



The Importance Of Centralization To Well Integrity

Presenter: David Westgard Cementing Product Line Manager – US Land

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The importance of centralization to well integrity



“Cementing is 80% placement and placement is 80% centralization. If you can’t centralize the pipe and place cement in more than 99% of the annular areas, you can’t expect to achieve reliable, long-term isolation.”

- Mike Cowan,
Senior Research Fellow,
The University of Texas at Austin

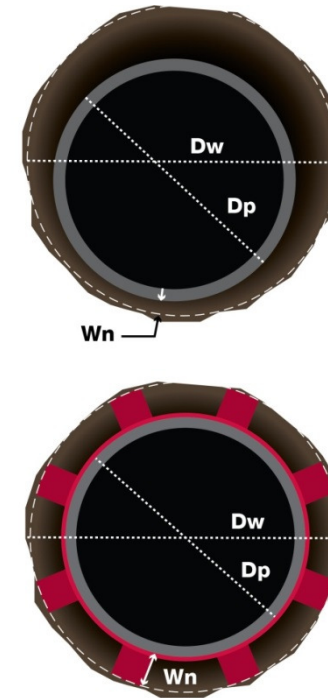
How centralizers provide standoff



The key to good, long-term isolation is proper standoff.

Standoff is calculated using the openhole diameter or previous casing ID (D_w), the current casing OD (D_p), and the shortest distance between the pipe OD and the openhole or previous casing (W_n).

Proper centralization increases standoff.



$$\text{Standoff (\%)} = \frac{W_n \times 2}{D_w - D_p} \times 100$$

The right centralization for every well



Weatherford offers one of the most extensive and advanced centralizer portfolios on the market.

We have a wide-ranging selection—including welded, nonwelded, and roller centralizers—that enables us to create solutions for proper casing standoff and centralization in any scenario. Our ongoing commitment to continual improvement results in centralizers that meet or exceed performance requirements.

As part of the largest selection of centralizers, our family of VariForm™ Centralizer bowspring centralizers offers options to address a variety of casing and running challenges to get to total depth

	VariForm		
	Regular	UR	Sub
Vertical Strings	●	●	●
Deviated Strings	●	●	●
Horizontal Strings	●	●	●
ERD Strings	●	●	●
Rotating Casing	●	●	●
Reciprocating Casing	●	●	●
Cased Hole	●	●	●
Open Hole	●	●	●
Under-reamed: < 0.875 in. (2.225 mm) Restriction > 1.5 in (38.1 mm)		●	●
Under-reamed: restriction ≤ 0.875 in. (2.225 mm) above casing OD			●
Oversized/Washed-Out Hole	●	●	●
Uncemented Completion	●	●	●

● Best choice ● Can be used without limiting operations □ Not recommended

What makes the VariForm™ centralizer different from other centralizers?



Single-piece, slip-on centralizer
The shape can be adjusted to optimize performance characteristics, including running and restoring forces for any given hole condition.

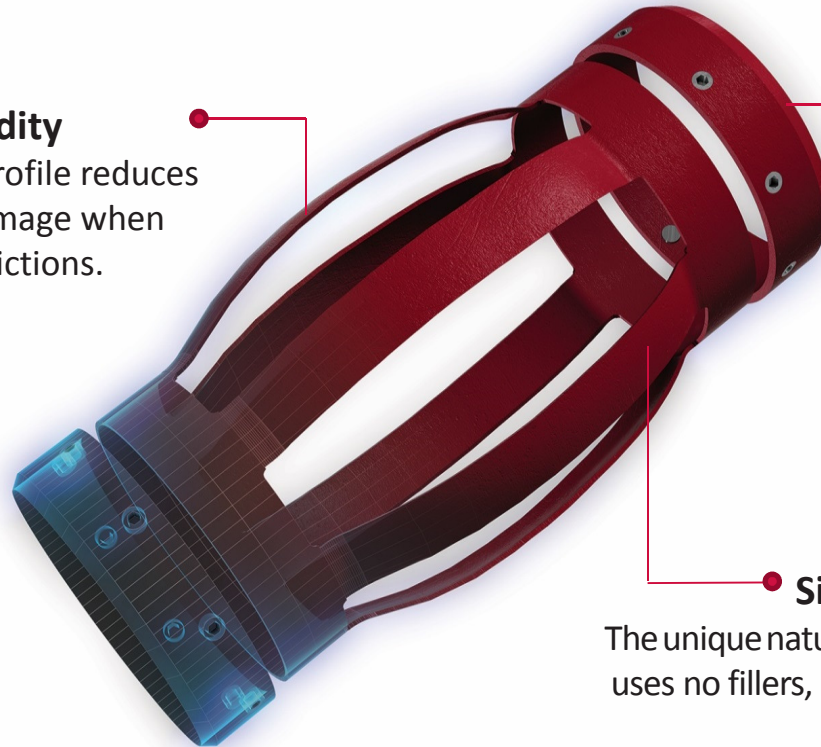


What makes the VariForm centralizer different from other centralizers?



