

SOLUTION MINING RESEARCH INSTITUTE

679 Plank Road
Clifton Park, NY 12065, USA

Telephone: +1 518-579-6587
www.solutionmining.org

Technical
Conference
Paper



Prediction of microbial impurities during hydrogen storage in salt cavern

Gion Strobel, Annette Lenze, Catharina Lesche, Maxim Stein-Khokhlov

Uniper Energy Storage GmbH, Düsseldorf, Germany

**SMRI Spring 2025 Technical Conference
27-29 April 2025
Wilhelmshaven, Germany**

Prediction of microbial impurities during hydrogen storage in salt cavern

Gion Strobel, Annette Lenze, Catharina Lesche, Maxim Stein-Khokhlov
Uniper Energy Storage GmbH, Franziusstraße 12, 40219 Düsseldorf, Germany

Abstract

This presentation summarizes the theoretical results of a model that predicts the impurities during underground hydrogen storage due to microbial sulphate-reduction.

Typically, one of the critical aspects of hydrogen storage operations, focusing on safety and an economic perspective, is the purity of hydrogen after withdrawal from subsurface storage. The aim is to deliver the same purity of stored hydrogen as injected, preferably without any additional surface treatment. A theoretical contamination of the gaseous hydrogen is due to the activity of microbes living in the brine-filled sump of the cavern. During the leaching phase of the cavern, the microbes are transported into the cavern by fresh water injection. Hereby, various microbial species may be present and active during operation, namely methanogens and sulphate-reducers. Further, the dissolution of carbon dioxide into the brine-filled sump and the gas could lead to additional contamination.

All in all, the model demonstrates the capability to predict the possible microbial contamination of stored pure hydrogen. Following the hydrogen withdrawal during the operation of a pilot cavern, the prediction model will be calibrated with real test data. Further, the model is adaptable to other microbial reactions for future studies.

Key words: underground hydrogen storage, salt caverns, impurities modeling, hydrogen contamination