

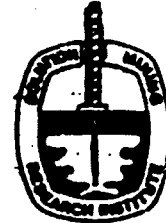
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MEETING  
PAPER



ALTERNATIVE METHODS FOR TESTING

THE INTEGRITY OF UNDERGROUND STORAGE CAVERNS

by

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April 2, 1990

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ABSTRACT

Phillips Petroleum Company owns and operates (through its operating groups and subsidiaries) 57 storage (solution mined) cavern wells in the United States. These caverns are used to store a diverse variety of fluids in domal and bedded salt formations.

Federal and state regulatory activity, particularly over the last eight years, have generated the need to develop methods to "prove" the mechanical integrity of storage wells. The author, as a member of the Company's Underground Storage Engineering Section for the last ten years, has been active in developing the Company's testing programs. Given our unusual variety of caverns, Phillips has had to develop some unique test methods.

Phillips developed (and patented) one technique (we now refer to it as the "Brine Pressure Response" method) which greatly simplifies the determination of the volume of a section of cavern (a necessary step in the conventional interface observation test method). Additionally, Phillips has conducted several pressure observation style tests with satisfactory results. Pressure tests have proven to be more economical and practical for some caverns than the conventional interface observation test method. Phillips has conducted two particularly unique pressure tests of gas caverns -- with significant cost and time savings over the conventional method.

This paper briefly describes the Brine Pressure Response method, our pressure observation style of testing liquid filled caverns and a method for pressure testing gas caverns. Each cavern is unique in many ways and, likewise, a test procedure must be tailored to the specific cavern to be tested at the specific facility. Thus, this paper is not intended as a complete instruction manual on how to perform such tests, but serves to orient those already familiar with the basics of testing underground storage caverns to some alternative test methods.