

Advanced exploration methods for dimensioning and optimizing of gas storage caverns at storage site Bernburg/Peissen (Central Germany)

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Abstract

The natural gas cavern storage site Bernburg, situated in the federal state of Sachsen-Anhalt, is operating since the early 1970ies. The cavern field has been expanded gradually to more than 30 caverns with a total working gas volume > 1 bcm. The cavern leaching technology as well as cavern dimensioning has been developed significantly during this period.

The geological conditions at Bernburg are well known in the central and northern part of the storage structure. However, the development of a new cavern field in the southern part of the salt pillow required the execution of an investigation program focused on an optimization of cavern parameters as cavern height and volume for a maximum brine production and the following gas storage operation. Additionally the program aimed at keeping respectively improving the high safety standards and cost efficiency.

In the period of 2008 to 2014 the following measures have taken to gain additional data and to enlarge the cavern field:

- 2D-Seismic survey producing 9 profiles with an overall length of 19 km to image the depth and the structural behavior of the overburden and the Stassfurt rock salt.
- Drilling of 7 boreholes at Bernburg site, thereof 2 wells in the quite recently explored southern part. Especially the Stassfurt rock salt was investigated by comprehensive wireline measurements and by detailed lithological and stratigraphical studies to establish criteria for maximizing the cavern volume and improving the efficiency and accuracy of drilling.
- Correlation and reprocessing of seismic data on the basis of the new borehole results.
- Realization of an in-situ pneumatic stress test program to determine accurately the maximum operating pressure.

This technical paper gives an overview of the exploration procedure, the geological and technical approaches and the results. Furthermore the implementation of the results is demonstrated with respect to the development of the cavern field with potential drill sites, the adaption of rock mechanical dimensioning and the planning, construction and operation of gas storage caverns.

Key words: Caverns for Gas Storage, Bedded Salt Deposit, Geology, Seismic, Pneumatic Stress Test, Germany