

CEMENTING

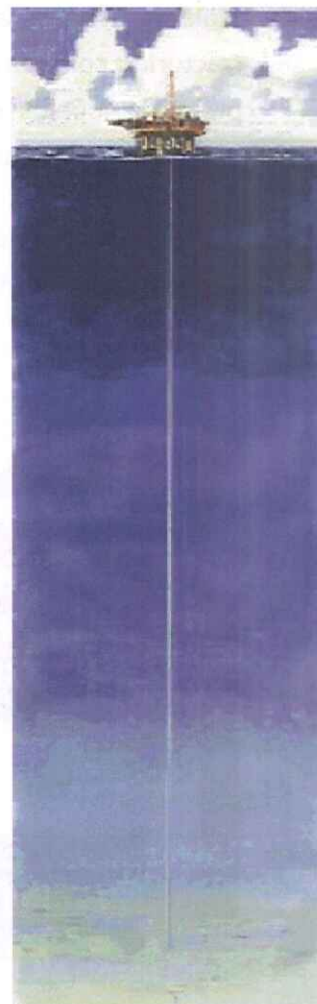
ZoneSealSM Isolation Process

Why settle for anything else?

After years of research and field application, we believe there is a better way to achieve maximum zonal isolation. We're delivering this optimum solution to you through the Halliburton ZoneSealSM Isolation Process. Maybe you can actually save a few dollars up front by sticking with a conventional cement job.

But what is the ultimate cost?

- Can you live with a poor cement-to-formation bond because of inefficient mud displacement?
- Can you live with gas channels that form in the cement while it sets?
- Can you live with uncontrolled lost circulation?
- Can you live with formations fractured by the weight of conventional cement?
- Can you live with asphaltenes, paraffins or gas hydrates precipitating even before the crude reaches the surface? Conventional cement is very poor at retaining heat.
- Can you live with the potential for mud, gas or water leaking to the surface? The risk of environmental hazards? And what about the ever-tightening regulatory standards – could you be faced with having to abandon a producing well? Or paying for expensive (and often ineffective) remedial work? There should be a better way.



Now There's a Better Way

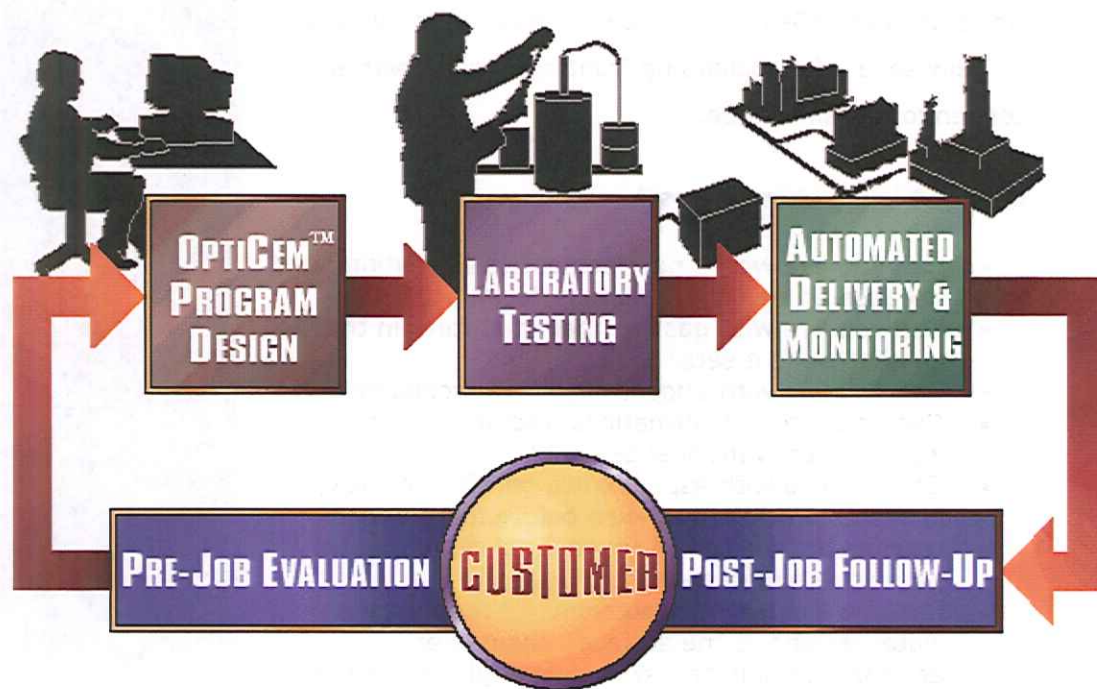
It's called the Halliburton ZoneSeal Isolation Process: *Foam cementing done the right way.*

