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## **Laboratory Investigations on the Mechanical Properties and Gas Tightness of Wellbore Cements and Casing-Cementation-Rock Salt Composite Systems for Salt Caverns**

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## **Laboratory Investigations on the Mechanical Properties and Gas Tightness of Wellbore-Cements and Casing-Cementation-Rock Salt Composite Systems for Salt Caverns**

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### **Abstract**

The further usage of existing natural gas storage caverns for future compressed air and hydrogen storage requires assessing the cavern wellbore integrity years after starting the cavern storage operation. Additional stresses induced by cavern convergence during storage operation may negatively affect the mechanical and hydraulic condition of the cavern well.

This study aims to experimentally investigate the mechanical properties and gas tightness of salt cement commonly used in cavern construction after extended curing. Additionally, the study aims to experimentally examine the changes in gas tightness of the composite system consisting of casing, cementation, and salt rock mass after its viscoplastic deformation due to additional stresses induced by cavern convergence.

Within the scope of the investigation, there is at least a tendency to show that the additional stresses related to cavern convergence on borehole construction, especially regarding the preservation of wellbore integrity, do not have negative effects on the indicator "integral permeability" and may even have positive effects.

**Key words:** wellbore integrity, laboratory test, salt cement, casing-cementation-salt composite system