Tenaris presents its latest development, the Premium Connection Sucker Rod with a remarkably resistant connection designed for high loads. The connection improves the rod’s fatigue life and provides an excellent performance in the field.

The total capacity of the sucker rod string depends entirely on the connection capacity. Up to now, a third of conventional pumping failures were traceable to this part of the sucker rod. The new Premium Connection Sucker Rod offers 100% connection efficiency and opens up a new future for oil pumping operations.

- **Flank-to-flank contact.** Reduces the thread’s tendency to loosen.
- **Stress reduction.** Higher fatigue life.
- **Reduction of thread deformation.**
- **Diametrical interference.** Increases the working capacity by decreasing the necessary pre-tension in the pin make-up.

*Patent pending*
Pumping at maximum performance

Conventional connections’ design limitations drove Tenaris to develop this product capable of increasing the life and efficiency of sucker rods.

Features

• Flank-to-flank contact that eliminates the gap existing in the conventional profile thread and increasing the interference level, thus reducing the tendency to loosen.

• Cut-tapered trapezium profile thread with diametrical interference that reduces the pre-tension in the pin make-up.

• Lower displacement during make-up and uniform contact between the flanks, allowing a better stress distribution and a reduction in the permanent deformations created in threads during both make-up and operation.
New Modified Goodman Diagram

Given the results obtained through Finite Element Analysis (FEA), lab tests and field trials, a new Goodman diagram showing a higher working capacity for the Premium Connection Sucker Rod was generated.

Benefits

The increased working capacity of the premium connection can:

- Dramatically reduce the number of workover operations caused by sucker rod connection failures.
- Expand the traditional working capacity of the rod pumping system to operations that are normally restricted to ESPs.
- Improve performance in high load operations with corrosive environments by replacing high strength sucker rods (with limitations for this type of application) for a less brittle material.
- Reduce the stress level, together with the energy consumption, in the pump jack by using a lighter rod string composed of smaller sucker rods (e.g., ¾” and 7/8” rods instead of 7/8” and 1” ones).

Multiaxial stress fatigue analysis

The Sines method was employed to evaluate fatigue behaviour. The Sines coefficient predicts a better fatigue behaviour the higher its value. The charts show that the new premium connection exhibits higher and more uniform values than the conventional one.
**Laboratory testing**

Laboratory tests were performed to evaluate and compare the maximum resistance of premium and API connections. To this end, it was necessary to increase the rod body diameters of the samples and to isolate the effects on them.

The connections’ stress level was evaluated following the Modified Goodman Diagram method, as recommended by API Specs. Results showed that:

- Grade D premium connection reached infinite fatigue life (10 million cycles) working up to 336% on the Goodman Diagram.
- The conventional connection could not surpass half these cycles at lower stress levels.

**Optimum performance verified on site**

When the sucker rod string reaches 10 million cycles, it is considered to have infinite fatigue life. This number of cycles has been reached in an operating well in which high-strength sucker rods were replaced by 7/8” Grade D premium connection rods.

The chart shows 7/8” Grade D premium connection sucker rods working under similar stress conditions to those of 1” high-strength rods with conventional connections. In this scenario, the new Tenaris premium connection has enabled a higher Grade D efficiency to be achieved in the field.
Improved Performance

The new premium connection makes it possible to increase the sucker rod string capacity by combining:

- New design technologies.
- Finite Elements Analysis of the stress distribution and verification of designs.
- Customers' field experience.
- Laboratory failure analysis.
- Thread analysis.

Handling and Operation

Special tools are not necessary for handling or make-up operations when using Tenaris’s Premium Connection Sucker Rods. Conventional power sucker rod tongs can be used with this new product.

For the correct cleaning, calibration and make-up of the connection, the procedures recommended in the Tenaris Handling and Operation video should be followed.

Accessories

As part of its integrated manufacturing process, Tenaris produces all accessories needed for the setting up of Premium Connection Sucker Rods, including reductions, cross-overs, pony rods and couplings.

Manufacturing & quality control

Tenaris uses state-of-the-art numerical control lathes and control gauges in order to ensure the highest quality in its connections.

Strict measurement equipment permanently monitors compliance with the design variables of the thread in order to ensure the uniformity and reliability of the product.

PREMIUM CONNECTION SUCKER RODS TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Diameter (inches)</th>
<th>Steel</th>
<th>UHS Coupling</th>
<th>Length (feet)</th>
<th>Thread Pitch (tpi)</th>
<th>Wrench Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot;</td>
<td>4142 M. Steel</td>
<td>8630 M. Steel</td>
<td>25 o 30</td>
<td>10</td>
<td>API</td>
</tr>
<tr>
<td>7/8&quot;</td>
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<td>8630 M. Steel</td>
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<td>API</td>
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</table>
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