

**SOLUTION MINING
RESEARCH INSTITUTE**

3336 Lone Hill Lane
Encinitas, California 92024, USA

Telephone: 619-759-7532 ♦ Fax: 619-759-7542
www.solutionmining.org ♦ smri@solutionmining.org

Meeting Paper



**Development of Cement Evaluation
Quality Control Measures
for Cavern Wells**

by

**Stephen L. Kelly
John A. Fleniken**

**Subsurface Technology, Inc.
Baton Rouge, Louisiana, USA**

Spring 1999 Meeting
Las Vegas, Nevada, USA
11-14 April 1999

DEVELOPMENT OF CEMENT EVALUATION QUALITY CONTROL MEASURES FOR CAVERN WELLS

Stephen L. Kelly and John A. Fleniken

Subsurface Technology, Inc.
Baton Rouge, Louisiana 70809

ABSTRACT

Underground Injection Control regulations require the casing strings in a cavern well to be cemented from the casing seat to the surface. The primary purpose of this cement is to provide a barrier in the casing annulus that prevents the vertical migration of injected fluids and eliminates the potential for crossflow between permeable saltwater zones above the cavern.

The large casing diameters and construction methods used in installing cavern wells create problems that limit the effectiveness of cement evaluation techniques. The factors adversely affecting each available cement quality measurement must be understood to properly develop cement evaluation quality control measures for a cavern well. These quality control measures are essential for ensuring that the external mechanical integrity of a cavern well has been properly evaluated.

The first step in developing cement evaluation quality control measures is to compare a cavern well's design and construction program with the various cement evaluation problems commonly associated with a cavern well. A brief discussion of these common problems follows:

- low compressive strength cement - The contrast between adequate and inadequate cement quality is greatly diminished by low compressive strength cement.
- large casing dimensions - Large diameter casing reduces the contrast between adequate and inadequate cement quality, and proper tool centralization becomes much more critical. Heavy wall casing also reduces the contrast between adequate and inadequate cement when using conventional cement evaluation instruments.
- large diameter wellbore - An enlarged wellbore reduces the ability to qualitatively evaluate the cement bonding to the formation.
- unfavorable formation acoustical properties - Conventional cement bond logs cannot quantitatively evaluate cement quality in formations where formation acoustical travel times approach or exceed the acoustical travel time of the casing. Unconsolidated formations produce weak acoustic signals which diminish the effectiveness of cement-to-formation bond quality evaluations.
- overlapping casing strings - If two or more casing strings overlap, a less reliable cement evaluation can be performed on the annulus cement of only the innermost string.
- microannulus effects - Microannulus effects provide a pessimistic analysis of cement quality unless casing pressurization is used to eliminate or minimize the effects while an evaluation is being performed.

©2022 – Solution Mining Research Institute
Full Paper is Available in the SMRI
Library(www.solutionmining.org)

193

After assessing the impact that each of the above problems can have on the evaluation of a cavern well's cement quality, a program can be developed for obtaining the most reliable cement evaluation data. This program, which may include one or more cement evaluation services, must be adequately incorporated into a well's construction procedure and subsequent mechanical integrity testing procedures. The most effective cement evaluation quality control program can be accomplished by integrating data from the following well construction and cement evaluation logging programs:

- review well construction - A review of the cavern well's drilling, casing and cementing programs must be completely reviewed to assess the quality of the cementing operation and to develop an effective cement evaluation logging program.
- cement evaluation logging program - A cement evaluation logging program must be developed that considers the limitations of the logs being run, includes a specific log quality control program, and establishes log interpretation objectives and guidelines.

©2022 – Solution Mining Research Institute
Full Paper is Available in the SMRI
Library(www.solutionmining.org)