



Western Energy Products and Services



Swellable Packers

WEPS Experience

- * More than 2500 Swelling Packer Installations to Date
- * Related US Patents Awarded
- * Related Industry Publications



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PS2005-XXX

Innovative Completion Technology Enhances Production Assurance in Alaskan North Slope Viscous Oil Developments

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Abstract
In the challenging North Slope operating environment, a cost-effective production equipment has provided solutions to zonal isolation and packer integrity problems in viscous oil reservoirs. Operators have employed new seal and technology using expandable rubber elements to manage annular fluid flow, control subsurface production, and achieve zonal isolation in wells where high costs, shallow depths, and long well-logs create unique completion challenges. The new technology is allowing new bypassed zones to be added to existing developments, and making future developments more economically viable.

The new design approach involves installing a swelling rubber packer (SRP) technology as part of the completion. The technology is based on specially designed swelling properties of rubber in crude or natural oil-based mud (MOCBM) to expand and seal the annulus.

The paper describes one operator's use of an array of IT devices in an -level horizontal wellbore used to manage annular flow and maximize subsurface production. The successful application of this technology has allowed shale interbedding to be effectively sealed behind blind pigs, thus allowing an additional zone to be added to the existing development. To date, the technology has been applied to eleven wells, improving production assurance.

Another major operator on the North Slope has used the technology to isolate potentially conductive fault crossings along the bore and maintain zonal crossings while fishing out from the perforation. Multiple packers have been run in

single wells to achieve the desired zonal isolation without reasonable offset on liner running. Long, narrow, closely spaced SRPs show significantly more resistance than previously encountered, increasing the ability to manage annular flow. Development and application of the SRP technology is detailed in the paper, including discussion of improved efficiency as a result of its use. The paper will also discuss field operations, installation, and unique considerations associated with design and installation in viscous oil environments.

Introduction
On the North Slope of Alaska, there are billions of barrels of unappreciated viscous oil reserves. It has been estimated that the North Slope contains a 20-25 billion barrels of OILIP (OOIP) (Figure 1). To date, 0 development of the viscous oil reserves has been forgone for the warmer, less viscous oil fields below. The reservoirs contain highly viscous oil due to the low reservoir temperatures caused by the extreme northern latitude, the presence of 1,200 feet of permafrost, and to relatively shallow burial depth.

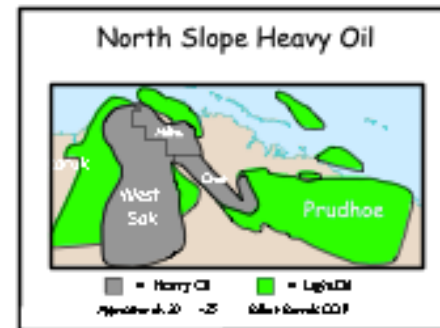


Figure 1 North Slope Heavy Oil Reserves



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Robust End Ring Design

Standard End Ring



- * Substantial end ring design provides protection to the rubber element during run in.
- * Rubber element is vulcanized to the base pipe using pressure, heat and chemical reaction to establish one effective annular seal.
- * Prevents extrusion during the sealing and production operations.

Enhanced AER End Ring

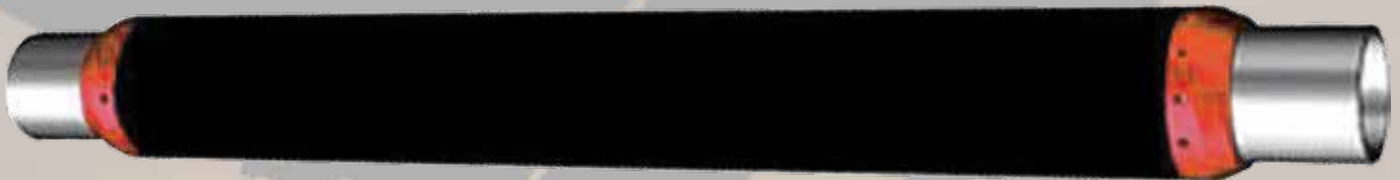


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Why Use WEPS Packers?

