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Meeting Paper

SMRI Reference for External Well Mechanical Integrity Testing / Performance, Data Evaluation and Assessment

Summary of the Final Project Report –
SMRI Research Report 94-0001

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0 Abstract

Verifying the external mechanical integrity of storage cavern wells based on interface tests is current standard engineering practice. There are, however, a number of different procedures applied to performing and, in particular, assessing such tests. For this reason, the Solution Mining Research Institute (SMRI) commissioned a research project aimed at developing a reference test, with the objective of providing future comparability between the various test alternatives and the assessment thereof. This report summarizes the results of the SMRI project (Report no. 95-0001-S).

The various test methods can be divided into three groups:

(1) In-Situ Balance (referred to in the USA as the Nitrogen Interface Test)

(2) In-Situ Compensation

(3) Above Ground Balance

In present testing it is usual to assess the tightness of the well by comparing the theoretically determined leak rate with the measurement accuracy, the minimum detectable leak rate (MDLR): if the theoretical value falls within the MDLR, then the well is classified as *technically tight*.

In order to determine the assessment criterion for the SMRI reference value, the achievable measurement accuracy of the widely used In-Situ-Balance Method was taken as the basis, assuming a typical gas cavern configuration (13-3/8" last cemented casing, setting depth 1000 m, cavern throat diameter 1 m). The MDLR is approx. 40 kg with nitrogen test medium. A precondition for this value is the use of accurate, standard pressure sensors and the depth-dependent calculation of the mass of the shut-in test gas.

Experience gained at many wells and over many years in the execution of this test - even with shut-in periods of only 24 hours (USA) - is that, to date, there is no evidence of any hazard to safety above ground, contamination of the underground, or loss of product where the theoretical leakage rate has been equal to or less than 40 kg/24 h. Taking this as a basis, the value was rounded up and developed into the SMRI Reference Value of 50 kg (N_2)/24h as the specification for test accuracy (MDLR).

Assuming a ratio of at least 3:1 between the smallest reliably detectable measurement value and the measurement accuracy, the *maximum admissible* reference leak rate (MALR) is then:

$$MALR = 3 * MDLR = 150 \text{ kg}(N_2)/24 \text{ h}.$$