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HOERBIGER Automotive Comfort Systems LLC · 284 Enterprise Drive · Auburn, AL 36830

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**SUBJECT: NMPI Nanodiamond Oil-additive Performance**

Recently we were faced with a durability issue in the development of a hydraulic cylinder for an automotive application.

The hydraulic cylinder housing was manufactured using a custom extruded aluminium profile.

To full-fill counterbalance requirements the hydraulic–cylinder had to be equipped with a long internal coilspring on the piston-side inside the cylinder-housing,

The coil-spring was guided by the ID of the housing preventing it from buckling.

During durability cycling of the cylinder-system the coil-spring was rubbing against the ID wall of the cylinder housing causing aluminum abrasion which resulted in premature failure of the rod-seal and external leakage.

As part of our process to develop a solution preventing aluminum abrasion we tested NMPI nanodiamond Oil Additive - FM. This solution of the lubricating oil and Oil Additive-FM was not tested to failure as the demonstrated durability exceeded our needs. In the initial testing of the oil failure only occurred after approximately 17,000 cycles, With NMPI Oil Additive FM it more then tripled the durability compared to a baseline test without oil-additive and would allow us to meet the requirements.

We are impressed with the performance of Nano Diamond oil-additive and regard it as a viable solution where internal wear on a cylinder can lead to premature failure and external oil-leakage.

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