

Using a third-party cementing laboratory to generate value for your company

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Abstract

The main objective for oil well cementing is well integrity. The 12th edition of the IADC Drilling Manual states *"The principles and processes for establishing and maintaining cement as a barrier are central to providing well integrity"*.

Establishing and maintaining an effective cement barrier is not easy and requires many coordinated processes, which include pre-project engineering, slurry design, laboratory testing, job modeling, material blending, quality control testing and onsite delivery.

Among these processes, cement laboratory testing is an essential component in designing a cement sheath for the life of well because it helps to ensure that what is pumped is what was designed. Cement integrity testing requires a full complement of robust conventional and specialized test equipment, highly documented process and procedures, and a staff who can, not only perform the testing, but can also analyze and interpret the tests.

A third-party cement-testing laboratory experienced not only in oil well cement testing but having cementing experiences in research and development, field operations, and engineering can easily generate extensive value for the well operator and their cement service providers.

Background

Globally the demand for cement testing has increased year-over-year for the past 10 years. This demand is being driven predominately by governmental changes, revisions to industry standards and recommended practices, increased industry focus on quality control/assurance, and more complex wells (Figure 1). Not only has the volume of cementing testing increased, but recently developed technologies have created the need for more complex cement testing methods and a higher order of test data analysis. The combination of increased demand and increased testing complexity are taxing the capacities and capabilities of many of the industry's cementing laboratories.



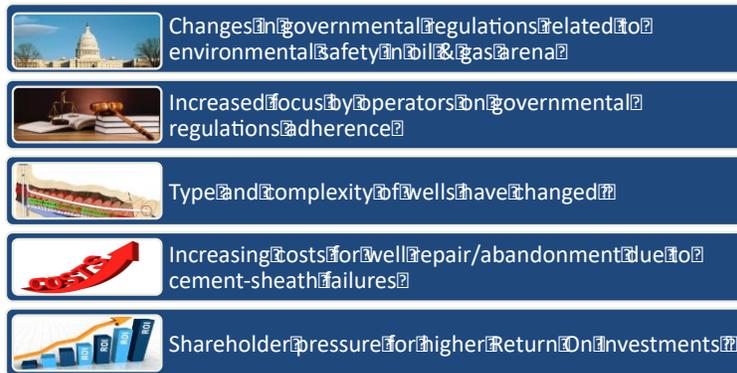
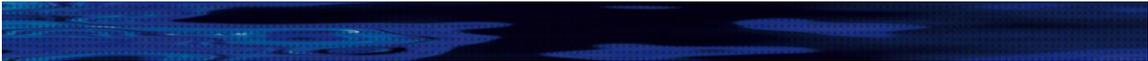


Figure 1. Key drivers that increase the demand for cement testing

Historically well operators have relied on their cementing service providers for their cement testing needs and the cost for testing was included in all cement job charge.

Today all oil well cement service providers have cement-testing laboratories. Strategically these labs are located in their field service centers and in the company's research centers.

Most cement service providers have one R&D laboratory and its major area of focus is to support the strategic initiatives of the cementing business unit. Usually these initiatives are focused toward the development of solutions for new cementing challenges, development of new or lower cost discrete cementing products, and the introduction of new technologies both internally and to the industry. Research and Development labs are staffed with advanced degreed chemists and engineers and are equipped with standard and specially designed lab equipment to support R&D activities.

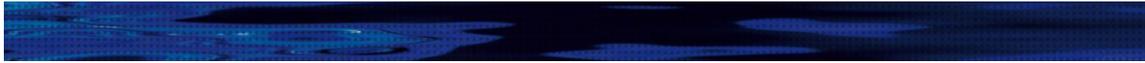
Conversely most cement service providers have field laboratories that support multi-service lines within an operations center. Their main areas of focus are to support day-to-day operations and quality control testing. These labs are staffed and equipped to meet only the current and anticipated near-future testing needs of the operations center. Non-typical cement tests, such as post-set mechanical properties, cyclic temperature and pressure loadings, and advanced fluid migration tests, require special lab equipment and staff experiences that typically do not reside in a field lab. When non-standard cement testing is needed, field labs transfer these tests to their R&D laboratories.

When a field lab request R&D testing support, it usually presents a unique set of challenges for each lab. In terms of the field lab, the challenges usually revolve in the areas of communications, material shipping, project logistics, and results timing. From an R&D lab perspective, challenges arise in the areas of resource identification and allocation, slowing down contracted R&D projects, and meeting technology R&D expectations of the business unit. In addition, many times the R&D staff performing the test has not the local or residential knowledge of the project, which can result in repeat testing which will further delay contracted R&D projects.

Solution

Employing and/or outsourcing cement testing to a highly experienced independent cement-testing laboratory can create substantial value for well operators and cement service providers. Below are examples of how employing a highly experienced independent cement-testing laboratory can create value.





Creating value for well operators (Figure 2)

- *The tendering process*
Typically the cementing services tendering process includes a technical and a commercial component. The technical component is used to technically qualify the service provider and is one component in the commercial evaluation.

Employing a highly experienced third-party, independent, cement-testing lab to supplement the well operator's technical team can ensure that the tender's technical requirements are clearly communicated, that specific testing process are correctly outlined, and that validation testing is performed to ensure that only technically qualified cement service providers are evaluated commercially.

