Industry-leading LFS-5 Shear Ram upgrades and conversions done on location...at sea or onshore

The NOV Low Force Shear - Generation 5 (LFS-5) is the latest application of the NOV Low Force Shear technology with enhanced shearing performance on high-strength, heavy-weight drill pipe and landing strings. NOV began working on a solution to the challenges from the industry to shear heavier landing strings. The design philosophy was to develop a new generation of ram, “Back to Back” heavy-weight landing string and subsequent work string. A new design could also center on the edge of drill pipe, new requirements by the Bureau of Safety and Environmental Enforcement, 30 CFR Part 250 and API 16-A 4th Edition also influenced the radical new design.

The LFS-5 design employs a self-centering geometry that sweeps the entire wellbore, ensuring that the drill pipe, casing, wireline or control lines are moved into the shearing surface of the ram.

Off-center shear tests were conducted with 10,000 lbs side load force to simulate a slack or buckled drill pipe. Wireline shear tests were conducted with slack wireline held against the extreme edge of the wellbore, without any tension to aid in the shearing process. The LFS-5 has cleared and sealed workline, multiple strands of control tubing, drill pipe, landing strings and casing in a simplified design. The LFS-5 sweeps 100% of the wellbore to ensure that the pipe or wireline is sheared and not “trapped between the rams”.

LFS-5 Features
• Self-centering geometry ensures the entire wellbore is swept.
• Enhanced shearing performance on high-strength, heavy-weight drill pipe and landing strings.
• Enhanced seal design with improved cycle life.
• Designed to shear and seal landing string and work string consecutively.
• Passed API 16-A qualification testing.
• Rated ED (30°F to 250°F).
• Will retrofit to current LFS-capable doors.
• Automate centering pipe with 10,000 lbs pull force.
• Standardized control system to reduce worktime.
• Increased cycle life.

LFS-5 Shear Rams
Generation 5 (LFS-5)

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Successful shear and seal from a single set of shear rams

Shear & Seal:
- 6 ⅝", 50ppf, S-135 followed by 5 ⅞", 27ppf, S-135
- 6 ⅝", 57ppf, UD-165 followed by 5 ⅞", 27ppf, S-135
- 6 ⅝", 64ppf, V-150 followed by 5 ⅞", 27ppf, S-135
- 7 1/16" x 5 1/2", VIT, CR-115 followed by 5 ⅞", 27ppf, S-135
- THRA followed by 5 ⅞" 27ppf, S-135
- 7 ⅞", 54ppf, V-150 followed by 5 ⅞", 27ppf, S-135
- 10 ¾", 104ppf, P-110 followed by 10 ¾", 104ppf, P-110
- 14", 115ppf, Q-125 followed by 14", 115ppf, Q-125

Shear & Seal Wireline:
- Schlumberger 7-48A SUS
- Rochester 7-H-490K
- Rochester 1-H-314K

*All with no tension on wireline

*All of the above shear and seal tests (and more) were performed using the same set of shear rams.

Superior strength, design and unmatched reliability

In testing the LFS-5 was able to repeatedly shear and seal heavy weight landing string followed by tougher work strings. This extreme condition test demonstrates the superior performance and reliability of the design. Testing has proven the capability of this shear ram design with consecutive shearing of the following pipes all performed on the same set of shear rams:
- 5-⅞", 27 ppf, 0.440" wall, S-135 Drill Pipe
- 6-⅝", 57 ppf, 0.813" wall, UD-165 Landing String
- 6-⅝", 64 ppf, 1.16" wall, V-150 Landing String
- 10-¾", 85 ppf, 0.837" wall, Q-125 Casing
- 14", 115 ppf, 0.820" wall, Q125 Casing

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Impact on the industry

Repeat shear capability translates to greater reliability and reduced downtime

This feature allows the operator to repeatedly shear and seal today’s toughest, heavier pipe dramatically improving safety. Back-to-back shearing of landing and work strings is providing important gains in field efficiency and operational effectiveness.

The ability to fully shear the bore and mitigate the possibility of trapped pipe provides a new level of safety. Tests of 1.16", 115ppf, Q-125 Casing, 15,000 psi WOB, and up to 200°F test temperature range the LFS-5’s ability to shear a wide range of pipe conditions.

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Eliminating additional accumulators, run casing liners with tools, and lower cement costs could conservatively account for up to $1M savings on a deep-water well cost.

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