Solution Mining Research Institute Fall 2019 Conference
Berlin, Germany, 23-24 September 2019

Mechanical Integrity Testing of Cavern Wells in a Salt Solution Mining in Portugal – First tests analysis and lessons learned

Franz Lahaie[1], Xavier Daupley[2], Paulo Quental[3]

[1] Ineris, Ecole des Mines de Nancy, Campus Artem, CS 14234, 54042 Nancy Cedex, France

[2] Ineris, Parc Technologique Alata, BP 2, 60550, Verneuil-en-Halatte, France

[3] Solvay, Rue de Ransbeek 310, 1120 Bruxelles, Belgique

Abstract

The Matacães site is a solution mining salt production field located in Portugal, 40 km (25 mi) north of Lisbon. Operated by Solvay since 1954, this field comprises 22 caverns created in a salt dome. The cavern depths range from 300 to 1200 m (1000 to 4000 ft) and their geometrical volumes from 80 000 to more than 1,2 million m3 (3 to 42 MMft3).

In a perspective of securing the caverns before final closure, a vast study program was defined including collection of geological data, hydrogeological studies, geomechanical modelling, acquisition of temperature profiles, sonar imaging and microseismic monitoring. In this context, an ambitious program of well mechanical integrity tests was defined, with the objective of testing the tightness of cavern wells before their plugging and abandonment.

This test program started in November 2016. The method used is the fuel-oil leak test. The test was designed with the objective to remain simple and adapted to industrial constraints. A web monitoring system was set-up to enable remote analysis and control of the tests in real time.

To date (August 2019), 11 tests have been conducted. This paper presents the design, site implementation, analysis and interpretation of these tests. All of them have concluded to the integrity of the wells, with a maximum leak rate of ~ 3 L/day (~ 1 gal/day), i.e. at the limit of the resolution of the method.

Beside characterizing the well tightness, it is shown that the fuel-oil mechanical integrity test may provide a wealth of additional information on the well geometry, the cavern compressibility and the long-term equilibrium pressure of the cavern. It thus appears as an interesting method to implement in the context of a solution mining field before closure.

Key words: well mechanical integrity, tightness tests, MIT, abandonment, salt caverns, Portugal