

DTS SHALE COMPLETIONS TECHNOLOGY



SHALE WELL INTEGRITY IS SHALE PRODUCTIVITY.

Unconventional oil and gas operators face difficult well completion and sealing challenges and urgently need better well lining methods in order to improve shale well productivity.

With expected oil and gas recovery of only 5% to 10%, it is critical that every aspect of well operations function effectively in order to maximize extraction.

50%
hydraulic fractures
UNPRODUCTIVE



This is due in part to unwanted communication between fracture stages during injection, fractures initiating in the wrong location or not initiating at all. Each problem is likely caused by inadequate pressure isolation of the well's production casing.

Most well casings are sealed with cement, a process normally only **60% to 85% effective**, due to a variety of placement and contamination issues. One such issue occurs when the heavier parts of cement slurry segregate from lighter water based components while curing in horizontal wells. This "free water" creates extensive voids and channels atop the wellbore, through which pressurized frac fluids and hydrocarbons migrate. These channels become prime pathways for unwanted frac stage communication, resulting in as much as 50% misspent stimulation investment.

Further cementing problems include plugging of reservoir productivity, field time required for wellbore conditioning, pumping, and hardening.

A variety of mechanically sealing products provide some alternative, but results in hydraulic fracturing operations have been mixed, with trends reverting to cement. The effectiveness of current mechanical sealing methods is quite limited due to short seal length, low expansion ratio, and insufficient force applied to the sealing elements in contact with the reservoir.

DTS INNOVATION

Dynamic Tubular Systems' elasticity-based, expansive well lining technologies provide an effective alternative that can significantly improve the efficiency of hydraulic fracturing and shale well productivity.

Built from many high strength "spring" layers, DTS elastically compressible and then "expandable" piping assemblies are manufactured to a diameter much larger than the drill bit size used to create the wellbore. The diameter of this deliberately oversized pipe is then temporarily reduced in order to allow its passage into the well. Once in place, the pipe's natural outward bias is released by application of internal expansion force. The entire length of the now partially expanded pipe's exterior is covered by a high-thickness sealing sleeve. These sealing sleeves receive the large expansion forces that are applied internally by the expansion tooling, transferring those forces through the pipe and directly against the wellbore creating a high-pressure seal externally. Sealing properties are typically three to seven times the amount of internally applied pressure.

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The result is an instant, elastically biased well barrier applied along the entire length of the horizontal section. The completion is immediately ready for hydraulic fracturing and hydrocarbon production, without the need for curing time or cleanout.

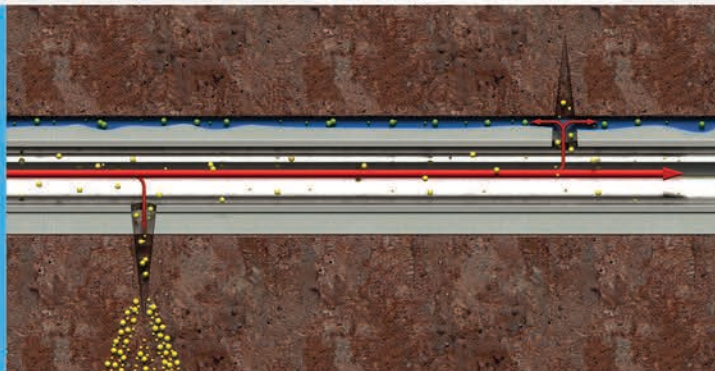
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UNIQUE FEATURES AND BENEFITS

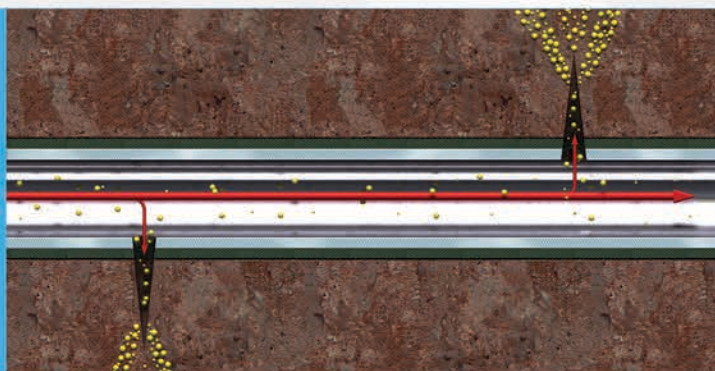
- Large outwardly-biased wellbore contact and sealing force.
- High expansion ratio (allowing use of thick sealing elements) and high product strength to 15ksi.
- Directly self-seals on a standalone basis, eliminating cement void problems and significantly improving fracturing reliability, gaining 25% or more in productive fractures.
- System elasticity absorbs the thermal shrinkage stresses caused by the introduction of cold frac fluids, mitigating risks of cement debonding and pulverizing normal to conventional completions.
- Cement curing time is eliminated, reducing field time related costs.
- Eliminates reservoir contamination and plugging, thereby increasing production and reducing costs for removal and remediation.
- Enlarged completed diameter leads to reductions in overall drilled volume and drilling footprint.
- System may be used to deepen, or extend the length of existing completions as a "monobore", maintaining the well's full inner production diameter; augments re-frac market opportunities.
- May be used in any conventional or unconventional well.
- Manufacturing economies for high volume footage installations allow for cost advantages relative to current completions costs.

Cement-water segregation and unwanted channeling of frac slurry resulting in lost fracture opportunity (upper-right). Functional cement seal resulting in successful fracture initiation (lower-left).



BEFORE

Expanded pipe and seal (green) applied along the full length of the producing interval eliminates channeling and better assures fracture success.



AFTER

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MARKET OPPORTUNITY

21,000 SHALE WELLS
DRILLED EVERY YEAR

X

each with horizontal
producing sections ranging
5,000 to 10,000 feet

Market growth is 10% annually and
international markets are emerging.

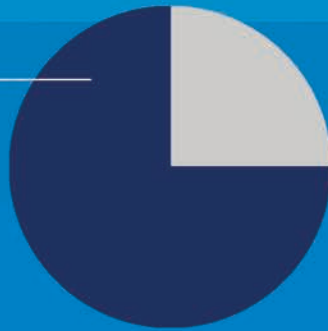
Producers need better, faster, and
safer well completions alternatives to
move beyond the current limited
operating environment.

DTS Shale Completion Liners fulfill
these needs.

Addressable domestic opportunity
(DTS Shale Liners):

75% of US new drill market

100,000,000 feet annually



PRODUCT BUILDOUT-INVESTMENT PROGRAM

DTS has developed unique and proprietary technology focused on elastically expandable tubular products for use in well construction, stimulation, and production. The shale completion liners are one of dozens of applications under the company's "self-expansion" technology portfolio. Dynamic Tubular Systems is currently discussing individual product build out and investment programs with investors who are interested in key applications of DTS Technology.

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