repository site for radioactive waste in the Gorleben salt dome [1]. Experiences and results gained from this research project enable the construction of reliable geological and structural models even with limited information just along the trace of one single borehole. Finally these improvements are leading to optimized cavern mining concepts and to sophisticated cavern development schemes.

IVG Logistik GmbH operates a large cavern field for oil and gas storage in a domal salt formation in north-western Germany. In the 1970s, when the cavern facility was developed, means and methods to collect geological information of the internal salt dome structure other than drilling a well were fairly limited. There was always a risk that a cavern borehole would penetrate through or border on heterogeneous salt beds thus leading to unforeseen cavern shape development during the later solution mining operation. An undesired cavern development due to inhomogeneous salt could lead to restricted cavern usage and, in extreme cases (unsuitable salt), to the abandonment of a cavern site.

For assured operational planning purposes IVG therefore requested a threedimensional geological model for a selected part of their cavern field. Based upon this detailed model the geological situation at a pre-selected new cavern site was predicted. In Summer 2003 the new borehole was drilled for future cavern development. Results of the geological evaluation of the borehole bear very good analogies to the prognosis made by the 3D-modelling.