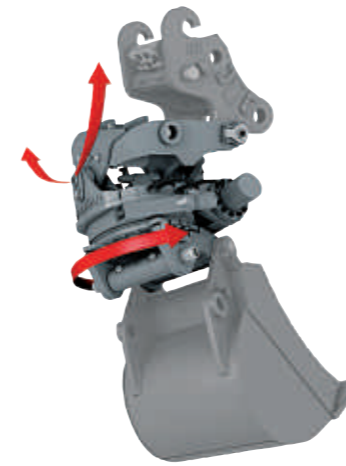
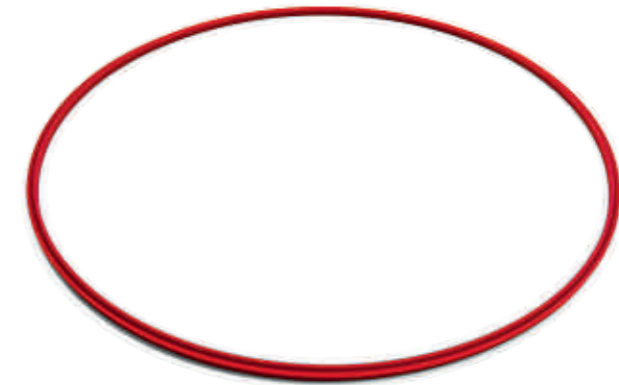


APSOseal® – for the “wrist” of Liebherr’s hydraulic excavator

Liebherr, one of the world’s largest construction equipment manufacturers, has developed a tilt rotator that enables its excavator tool attachments to be infinitely adjustable, rotating 360 degrees in both directions. In addition, the rotator is capable of tilting ± 50 degrees and can thus be viewed as the “wrist” of the hydraulic excavator. The seals for this innovative tilt rotator were developed by Angst+Pfister.



Thanks to the innovative sealing solution, the tilt rotator from Liebherr can withstand even the worst levels of dirt pollution.



Specially designed for the extremely restricted space of the rotator, the seal can nonetheless be supplied in short order.

Even little children in sandboxes are always happiest when their toy plastic earthmovers can dig as deeply as possible in muck and grime. Although the jobs performed by professional excavators are obviously much more challenging, one thing is the same: even the biggest excavators permanently come in contact with dust and dirt. The seal material and seal geometry must therefore be selected in a way that prevents outside contamination from penetrating the interior of the tilt-rotator system. The sealing elements must also be exceptionally wear-resistant.

The system provides a perfect seal to the outside, but can still discharge any excessive grease pressure buildup from within.

Dual-action piston seal For the smaller inner seal, Angst+Pfister developed a dual-action piston seal made of highly abrasion-resistant polyurethane. Its interior circumference is equipped with a sealing lip and its exterior circumference is outfitted with a dirt wiper. In close cooperation with Liebherr, a seal was developed that stands out for its very long service life even under extreme exposure to dust and dirt.

A seal that mustn't be impermeable The larger outer seal must not only prevent grime from penetrating the interior, but must also fulfill an additional function: It must prevent excessive pressure from building when the tilt rotator is relubricated with grease. The solution developed by Angst+Pfister is just as precise as it is effective: It's an asymmetrical seal that is completely impermeable to outside pollutants, but it can relieve a potential interior lubricant overpressure by allowing lubricant to escape to the outside. A special abrasion-resistant polyurethane compound was used for this innovative seal.

All's well that's sealed well? Angst+Pfister's engineers make sure of it! The sealing technology engineers at Angst+Pfister were not content with merely providing a technical solution. Given the tiny installation spaces, the special seal geometries and tolerances required, they ruled standard seals out right from the start. Nevertheless the sealing solution had to be promptly available for first sample delivery while keeping the costs to Liebherr as low as possible.

Angst+Pfister possesses the expertise and technical capabilities needed to mechanically fabricate seal prototypes and

series production in its own workshops, thus sparing customers additional tooling costs. Consequently, during the development stage, Angst+Pfister was quickly able to manufacture inexpensive lathe-cut seals that were perfectly custom-designed for the specific application and were identical to the subsequent large-series lathe-cut seals.

APSOseal® – not just for excavator shovels

The next joint project is already up and running: Liebherr needs customized polyurethane seals for the critical application of their brake units. Angst+Pfister has adapted polyurethane rod and piston seals to Liebherr's specific requirements for these brake units and has prototyped them using new tools.

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The excavator has added mobility thanks to the integrated tilt rotator. This would not be possible without Angst+Pfister's onsite technical consulting.

