



## The birth of an innovative solution for oil pumping

The first field test of sucker rods with premium connections successfully reduced well interventions in a YPF field. After operating during the last three years, no failures have been registered.

### Summary

#### Reducing failures, top priority

Extensive oil field analysis has shown that a significant number of sucker rods failures occur in their connections.

The main causes of failure are limitations in the API design (stress concentration, permanent thread deformation and loosening tendency) and deficiencies during the installation of rod strings.

Premium connection rods were tested in YPF's CH-2254 well with the objective of offering better performance and reducing interventions caused by failures. The innovation of the product's design helped extend the product life and enhance its capabilities.

### Solutions for the customer

#### Operational costs

As sucker rod failures went from three per year to zero in three years, operational costs were significantly reduced.

#### Fatigue and thread's tendency towards loosening

The connection design offers a significant reduction in stress concentration and plastic deformations, thus reducing the probability of failures produced by fatigue. Also, the flank-to-flank contact reduces the thread's tendency to loosen.

#### Corrosion and handling

Mature oil field corrosive environments and operational deficiencies represent risks for high-strength steel, which is more brittle and therefore tends to fail. The new product employs steel grades with higher resistance during operations (pump shocks or fluid pound, compressive loads or deficient handling) and to corrosion, offering excellent results when replacing high-strength sucker rods.

Make-up operations also showed great consistency in terms of repetition of circumferential displacements necessary for the connection adjustment.

### DETAILS

#### Location

Bella Vista field, Comodoro Rivadavia, Chubut, Argentina.

#### Type of well

Onshore - Beam pumping

#### Products delivered

Sucker rods with premium connections (1", 7/8" and 3/4")

#### Accessories:

- Pony Rods
- Crossovers
- Couplings
- Rod guides

#### Services provided

- String design
- Installation supervision
- On-site technical assistance
- Just-in-Time delivery
- Failure analysis
- Material Optimization Service



▲ Conventional sucker rod

▲ Premium connection rod

## Results

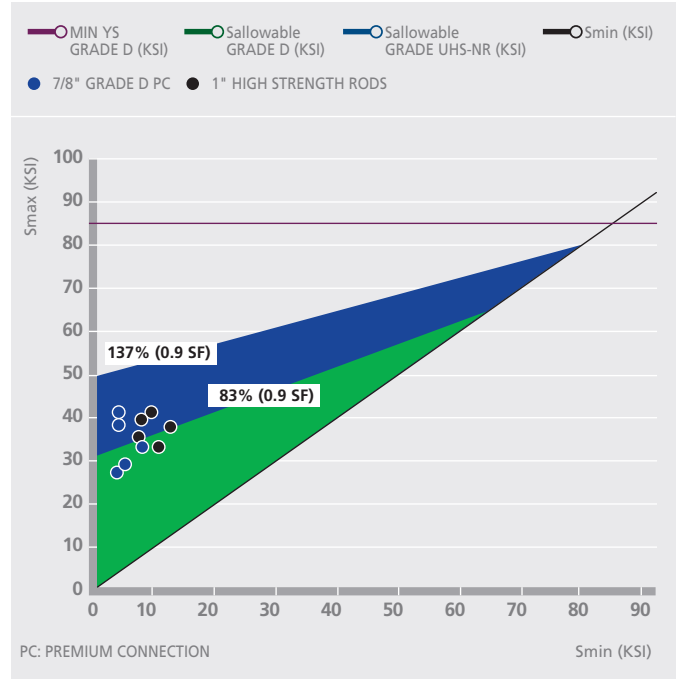
YPF's CH-2254 well had a high-strength sucker rod string whose connections had faced multiple failures.

All failures (six in two years) had occurred in 7/8" UHS-NR grade rods. Therefore, the whole 7/8" high-strength taper was replaced by premium connection rods.

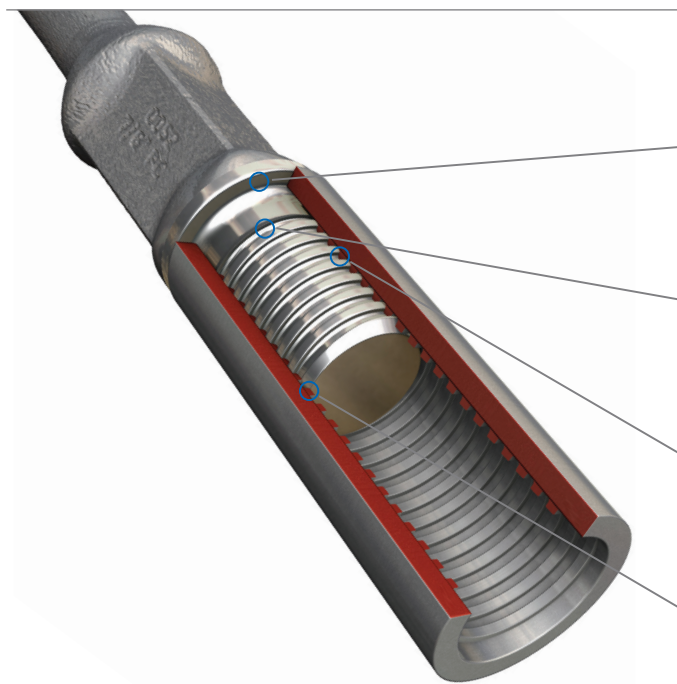
In comparison with API connections that tend to fail before the rod body, the premium connection has proven to be more resilient than its own body, enhancing the sucker rod working capacity.

The string was made up with 1" UHS-NR, 7/8" premium, 3/4" UHS-NR and sinker bars. Over the last three years, the well surpassed more than 10 million cycles without registering any failures.

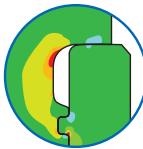
## MODIFIED GOODMAN DIAGRAM FOR GRADES D AND HIGH STRENGTH

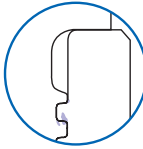


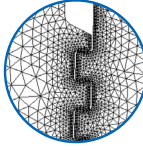
▲ The chart shows 7/8" grade D sucker rods with premium connections working under similar stress conditions to those of 1" high-strength rods with conventional connections.

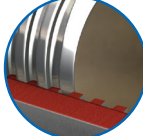


### Advantages provided by premium connection rods

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**Stress reduction**  
A more even stress distribution.
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**Reduction of thread deformation**
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**Flank-to-flank contact**  
Reduces the thread's tendency to loosen.
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**Diametrical interference**  
Increases the working capacity by decreasing the necessary pre-tension in the pin make-up.