Getting Packer to TD is tougher & tougher...

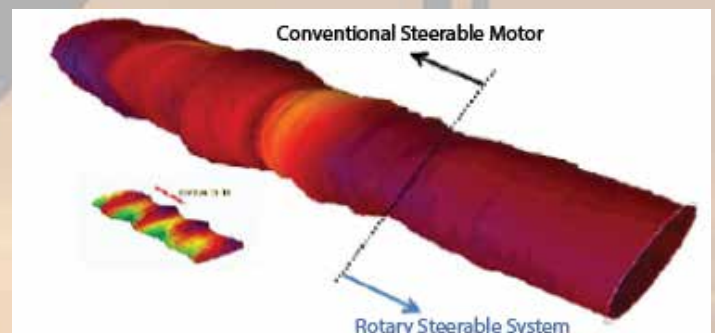
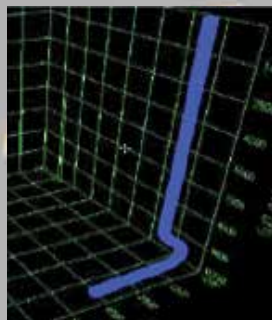
We have the technology to make that happen...



- ⚡ WEPS has 98% success with getting packers to TD with use of our technology and reamer tools
- ⚡ WEPS Understands the interconnected relationship of borehole quality, T&D, Directional Drilling and Swell Packer Design
- ⚡ Several Swellable Packer Patents & Technology - WEPS Patented End Ring Design
- ⚡ Superior bonded element, not slip-on
- ⚡ Testing with research capabilities - engineering support and manpower assets
- ⚡ WEPS provides service and support throughout the purchasing process that ensures performance success
- ⚡ Weps employees have hands on experience relating to providing reamers and packers on hundreds of wells

CHARGER PACKERS

Fast Acting ♦ Powerful
Quick Into Position



With WEPS introduction of a new reaming tool for ream-while-drilling (RWD) in the Williston Basin we have had 100% successful installations of swellable packer in over 100 wells and over 5 million feet reamed.

Testing and Qualification



Scaled Testing

- * Swell Oil and Water Testing
- * Pressure Testing
- * Scaled Length Testing
- * Full Scale Testing
- * Different Fluids
- * Temperatures
- * Diameters



Full Scale Testing



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What is the cost of liner not getting to TD or being off depth?