- *Project specific testing*
At times a well operator may require non-standard cement test methods or cement test performed to mirror actual well conditions. Many times these tests require the use of non-standard test equipment and/or testing methods. Typically non-standard test present many challenges for cementing service provider's labs in the areas of equipment availability, time requirements, staff experience, and existing field and R&D project requirements.

An experienced independent lab can easily work with both the well operators and their service providers to develop specific testing methods to ensure that the tests meet the needs. Additionally most experienced independent cement labs have the flexibility to quickly modify existing equipment or build new test equipment to meet the needs.

- *Quality Assurance process*
Due to the inherently high human, environmental and financial risk associated with finding and producing oil and gas, quality assurance is a major industry focus. Today virtually all companies working in the Oil and Gas industry have a documented quality assurance, (QA) program. A typical QA program includes quality control testing, process adherence auditing and a quality review process.

Employing an experienced independent cement-testing laboratory, as member of a company's quality assurance team can provide value beyond simply product quality control testing. Including an experienced independent lab on the company's lab auditing team will bring extensive hands on experience in all facets of a cementing lab's operation. In addition to providing experience and its knowledge in all areas of cementing lab management an independent lab can effectively communicate audit finding to both the audit team and the lab being audited and help in development of action plans if deficiencies are discovered.



Figure 2. Creating Operator Value





Creating value for cement service providers (Figure 3)

- *Relieve short-term capacity issues*
At times all cementing labs will experience capacity issues. Contracting an independent cementing lab to provide supplemental cement testing can prevent non-scheduled capital expenditures for additional equipment and increase of monthly lab expense due to staff additions. Additionally an experienced independent lab can help reduce the number of "repeat test" due to errors that are typically incurred during the new hire-training program.
- *Non-conventional testing*
Many field-cementing labs are equipped and staffed to provide standard or conventional cement testing. As such many field labs are neither equipped nor staffed with experienced engineers in non-standard testing such as post-set mechanical properties, cyclic loading, fluid flow, cement shrinkage, etc. Outsourcing non-conventional testing to an experienced independent lab can reduce challenges associated with using the company's R&D staff and the cost to acquire potential low usage new lab equipment.
- *R&D support*
As previously stated, R&D labs support business units' strategic initiatives, which require that the R&D lab maintains a laser-like focus on contracted projects. Many times, a R&D project may require special test equipment that is either not available, broken, or requires extensive time and capital to acquire. Outsourcing these tests to an independent lab may sizably reduce the time and cost associated with testing. Additionally an independent lab may bring a level of experienced to the project, which can again help reduce project development time. Finally, outsourcing field lab support request to an independent cement testing lab can help eliminate loss R&D project time, and increasing field lab support service quality.
- *Internal audits*
Many service providers' quality programs contain a self-auditing component. A typical internal audit team requires 2 to 3 highly experienced lab resources and takes between 6 to 10 (auditing 2-6 days, travel 2 days min, report generation 2 days) working days to complete. Many times the human capital requirements can present challenges for the labs supplying the auditors. Additionally the audit team's findings may result in corrective actions, which may create a disruptive work environment between the audit team and the lab being audited. Employing an independent lab as lab auditors can create substantial value in the areas of human capital, disruptive environments and actually reduce the total cost associated with the auditing process. More importantly employing an independent lab for auditing enables the service provider to demonstrate to the industry their commitment to quality.

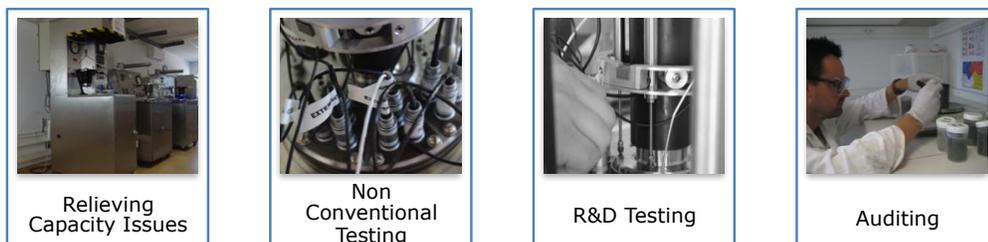


Figure 3. Creating Service Company Value





Meeting the Industry Needs

CURISTEC is uniquely positioned to meet the industry's cementing laboratory testing challenges. As a privately owned, third party, industry recognized, technology company specializing in oil & gas geomechanics, wellbore integrity, cement integrity, materials testing, engineering software and consulting services, CURISTEC brings over 50 years of cementing field operations and R&D experience to your projects. Its CurisLab is fully equipped and staffed with experienced lab engineers. It can provide both primary and outsourced cementing testing, engineering and auditing services.

Conclusion

- Increased industry focus in the areas of quality assurance and new cementing technologies are driving the demand for more conventional and non-conventional cement testing.
- The increased demand for cement testing is challenging the capabilities and capacity of the service providers' laboratories.
- Employing an experienced independent cementing laboratory can generate substantial value for the well operator and the cementing service provider
- CURISTEC and its CurisLab facility are uniquely positioned to provide both cementing laboratory testing and professional services to cementing industry.

