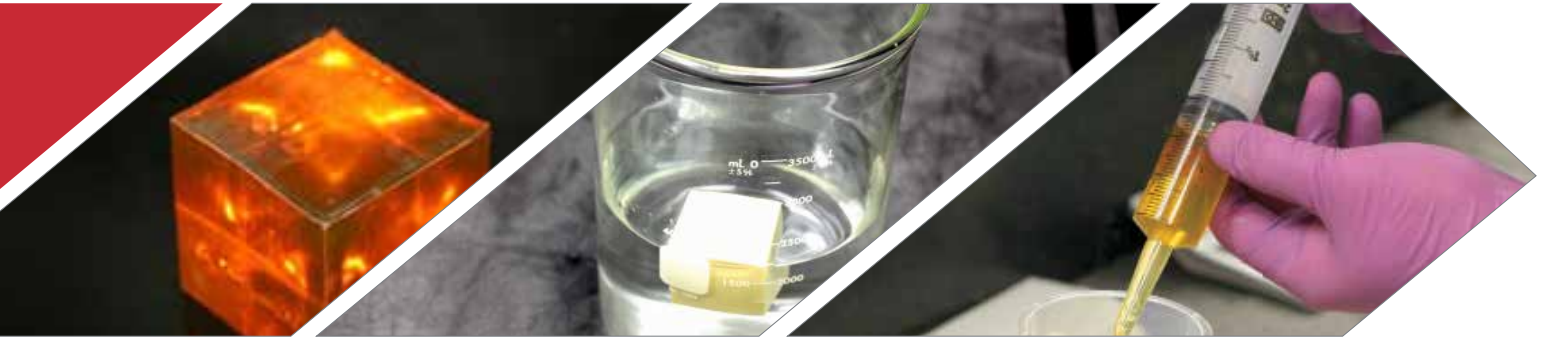


CSI Resin Sealant

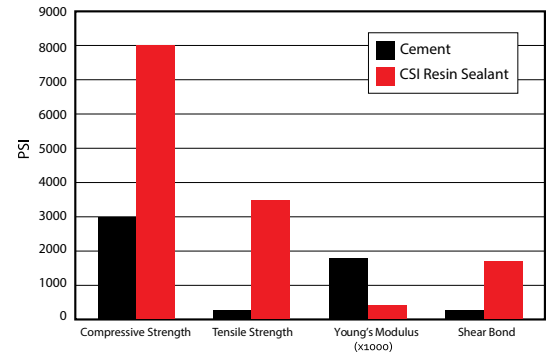


CSI RESIN SEALANT OUTPERFORMS CEMENT

Applications of CSI Resin Sealant are:

- > Remedial squeeze jobs
- > Consolidating weak and permeable formations
- > Plug and abandonment operations
- > Sealing gas leaks, leaking packers and valves
- > Shutting off water flows
- > Gravel pack completions

Long-term zonal isolation issues with oilfield cement annuli commonly result from cyclic temperature and pressure loading during the lifetime of the well. Cement mechanical properties such as brittleness and low tensile strength affect the long-term durability of the cement seal. Remediation of zonal isolation failures, such as microannuli, can be both costly and challenging to execute successfully. The relatively large particle size of Portland cement compared to a microannulus means that it is difficult for the cement to penetrate far enough to create an effective seal.



CSI Resin Sealant was designed to address these issues and reduce remediation costs to the operator. CSI Resin Sealant is a bipartite system of an epoxy resin and chemical hardener. Unlike previous oilfield sealants, this system is insensitive to water contamination and will not dilute. CSI Resin Sealant can be effectively designed for a temperature range of 40°F to 300°F at densities ranging from 7.0 ppg to 19.0 ppg.

Features of CSI Resin Sealant

- > A solids-free formulation means that the resin can be squeezed deeper into a microannulus to create a stronger seal, eliminating the need for repeating remedial cement jobs.
- > Low rheology means that the sealant can be easily mixed and pumped.
- > Used with conventional oilfield equipment such as pumps, batch mixers and dump bailers.
- > Cohesive properties ensure that the sealant will remain stable at downhole conditions.
- > Free falls through water and re-forms in the zone of interest.
- > Can be drilled out with standard oilfield drill bits or can withstand perforation.
- > Outperforms conventional Portland cement for compressive strength, tensile strength and shear bonding.
- > Non-shrinking and impermeable for long-term durability.



CSI RESIN SEALANT CASE HISTORY #1

A client with a well located in the Gulf of Mexico was having problems with a leaking production packer. They were experiencing communication between the tubing/casing annulus and had made several unsuccessful attempts to resolve this issue. The leaking packer was preventing the well from being put on production. CSI Technologies was called out to pump CSI Resin Sealant into the annulus to the top of the production packer, essentially locking the tubing in place and sealing the annulus so gas lift production could resume. After 24 hours, a successful positive pressure test was performed, indicating that the CSI Resin Sealant had successfully set against the top of the packer and sealed the annulus.

| CONDITION / PARAMETER | CURRENT RANGE |
|-------------------------------|-------------------|
| Temperature | 40°F – 300°F |
| Viscosity unweighted | 425 cP |
| Surface Handling Time | 40-50 minutes |
| Downhole Fluid Times | 1-3 hrs |
| Initial Set Time | 12 hrs |
| Hard Set Time | 24 hrs |
| Unweighted Density | 9.2 ppg – 9.3 ppg |
| Lightened or Weighted Density | 7 ppg – 19 ppg |
| Shrinkage | None |
| Shear Bond | 1600 psi |
| Compressive Strength | >8000 psi |

PUBLISHED ARTICLES

Sabins, Fred and Larry Watters. (2007). “Cement alternative has unique properties” E&P Magazine. http://www.epmag.com/EP-Magazine/archive/Cement-alternative-unique-properties_428

CSI RESIN SEALANT CASE HISTORY #2

During P&A operations on an offshore well, an operator had made repeated attempts to seal the 9 7/8-in. casing, however gas continued to leak to the mud line between the 9 5/8 x 13 1/3-in. annulus. After multiple attempts, the operator selected remediation by CSI Resin Sealant. A window was milled through the 9 7/8-in casing in the area of the leak, and 13 bbls of 16.5 ppg resin was pumped. The set time was 4 hours and the bottom hole temperature was 85°F. After the resin was placed, the well was shut in for 24 hours with pressure. After 24 hours, no bubbling was observed in the annulus, indicating a successful job.



CSI Technology wins OTC Outstanding Innovation of the Year Award (2007)

Simplified Schematic Showing Resin

