



Date: September 21, 2021
Applicability: Priority for 475 PowerDrive, though available to every size
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BACKGROUND INFORMATION

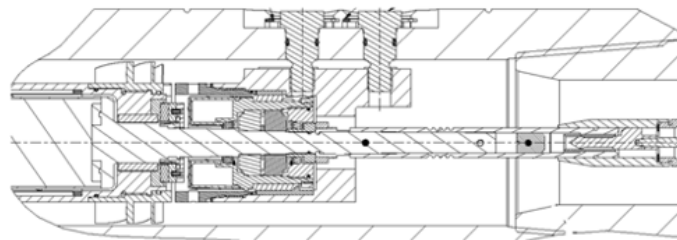
A new combination bearing is now qualified for widespread use in the PowerDrive control unit. This bearing has a higher dynamic load rating than the legacy bearing. It also carries the radial and axial load of the assembly separately.

The primary focus for this improvement is 475 configurations where issues with the legacy bearing have been observed. These configurations have the highest axial (from pressure drop across the assembly and vibration) and lateral loading (from vibration). However, the improvement is also applicable to larger hole size configurations.

FUNCTIONAL DESCRIPTION

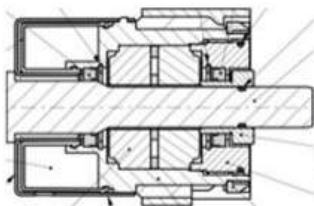
The Control Unit is held in the collar by two hangers which enable the Control Unit to rotate independently of the collar. Each hanger is fixed to the collar with two bolts and contains oil lubricated bearing packs. The lower bearing pack supports all axial loading of the control unit. The upper bearing assembly only constrains the tool radially.

Lower connection to CC

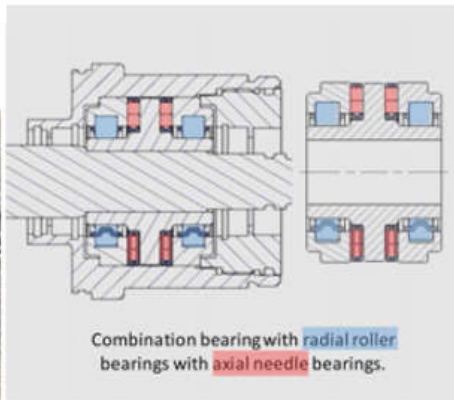


The standard lower bearing pack has two tapered roller bearings that support both radial and axial load. Under extreme combined axial and lateral conditions, the races have been observed to crack due to sub-optimal shoulder loading. The new combination bearing has radial roller bearings and needle thrust bearings in a combined package which carries radial and axial loading on different surfaces. The axial dynamic load rating is increased by 2 times. The lateral load rating is also improved.

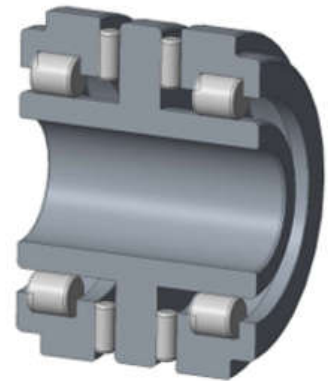
The new combination bearing also provides resistance to shaft motion which can degrade seals in the assembly – keeping the lubricating system clean of debris. This can help to prevent gradual degradation of the bearing's frictional properties over time.



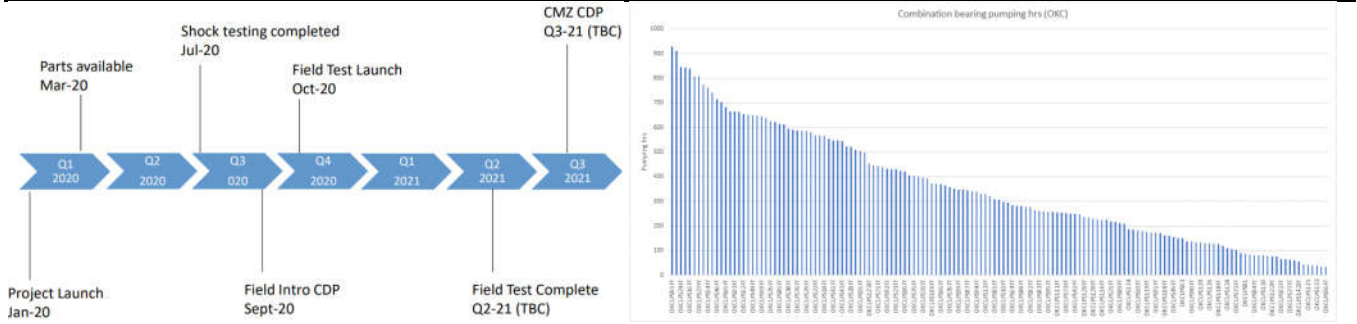
Standard Lower Bearing Pack



Optional New Bearing Pack



FIELD TEST



Pacesetter designed, tested, and converted their fleet to this bearing between 2018 and 2019. Formal Schlumberger field test was launched in Q4 2020 in multiple worldwide locations. All have been successful.

In NAL alone, as of the end of August 2021, we have accumulated over 47K pumping hours with 141 combination bearings. So far, the highest bearing has 930 pumping hours with an average life of 350 pumping hours across the fleet – a significant improvement over the current bearing. No new failure modes have been introduced with the use of this bearing.