

Status of SMRI/DOE Sponsored Casing Sealing Integrity Study

by

Kirby Mellegard

Tom W. Pfeifle

RESPEC Inc.

and

Mike Bruno

Terralog Technologies

ABSTRACT

For the past year, RESPEC and Terralog Technologies have been engaged in a study funded jointly by the Solution Mining Research Institute (SMRI) and the Department of Energy (DOE) under SMRI Request for Proposal (RFP) 98-3 to evaluate the integrity of cemented casing seals in salt formations. The study is not complete, so this paper is a project status update that presents preliminary results. The final results will be available in a final report to be issued when the project is completed. The scope of the project calls for laboratory bench-scale testing of a simulated casing seal to determine the maximum pressure that a typical well casing seal can withstand. The scope also includes numerical analyses to determine the states of stress and deformations encountered by the bench-scale specimen components and interfaces. Laboratory test results are presented from two trials. The specimens are comprised of thick-walled hollow cylinders of salt with a steel casing cemented within the interior bore. The nominal dimensions of the salt are an outside diameter of 12 inches, an inside diameter of 6.5 inches, and a length of 16 inches. The steel casing has a ¼-inch wall thickness and an outside diameter of 4.5 inches, which results in an annular cement thickness of about 1 inch to form the seal between the casing and the salt. Lithostatic loadings of 2,000 psi were applied to the outer surfaces of the specimen with internal brine pressure initially at zero. The internal brine pressure was then gradually increased to test the integrity of the casing seal. Initial results indicate that brine flow can be observed at relatively low internal pressures (about 500 psi to 1,000 psi), but those brine flows tend to decrease with time. However, this holds true only up to some limiting internal brine pressure (perhaps 80 percent of lithostatic) where the flow path begins to open, resulting in an accelerating brine flow and a potential permanent loss of seal integrity. This conclusion is based on an extremely small database of results and should be considered highly preliminary at this point.

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