

**CYCLIC LOADING EFFECTS ON DAMAGE AND HEALING OF ROCK SALT
FROM AVERY ISLAND LOUISIANA
250 DAYS CYCLIC LOADING TESTS AND NUMERICAL BACK ANALYSIS**

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Abstract

In response to the SMRI request for proposal 2010-01 RESPEC and TUC have analyzed the effects of mechanical cyclic loading of rock salt by laboratory testing. According to the agreement the tests were characterized by cyclic loading at either of two stress conditions: one above the stress level where damage will occur and one below the damage stress level. The duration of both stress levels were given by some 30 days.

Although the SMRI project was finished after reaching the end of the second cyclic loading phase TUC has continued the cyclic loading up to a duration of 250 days to analyze in detail damage induced creep behaviour and healing behaviour of rock salt by long term cyclic and constant loading at different stress levels.

At first the paper presents in detail the pretended loading history and the observed creep behaviour, volume damage and ultrasonic wave velocity measured during the long term cyclic tests. To validate by a back analysis the ability of the constitutive model *Lux-Wolters* to image the measuring results observed from the tests, a short description of the constitutive model *Lux-Wolters* is given thereafter. At least a comparison between the measured data obtained by the cyclic loading tests and the computed data, obtained by a numerical back analysis of the tests indicates clearly, that the Lux-Wolters model is able to image the load bearing behaviour of rock salt considering cyclic and constant loading above as well as below damage stress level. That is, transient and stationary damage free creep behaviour, damage induced creep behaviour as well as healing induced creep behaviour could be computed using one unique set of parameters for the total loading history.

Key words: Rock Mechanics, Salt Properties, Computer Modeling, Cycling, Storage Caverns