

Prevention and Remediation of Sustained Casing Pressure and other Isolation Breaches

PROJECT FACT SHEET

Program

2011 Unconventional Resources

Project Number

11122-42

Start Date

May 2013

Duration

40 Months

RPSEA Share

\$4,096,691

Cost Share

\$2,852,082

Prime Contractor

CSI Technologies, LLC

Participants

Southwestern Energy; The Measurement Group; University of Houston

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Reports and Publications

www.rpsea.org/projects/11122-42

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Research Objectives

The project objectives are to develop techniques to mitigate risk to groundwater resources associated with shale gas development, to remediate failed annular seal to stop communication in an existing well, to improve techniques that enhance lifelong wellbore annular isolation during the wellbore construction process, and to prevent potential annular seal failure which can cause sustained casing pressure (SCP) later in the well life. The application of this project will illustrate positive value and acceptable risk of the gas shut-off and prevention concepts. The success of the field trials will drive the technology transfer of this developed concept to shale gas driller cross the U.S. as well as other unconventional plays employing factory drilling methods for wells with high potential of SCP.

Approach

The approach is to develop methods and materials both for the prevention and remediation of sustained casing pressure. Phase 1 will consist of an analysis of the current problems that lead to SCP as well as the development and testing of materials for use as potential prevention or remediation technologies. An acoustic downhole tool will also be developed to use as a locator of downhole sources of gas migration issues that are already occurring in wells. These tasks will be the basis of determining what technologies and methods are to be used in the field trials and demonstrations in Phase 2. In Phase 2 the technologies developed will be applied to real-life horizontal wells specifically chosen using a set criterion of conditions and characteristics to evaluate their effectiveness when used in real well scenarios. The field trials will be monitored and analyzed to determine the success both short and long term as it relates to the prevention or remediation of SCP.

Accomplishments

Phase 1 of this project is complete. Initial work included a state-of-the-art review of publicly available literature to assess related best practices, the current technology, and future trends for addressing SCP prevention including improved cement slurry designs. Phase 1 evaluations were performed to determine the potential benefits of lowering the top of cement (TOC) for the production casing. These proposed design changes would allow for an increase in the density of the lead cement, improving well construction through:

- Greater control of final TOC with reduction in lost circulation and fall back.
- Decreased short-term gas flow potential (GFP).
- Improved mechanical durability of cement.

The Phase 1 results were influential to recent changes (May 2015) in Arkansas completion regulations allowing for lower TOC.

Phase 1 also included the design and development of an acoustic downhole tool to accurately locate gas flow behind a casing wall using both active and passive detection methods.

Future Plans

The project has implemented new slurry designs in field trials for primary cementing operations of wells in the Fayetteville shale play according to the new regulation brought about by this project. Field observation have begun and SCP data collection is showing early, but promising results including a major decrease in pre-frac annular pressure occurrence. The project researchers will continue observing cementing jobs and collecting data as well as seek opportunities to field test the flow detection tool prototype developed in Phase 1.