Chapter C15

High pressure washpipe packing

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Individual chapters of the Kalsi Seals Handbook™ are periodically updated. To determine if a newer revision of this chapter exists, please visit https://www.kalsi.com/seal-handbook/.

1. Washpipe packing description

Kalsi Engineering's high pressure washpipe packing rings were developed to reduce downtime in applications up to 5,000 psi and 200 rpm. They incorporate grease inlets that increase packing life in higher pressure, higher speed applications by distributing grease to critical portions of the dynamic sealing interface during rotation. This high-performance packing is interchangeable with conventional oilfield washpipe packing and uses the same fabric reinforced elastomer construction.

Kalsi packing is stocked in several sizes that fit washpipes used in top drives and power swivels; see the shaft seal catalog portion of our website. New sizes can be furnished, but may require a one-time tooling charge, depending on initial order quantity.

Figure 1

Kalsi high pressure washpipe packing rings

The increased performance of Kalsi Engineering's high pressure washpipe packing rings is due to patented grease inlets that provide grease to the dynamic interface during rotation (U. S. Patent 9,121,503). Not recommended for temperatures greater than 275°F (135°C).

2. How to implement washpipe packing

The best packing performance can be obtained when:

- Spindle runout is minimized.
- The gooseneck is well-aligned to the rotatable spindle of the top drive.
- The washpipe is pressure-balanced in the axial direction, and is designed to articulate to accommodate runout and misalignment.
- The running surface of the washpipe is tungsten carbide coated to minimize surface wear.
- The packing rings are well-greased initially, and re-greased periodically (at least every 12 hours) to flush contaminants and provide lubricant to the waves.
- The metal spacers that support the washpipe packing are well-fitted to the packing, and designed to minimize clearance with the washpipe while avoiding metal-to-metal contact with the washpipe.

What to consider when designing packing spacers

Spacers must be manufactured with a material having suitable strength to withstand the anticipated operating pressure. Beware that high strength copper-based alloys have a modulus of elasticity that is significantly less than steel, and therefore spacers made from such alloys will have significantly more pressure-induced radially inward deformation. Spacer length should be designed with enough axial crush to establish sealing, without grossly deforming the packing rings.

Factors that must be considered when evaluating the bore diameter of the spacers include pressure-induced radial deformation of the washpipe and spacer, washpipe misalignment and runout, and the ability of the packing to center the spacer on the washpipe. Smaller clearance is better, provided that heavily-loaded contact does not occur between the washpipe and the spacer.

What to consider when designing washpipes

The static and dynamic sealing surfaces of the washpipe should be identical in diameter, so that the washpipe is hydraulically force balanced in the axial direction, and therefore free to articulate to accommodate gooseneck-to-spindle misalignment, and to follow spindle runout. Avoid stepped-down washpipes, that are intended to adapt large top drives to smaller diameter packing, because such washpipes are not free to articulate.

Avoid washpipes manufactured from mild steel, such as AISI 1018, because such washpipes are not intended for high pressure, and may yield in service. Tungsten carbide coated washpipe running surfaces are preferred over chromed surfaces, because they have vastly superior wear resistance.

Avoid non-circulating break-in

Do not subject washpipe packing to normal drillstring rotary speeds in the absence of fluid circulating through the washpipe. Rotation without circulation will quickly overheat and destroy the packing.

How to install washpipe packing

Hand-pack the grooves of the packing rings with grease during assembly. Grease the inside surface of the packing rings before inserting the washpipe. Clean and grease the outside of the washpipe prior to insertion of the washpipe into the packing rings. After installation of the washpipe onto the top drive, grease the assembly thoroughly before commencing rotation.

3. Rotational direction

Kalsi high pressure washpipe packing was developed for oilfield top drives and power swivels, which have a single primary direction of high pressure rotation. The waves are unidirectional in nature, and only provide interfacial lubrication in one direction of rotation. Most Kalsi-brand packing has been designed for the direction of rotation encountered in top drives and power swivels, which is shown in Figure 2.

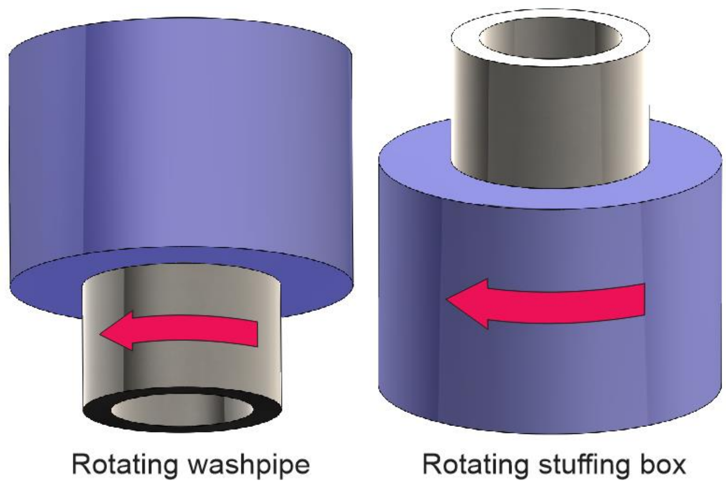

Figure 2

Direction of rotation

The waves on Kalsi -brand washpipe packing are designed for applications that have a single direction of rotation with high pressure. Most Kalsi packing has been developed for the high-pressure rotation direction that is encountered in oilfield power swivels and top drives and shown here. The same packing is applicable whether the washpipe or the stuffing box rotates with the drill string.