Solution Mining Research Institute Spring 2014 Technical Conference

San Antonio, Texas, USA, 5 – 6 May 2014

Fast learning from fast cycling

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Abstract

The purpose of this paper is to present the results of a fast learning experience during the first three years of commercial operation of a *fast cycle*, also called *high-frequency*, underground gas storage facility, making use of caverns in a salt dome.

One of the most important design features of our fast cycle installation is an usually large capacity of the surface facility in relation to the working gas volume. Our maximum theoretical churn rate is 20.

In addition, the facility has been equipped with advanced controls enabling it to switch fully automated between 100% injection to 100% production load, or vice versa, within 15 minutes.

This puts the 10 bar (150 psi) per day criterium for maximum pressure change within the caverns in a new perspective. This criterium, more than anything else, has become the prime limitation, hence the prime subject of study to further debottleneck the facility.

This paper discusses how the *maximum daily quantity* and *effective working gas volume* that can be withdrawn from or injected into the caverns depends on

the thermodynamical computer models used,

the heat exchange with salt rock and bore wells assumed,

the degree of thermal imbalance due to ever-changing conditions assumed,

the frictional pressure drop in the completion,

and last but not least the pooling of non-identical caverns.

Key words: Cavern Operation, Caverns for Gas Storage, Computer Modeling, Gas storage, the Netherlands