EXHIBIT # 2128
WIT: _____

Chances are you've heard about foam cementing. Maybe you know of operators who have tried foam, hired someone to come in with nitrogen...and maybe you've seen poor results from a low-tech approach to a high-tech process.

Foam cementing can offer a truckload of benefits. But you may never realize them unless you do the job right. And that's what Halliburton's breakthrough ZoneSeal Isolation Process is all about. Because Halliburton is the world's largest nitrogen fracturing company, the world's largest cementing company, and the world's premium supplier of foam cement, we've been able to put all the pieces together to make sure that you capitalize on *all* the advantages intrinsic to foam cement.

We think you'll find that the ZoneSeal Process is the most cost-effective insurance you can ever obtain – for the *life* of your well.



What potential benefits does foam cement offer?

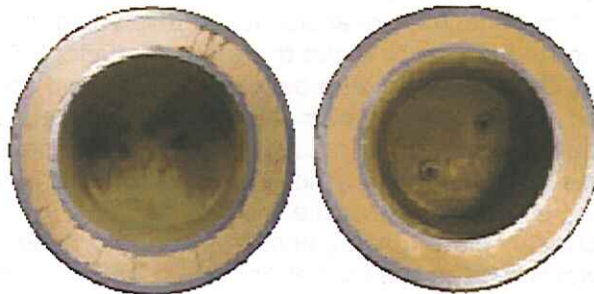
To understand the potential benefits of foam cement, you have to understand what can happen with conventional cement – and why.

Conventional cement jobs often lose zonal isolation.

These all-too-common failures occur in two ways:

Cement failure after setting, due to:

- Mechanical shock from pipe tripping.
- Expansion of the casing and compression of the cement during pressure testing.
- Expansion and contraction of the pipe due to cycles in production pressure and temperature.
- Poor primary cementing, due to:
 - Thick mud filtercake lining the hole and preventing good formation bonding. Proper displacement techniques are a must – and they still may not be enough because conventional cement is not the best displacement fluid.
- Gas invading the cement while it sets. During gelling and prior to complete hydration, conventional cement slurry actually loses its ability to transmit hydrostatic pressure to the formation. When this occurs, fluids from the formation can migrate freely into the cement, forming channels for future gas leaks.



The above photographs show sectioned samples from cyclic stress tests. The tests were performed by cementing 5 1/2" casing inside of 7 5/8" casing. In each test, the cement was allowed to cure, after which the internal casing was pressurized simulating actual well conditions. The conventional high strength neat cement (left) failed when the pressure in the inner pipe reached 4,500 psi. When foam cement (right) was tested in the same way, it showed only very slight debonding when cycled to 10,000 psi.

Foam cement works to maintain zonal isolation and decrease costs.

Here is that truckload of benefits you get when you do foam cement the right way:



Once set, foam cement is both resilient and a good insulator:

- Stable bubbles make foam cement compressible, allowing the crystalline matrix of cement to flex without breaking. The bond remains intact as the casing expands and contracts, and the cement resists stress cracking. Result: Lasting zonal isolation that means no sustained casing pressure; less produced water for treatment and disposal; fewer workovers; and more efficient production.
- Foam cement does not require excess water to achieve low densities. Result: Slurries that are ideal for fracture zones because they have higher compressive strengths than unfoamed slurries of equivalent density.
- Foam cement has lower thermal conductivity. Result: Retention of heat as fluid is injected into the well – and fewer problems with paraffin, asphaltene and gas hydrate precipitation when the crude is produced.

