



## **5 Factors for Manufacturing and Servicing Beam Pumping Units**

At Schlumberger, we believe reliability stems from a firm focus on quality, from the base metallurgy and raw steel through field support and service. That is why we go beyond industry standards to improve equipment lifetime and reliability.



High-quality beam pumping units have almost 100% uptime over 10 years, except for preventive maintenance. Low-quality units can require major component replacements after 3 years, increasing overall cost and downtime.



# 1 Monitor the metallurgy

Poor metallurgy and poor steel quality lead to early, expensive, and catastrophic failures, with possible HSE implications. Optimizing steel grades, chemical composition, heat treatment processes, hardness, and surface finish all aid to maximize pump performance, reliability, and lifetime. Schlumberger units have never had a material-related failure, which translates to significant savings on unit repairs and servicing for operators over the life of the equipment.



## Straighten beams to reduce stress

API does not set a tolerance for beam straightness, a key factor that complicates unit setup and increases stresses, leading to premature failures. Ensuring specifications for multipoint beam straightening and processing enables optimal setup and functionality. Schlumberger units are standardized and interchangeable, with service life of more than 25 years to improve economics compared with low-quality units that are scrapped or replaced every 3 to 5 years.



## Survive cyclical loads with better welds

The welding process is one of the most important factors associated with pumping unit manufacturing due to the cyclical loads the structure experiences while producing a well. Qualifying our manufacturing plant to the AWS Structural Welding code ensures regulation of procedures and welding personnel in charge of the process. To verify performance, all Schlumberger units undergo nondestructive testing: at minimum a dimension test of every weld and dye-pen inspection of all load-path welds.



## QUICK FACT

Schlumberger's manufacturing plant employees are qualified to American Welding Society (AWS) Specification D1.1.

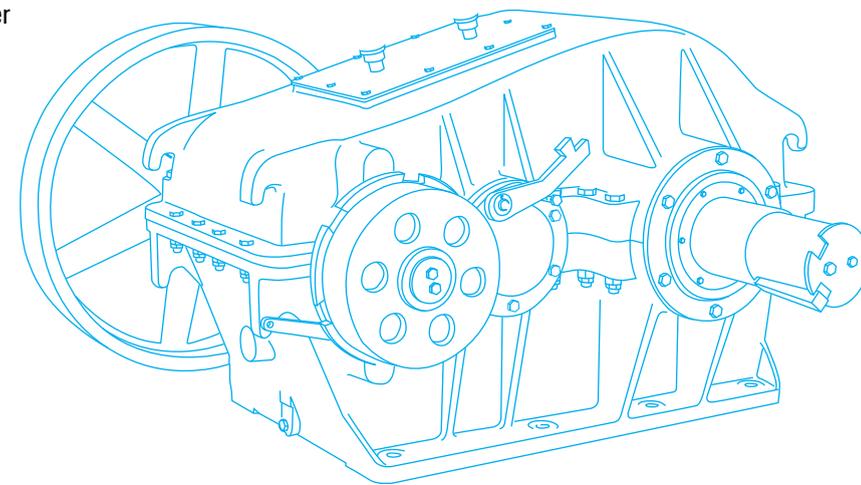


## 2 Evaluate the gear reducer

As the single most expensive component to repair and the heart of the pumping unit, the gear reducer must be robust and reliable to ensure a long, trouble-free lifetime. Replacing this one component can cost up to 40% of the initial purchase price and takes the well offline for at least a week each time it fails.

For the best performance over the long term, Schlumberger reengineered the gear reducer with a proprietary design, optimizing the tooth form for low-speed, high-load operations. The new design is expected to increase the interval between service events by more than 5 times, thus maximizing pumping uptime and minimizing operating costs.

Manufacturing procedures and inspection criteria define product quality. Schlumberger checks all machine tooling to ensure it matches the design, inspecting the gears in process against the design requirements and performing a postmanufacturing inspection to confirm all design tolerances are met.



