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BEHAVIOR INTERPRETATION OF MECHANICAL INTEGRITY TESTS

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Introduction

Interpretation of tightness tests in underground salt caverns is the main concern of this paper. Much of the material used to prepare this paper was first included in a report prepared for the SMRI (Van Sambeek *et al*., 2005).

Almost all solution-mined caverns are tested on a regular basis to prove the absence of significant leaks. Various tightness tests are currently used. We focus on the simplest one: cavern pressure is built up to the testing figure, and pressure evolution as a function of time is recorded during several days. A significant pressure drop rate is a clear sign of poor tightness. In fact, together with a liquid leak, several phenomena may explain the pressure drop observed after a cavern has been rapidly pressurized. They must be identified and quantified to allow a correct interpretation of the test results. In some cases field data can be corrected for the effects of these phenomena, leading to a better estimation of the leak.

More precisely, one must distinguish between:

- The “apparent” leak, which is directly deduced from the observed pressure decrease, or $Q_{app} = -\beta V_c \dot{P}_i$, where $\dot{P}_i$ is the as-observed cavern pressure drop rate and βV_c is the cavern compressibility.
- The “corrected” leak, obtained when the effects of known and quantifiable mechanisms contributing to the apparent leak are taken into account.
- The “actual” leak

The objective of this paper is to identify those mechanisms that might contribute to the apparent leak and which, when properly accounted for, can potentially reduce the gap between the corrected leak and the actual leak.