Foam cement helps improve mud displacement, helps prevent gas migration and helps protect the formation:

- Foam cement under compression is a highenergy, high-viscosity system that is more efficient than conventional slurries in displacing mud. Preflushes and spacers can also be foamed to make them more efficient. Result: Cement-formation bonds that really hold up because all the mud has been removed.
- The compressed gas bubbles in foam cement shrink or expand, but they don't move around or coalesce. Instead, they maintain pressure while the cement hydrates. Result: Virtually no gas migration into the cement, ever – while cement is being placed or while it sets.
- The bubbles actually "plate out" against the formation and form a barrier. Result: lower water loss to the formation, which helps prevent formation swelling, washouts and other damage.
- Foam cement can be mixed at very light weights – as low as 4 lb./gal. Result: A good fix for extreme lost-circulation problems where nothing else will work.
- The density of foam cement can be varied at will using the same base slurry. Result: Hydrostatic pressure that can be tailored to protect fragile formations and help prevent high-pressure zones from coming in – all within the same job.

The benefits are clear, but...

Foam cement is simply the right way to complete a well. It can be the best

insurance of trouble-free operation and long productive life that you'll ever have. But unless it is applied the right way, its potential benefits may never be realized.

Today you can get the benefits you expect from foam cement because now you can take advantage of the ZoneSeal Isolation Process from Halliburton.

The ZoneSeal Isolation Process - The Right Way to do Foam Cement

What does it take to do it right? Consider the variables that should be controlled:

- The job should be engineered to maximize mud displacement, prevent high-pressure zones from coming in and weak zones from fracturing. The ZoneSeal Process includes all the tools for the job.
- Bubbles in the slurry should remain stable as the cement flows into the well and up around the casing. And the energy and viscosity of the pumped foam should be maintained to help ensure effective mud displacement. Making this happen is both an art and a science – optimized in the ZoneSeal Isolation Process.
- The design parameters and composition of the slurry should be maintained at all times – even when the slurry rate changes. Only the automated control provided by the ZoneSeal Process provides nitrogen injection and chemical injection to the slurry injection rate.
- Every part of the job should be monitored to help ensure that it meets design specifications. The on-site ZoneSeal Process Certified Specialist and ZoneSeal Process real-time recording and analysis tools do just that.

The Right Way to Engineer the Job

Because foam density depends on pressure, planning a foam cementing job is a demanding task. The ZoneSeal