### QUICK FACT

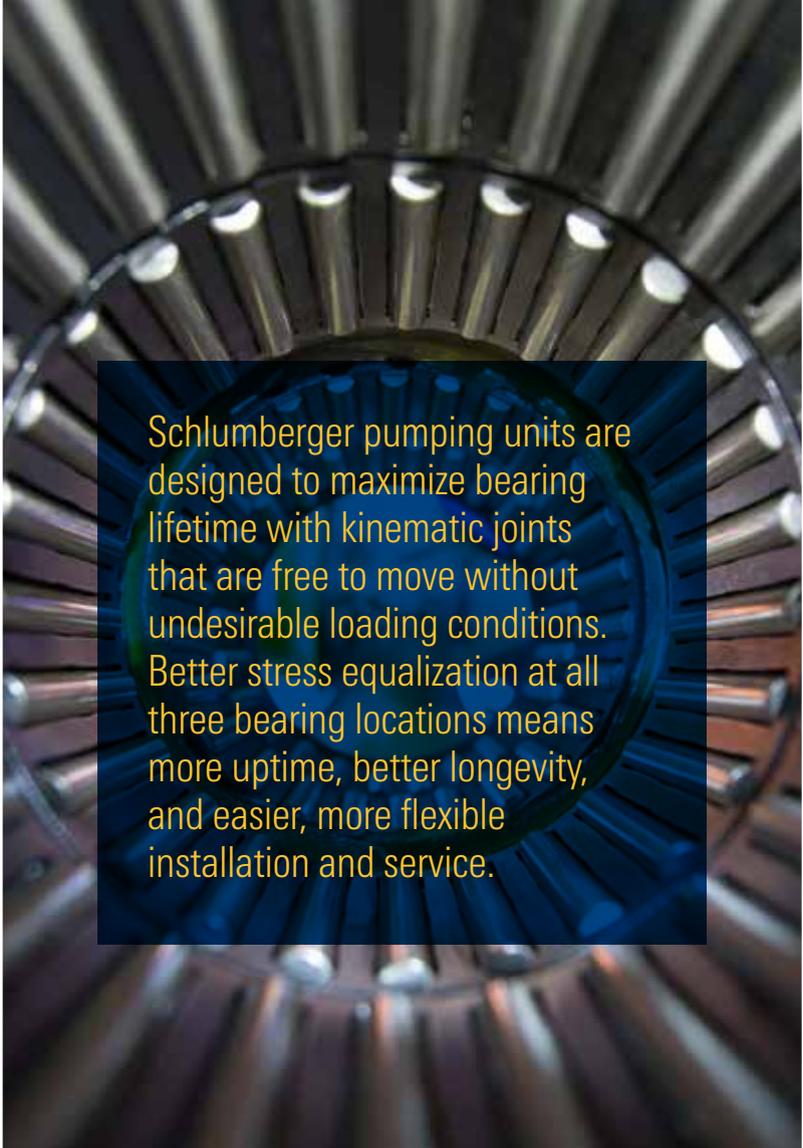
The Schlumberger proprietary reengineered gear reducer design exceeds API specifications by at least 30% and more than quintuples the interval between services compared with standard units. All gear reducers undergo a three-step inspection process for machine tooling, design requirements, and postmachining tolerances.

### 3 Equalize the bearing stress

Although structural bearing assemblies are designed for wear and replacement, a well-designed pumping unit ensures long life while simplifying maintenance and inventory with standardized, high-quality components.

#### Limit the loads

A decade ago, rod pump bearings survived 10 to 15 years. Today, they are typically replaced after just 3 to 7 years because deeper wells increase the load on the bearings. Whereas these bearings once ran in the middle of their load range, they now run almost constantly at or near their upper limit. Increasing reliability—and decreasing downtime for replacements—means choosing larger bearings or easing the loads by ensuring they are equalized across the unit.



Schlumberger pumping units are designed to maximize bearing lifetime with kinematic joints that are free to move without undesirable loading conditions. Better stress equalization at all three bearing locations means more uptime, better longevity, and easier, more flexible installation and service.



#### Standardize maintenance regimes and control inventory

The ideal equalizer bearing design provides two degrees of freedom: One axis is constrained by standard roller bearings while the other axis rotates on a hinge pin. This equalizes the stresses on the crank pin bearings and minimizes stresses through structural components. The effect is that actual loads are very near theoretical design loads, even if the installation is imperfect. This is critical because damage to the crank pin bearing can result in loss of the structure.

Railway-style center bearing assemblies should be standard tapered roller bearings, which can transmit very high radial and axial loads and provide a more direct load path for stresses transferred from the walking beam to the Samson post, again improving lifetime and installation flexibility.

#### QUICK FACT

Schlumberger equalizer bearing design exceeds API standards and triples the interval between replacements, increasing pump uptime and efficiency. In addition, our pump crank pin bearings are standard spherical roller bearings with precision-tapered inserts to simplify servicing and ensure an accurate nonrotating fit in the crank arm. This protects the crank arm bore from wear, helping to prevent a much more expensive repair or replacement.



## 4 Verify manufacturing quality



From the steel mill to your well, Schlumberger provides traceable quality control, assurance, and accountability.

### Test 100% of each run

To ensure product quality, Schlumberger owns its manufacturing plant rather than leasing or subcontracting. This gives us total control over the manufacturing processes, employee training, and quality control and assurance programs. Schlumberger plants are also certified to ISO 9000/9001 and API specifications, allowing for monogramming of pumping units under API Specification 11E.

### QUICK FACT

Schlumberger pumping units and components are 100% traceable for full quality control and assurance. Manufacturing is certified to ISO 9000/9001 and meet or exceed API standards, enabling us to monogram pumping units under API Specification 11E.

## 5 Expect field support and service

Reliable and quick support and service are often critical to ensure the best performance at the wellsite. Providing a comprehensive level of service with the ability to tap into an extensive network of expertise results in quick response times and rapid, accurate problem-solving. Schlumberger personnel are certified for installing and maintaining units to ensure efficiency and improve safety.



**QUICK FACT**  
Schlumberger provides the most comprehensive pumping unit offering in North America. Service employees are trained to efficiently install and repair any pumping unit equipment — with safety in mind.



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