
EXECUTIVE SUMMARY

Petroleum Technology Alliance Canada (PTAC) has engaged InnoTech to determine what methods may be used to identify the placement of sealing products behind steel casing in wellbores, particularly during well remediation. Confirming the placement of these products provides an assessment of likelihood of hydraulic isolation in the annular area between casing and formations or the existing cement.

Well remediation is complex and many different repair methods may be deployed. Various types of wellbore evaluation tools have been developed to assess well integrity and to provide technical guidance for these operations. The vast majority of well interventions to restore hydraulic isolation behind casing has historically utilized oil well cement as a sealing product.

Due to some shortcomings of cement, new products have been undergoing development to address applications where traditional remedial cementing is not adequate. Operators want to know how effective these products are and to confirm the final placement behind casing.

A series of cased hole cement evaluation tools has been in service for many decades which are designed for assessing cement quality. This project examines how cement evaluation logs and other cased hole logging tools may be utilized to identify the placement of alternate products behind casing. These technologies are summarized as follows:

1. Temperature and passive noise logs.
2. Legacy cement bond logs (CBL) which utilize 3 and 5 foot receivers, and which are now also referenced as a type of cement evaluation logs.
3. Modern cement evaluation logs particularly high frequency sector and segmented tools.
4. Deploying gamma emitting tracers with the products and running spectral logs.
5. Deploying boron / borax with the products and running pulsed neutron logs.
6. Magnetic detection with electromagnetic pulse tools.

Many alternate products have a range of properties that can be tailored depending on the blend of components. In this report the properties of alternate products are discussed as much as practical with respect to the recommended operating ranges of the logging devices.

Guidelines for using the subject logging tools are included in this report and one device will not be suitable for all applications. In many instances it may be advisable to use more than one tool in a logging suite depending on the specific conditions and sealing product that is deployed. Whoever is planning the well intervention will determine the most cost-effective approach often with input from other technical experts.

The key recommendations which have resulted from this project are:

- The guidelines in this report should be provided to DACC of Energy Safety Canada for consideration in future updates to industry recommended practices (IRPs).
- Alternate products should be assessed for acoustic velocity, density and acoustic impedance of the product blends to determine their suitability of identifying placement with cement evaluation logs before the products are placed in the wellbore.