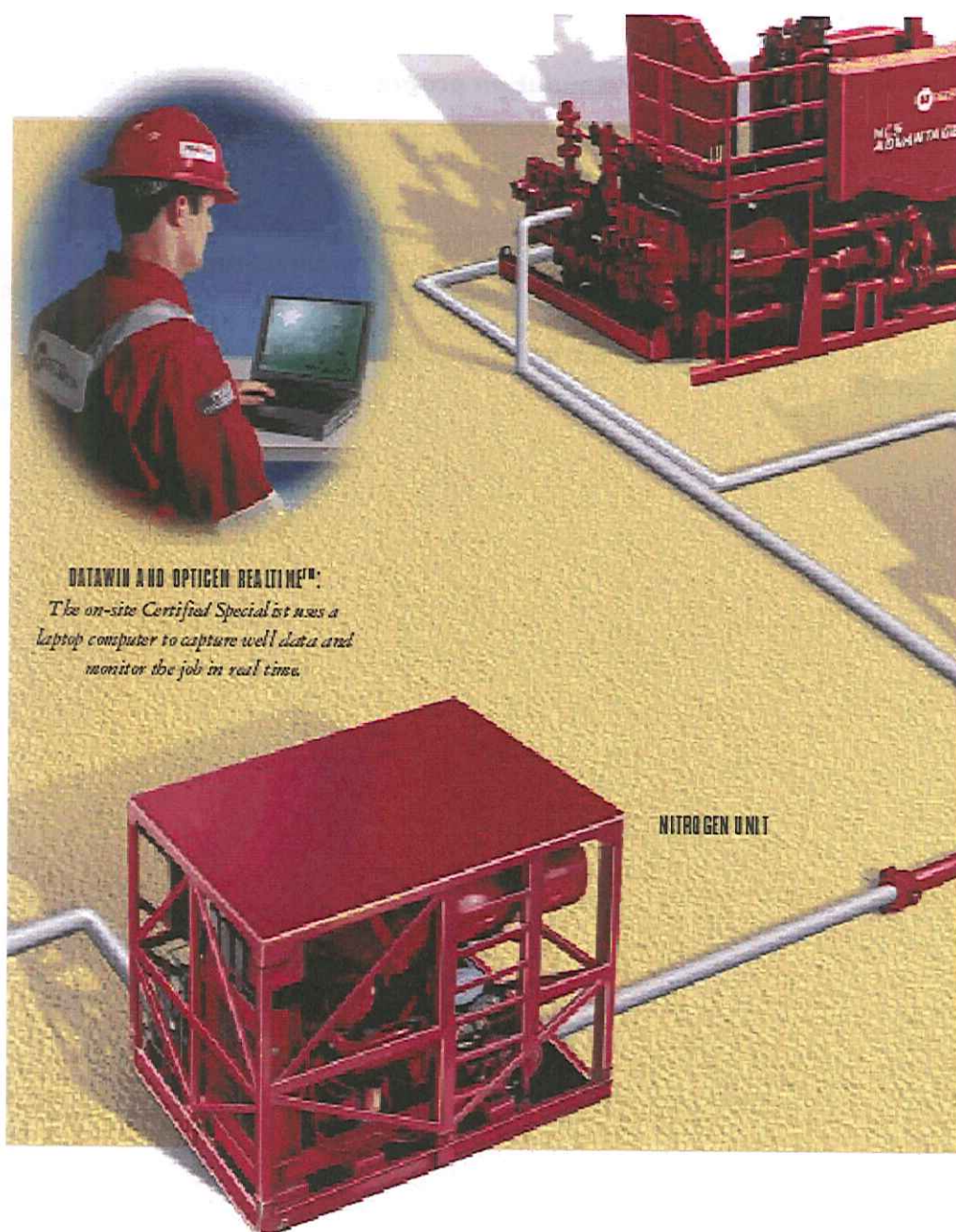
Process includes

high-level support for every part of this task:



New OptiCem™ wellbore simulation program is a comprehensive interactive system that includes both static and dynamic modeling for foam cementing jobs. OptiCem software can:

- Optimize pump rates for maximum mud displacement.
- Predict circulating pressures (ECDs) at any time during the job and at any depth in the well, to help ensure adequate safety and protect the formation.
- Incorporate electronically imported caliper log data into the design
- Design centralizer placement with any combination of holes, casing and centralizers.



DATAWIN AND OPTIGEN REALTIME™:

