Solution Mining Research Institute Spring 2013 Technical Conference

Lafayette, Louisiana, USA, 22 – 23 April 2013

MAINTAINING ADEQUATE CAVERN PRESSURE DURING AN INTERRUPTED LEACHING OPERATION

Brandon C. Lampe, PB Energy Storage Services, Inc., Houston, Texas USA

Fritz H. Wilke, DEEP Underground Engineering GmbH, Bad Zwischenahn, Germany

Paul E. Nelson, PB Energy Storage Services, Inc., Houston, Texas USA

Abstract

Pressure variation when the well is quiescent is observed as the net result of many mechanisms following the (1) interruption of leachate injection during the solution mining of a cavern or (2) displacement of a large amount of stored product. One of those mechanisms is caused by the presence of undersaturated cavern brine that continues to leach the salt formation until chemical equilibrium is attained. If cavern growth, resulting from salt dissolution, occurs to an extent where it overshadows other transient mechanisms (e.g., brine thermal expansion or cavern creep), the cavern pressure will drop.

During the development of a solution-mined cavern, surface pumps inject raw water for leaching salt and displacing brine. Often, when a cavern is leached for storage, a predominant goal is to leach the cavern as quickly as possible, which typically results in the cavern brine being undersaturated. In the event that surface pumps are unable to continue injecting raw water (e.g., loss of power or mechanical failure), the continued leaching process and resulting cavern growth could result in an excessive drop of cavern pressure. If this process is allowed to continue, the cavern pressure may drop below a critical threshold and structural damage could occur. However, this situation may be countered by a top-up method (i.e., fluid injection) that would prevent a critically low pressure from being reached.

This paper describes the mechanisms influencing shut-in cavern pressure and presents a case study where an analysis of these mechanisms was applied.

Key words: Solution Mining, Cavern Development, Transient Cavern Pressure