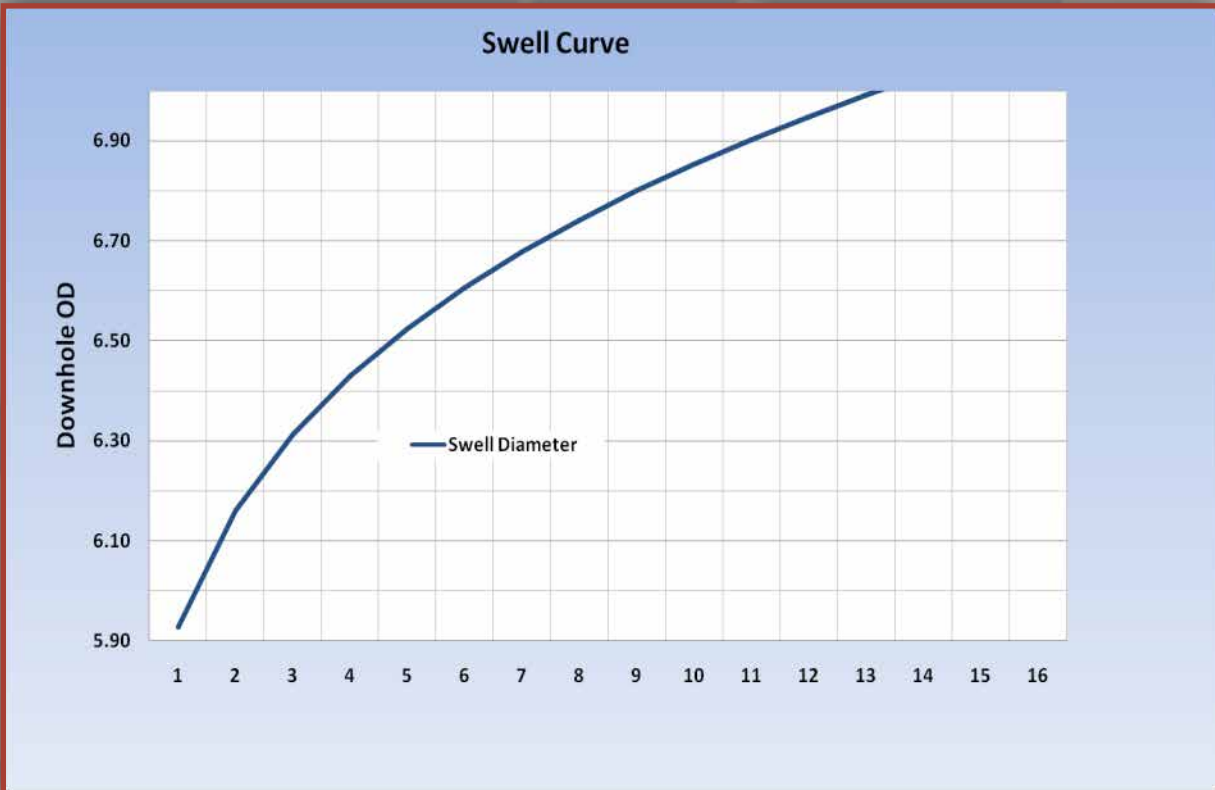
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We estimate 10-20% liners not going to TD today - note end rings



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Quality Rubber Elements



* Both the rubber and packers are manufactured in the same facility.

* Traceability of each batch or rubber to the rubber and the date the element was manufactured.

* Consistent quality control through the entire process.



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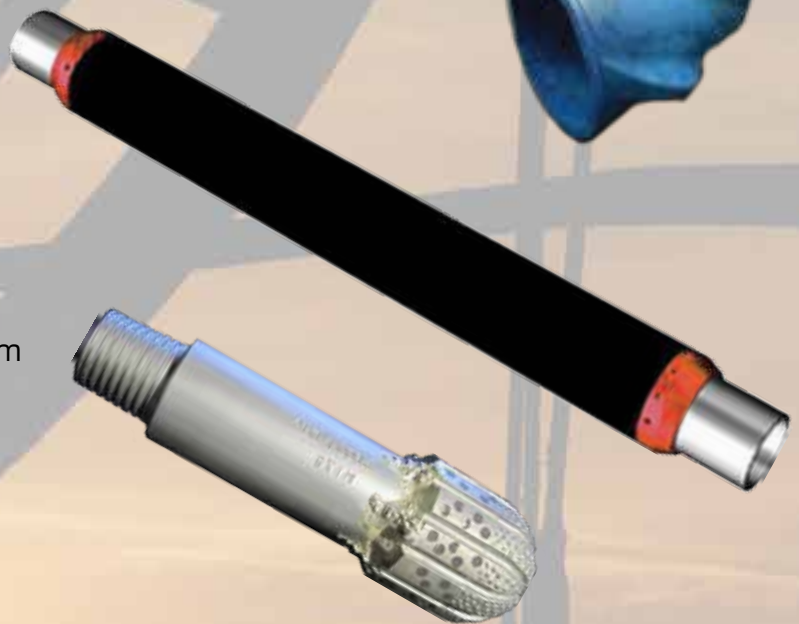
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