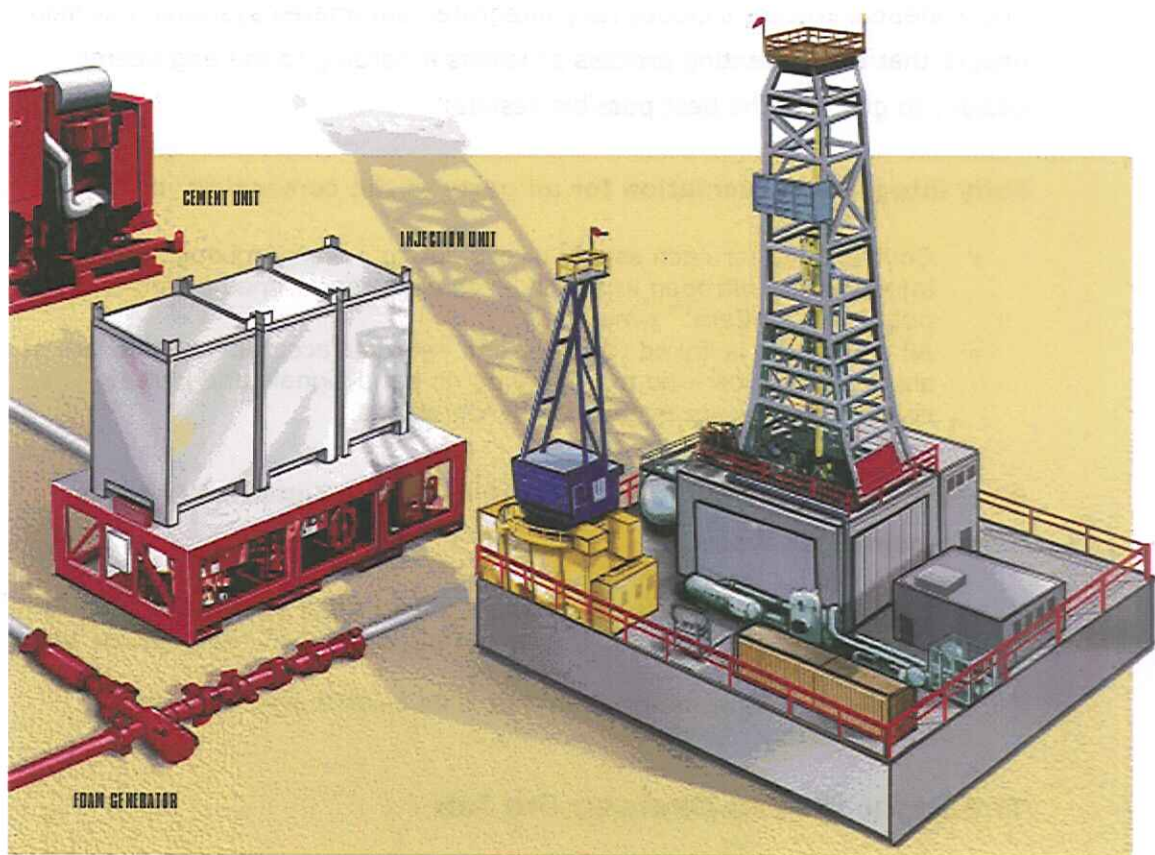
The on-site Certified Specialist uses a laptop computer to capture well data and monitor the job in real time.

The ZoneSeal Isolation Process

A typical location layout for the ZoneSeal Isolation process looks similar to this. Halliburton's automated control system helps ensure that the job proceeds according to specifications, and our real-time data collection and analysis system makes it possible for the ZoneSeal Process Certified Specialist to monitor the job every step of the way.

Comprehensive laboratory testing and fluid design programs: No two jobs are alike – cements, muds and even mix-water can change from job to job and location to location. And no single preflush, spacer or cement slurry can fit all situations. Halliburton's 75 years of experience is your assurance of:

- Appropriate material testing to help ensure compatibility, foam stability and optimal material selection for your job.
- Evaluation of foaming muds, preflushes and spacers ahead of the cement in order to balance frac gradients, pore pressures and ECD to achieve optimum slurry placement.



The cement unit uses the Automatic Density Control (ADC) system to produce consistent slurry at the desired density, and it also controls both the injection unit and the nitrogen unit based on the rate of slurry production. The injection unit adds a proprietary Halliburton surfactant blend of foaming agent and stabilizer. The nitrogen unit uses an automated system for precise control and ramping of nitrogen rate to meet job specifications, and foam generator adds mix energy to the slurry to create a stable foam. The laptop computer system uses HalWin to capture cementing data in real time through cable connections at each unit, allowing the Technical Specialist to rerun the wellbore simulation using OptiCem RealTimeTM and actual well data.