Enhanced bow rigidity

The contoured bow profile reduces drag and prevents damage when running through restrictions.



Quality materials

The centralizer is made from top-quality European and American alloys that are engineered to stringent standards.

Single, metallurgically invisible weld

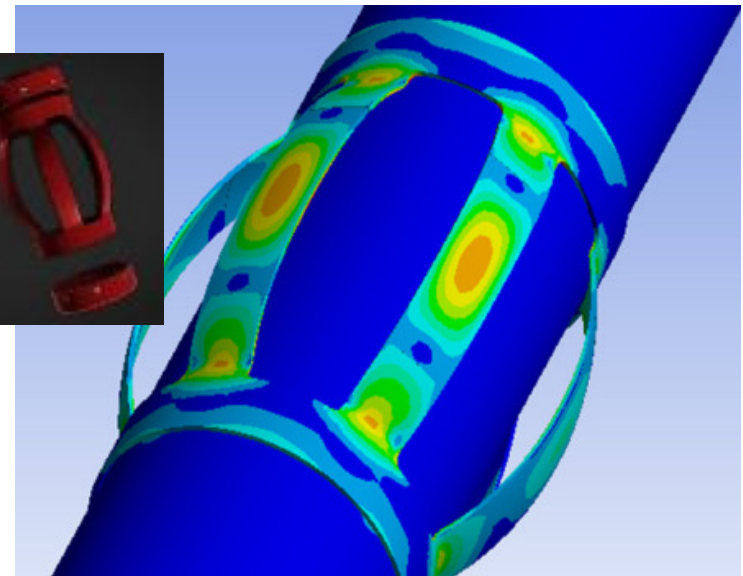
The unique nature of our fully automated welding process uses no fillers, which leaves a single, resilient weld that is indistinguishable from the parent metal.

Design flexibility with repeatable precision



With the Weatherford design process, the curvature and dimensions of each **VariForm centralizer** model are easily customized to balance requirements for:

- Size
- Standoff
- Flexibility
- Starting forces
- Running forces
- Restoring forces for specific applications



VariForm centralizer prevents NPT over a 40-hour operation that involved rotating liner at TD



■ Location

- Offshore: North Sea

■ Well Details

- Hole size and angle: 8-1/2 in., 42° at the toe and shoe
- Liner type and size: 7-in., 29 lb/ft L80 Vam Top HC
- Total depth (TD): 10,302 ft (3,140 m)

■ Product in Use

- VariForm centralizer

■ Customer Objective

- Run a liner to TD through a depleted formation while mitigating mud losses and differential sticking.
- Rotate the liner in the open hole to remove mud and to improve zonal isolation in the cemented section for planned perforation and completion operations.

VariForm centralizer prevents NPT over a 40-hour operation that involved rotating liner at TD



■ Our Approach

- Weatherford CentraPro Plus® software modeling identified the VariForm centralizer as the optimal technology to centralize the liner in the 8 1/2-in. open hole.
- Based on the results from CentraPro Plus® software, the team placed two 7- x 8 1/4-in., six-bow VariForm centralizers on each liner joint across the planned cemented section. This helped to reduce differential sticking while running the liner downhole; to enable liner rotation; to improve mud removal, cement placement, and zonal isolation; and to achieve 93% standoff without imparting starting and running forces.
- The team ran the liner to TD without mud losses or other problems. Then, the team established circulation and rotated the liner 20 rpm. The liner set inside the 9 5/8-in. casing and the running tool released with no issues.

■ Value to Customer

- For the duration of the 40-hour operation, the VariForm centralizer helped to prevent nonproductive time (NPT) related to reaching TD and rotating the liner before and after setting the hanger
- Despite the poor hole conditions, the operation had no lost circulation or differential sticking, which helped to save rig time and associated costs

Summary



- Design considerations for improving well integrity include the type of well, casing and cementing program, downhole environment, and final completion.
- Proper centralization provides a foundation for good zonal isolation, creates a hydraulic seal, provides casing structural support, and protects water sources.
- Consequences of poor well integrity can cause harm to the environment and community, and negatively impact on a company's bottom line.

Any Questions?