The Right Way to Foam

Proprietary Halliburton foamers and stabilizers help ensure stable bubbles. We often refer to our liquid additives with the generic term "surfactants", but the true and proper terms are foamers and stabilizers.

The (Automated) Right Way to Place Foam Cement

The ZoneSeal Process includes fully integrated automated systems that help ensure that the cementing process proceeds according to the engineered design, to give you the best possible results:

Fully integrated automation for all parts of the cementing job.

- Control units for each aspect of cementing – slurry mixing, surfactant injection and nitrogen injection – are pre-programmed based on the output of OptiCem™ simulation.
- All equipment is linked together and operates according to the rate of slurry production – no more relying on hand signals and verbal corrections to keep everything synchronized.

Real-time on-site simulation with the exclusive ZoneSeal Process laptop computer system.

- HalWin module collects and formats job for input to OptiCem RealTime™.
- OptiCem RealTime reruns the cementing simulation using actual well data.
- Result: downhole information that is invaluable when last-minute decisions must be made.

The Right Way to Oversee the Job

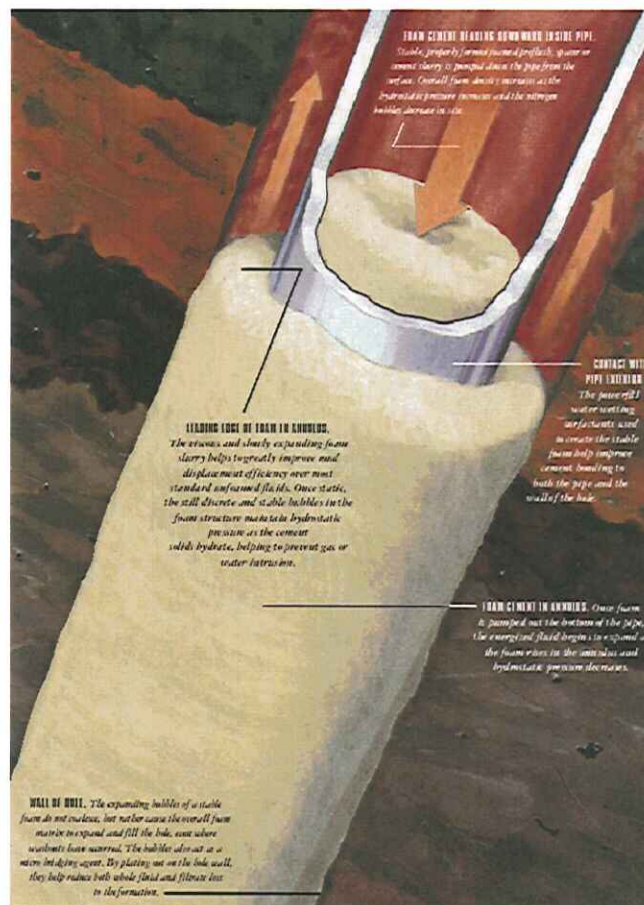
As a fully integrated supplier of foam cementing services, Halliburton provides and manages all aspects of each job through a ZoneSeal Process Certified Specialist and a specially trained ZoneSeal Process cementing team. The Certified Specialist is an expert with a record of dozens of successful foam cementing jobs – and the backup of a company that has performed more foam cementing jobs than anyone else in the world. Here is your own on-site supervisor, the person who runs the show, using OptiCem

RealTime simulations to help ensure that your ZoneSeal Process project lives up to your expectations.

Would you want it any other way?

The ZoneSeal Isolation Process - the Right Way to Cement. Period.

Why risk anything less for the life of your well? Take advantage of the most cost-effective insurance for well life that you can buy. Count on the ZoneSeal Process. And expect the best.



Send questions or comments about this site to
Halliburton Service Center or call U.S. (877) 263-6071
or outside U.S. (281) 983-4900.
Copyright © 2008 Halliburton.
All Rights Reserved.

[Privacy](#)

HALLIBURTON

