



SA Performance

Universal Rotary Screw Compressor Lubricant

A quality lubricant will coat seals and allow parts to move smoothly, while simultaneously preventing the formation of corrosion, varnish, and extending compressor reliability. For oil-injected rotary screw compressors, the lubricant is injected into the compression chamber for sealing of the intermeshing rotors and lubrication of the bearings they turn on. The lubricant also plays a critical role in removing the heat generated by the compression process and protects rotating parts against wear.

Most rotary screw compressor manufacturers today use one of two quality synthetic lubricants as a factory fill in their machines, either polyalkylene glycol (PAG) or polyalphaolefin (PAO). Those manufacturers electing to use a PAO or other type of synthetic hydrocarbon, may also include an option for a polyolester (POE) upgrade to be used in units operating in high temperature environments where greater thermal stability may be required.

Incompatibility across PAG, PAO and POE lubricant technologies can vary from a slight change of a single performance parameter to harsh rejections leading to catastrophic machine failure. To avoid these pitfalls, lubricant manufacturers must have an intimate knowledge of the chemistries used in the OEM lubricants across industry as well as all major competitors.

Through a long-term competitive product study and countless laboratory hours evaluating the reactions of various additive mixtures, the industry's first true full synthetic universal rotary screw compressor lubricant has been developed - SA Performance's SAP 1000.

SAP 1000 - A True Full Synthetic Universal Rotary Screw Compressor Lubricant.

The universal fluid goes beyond top-off compatibility to be 100% soluble and miscible in any ratio with most any competitive rotary screw lubricant on the market.

Beyond this broad compatibility, there are numerous other advantages seen by using a universal compressor lubricant:

- By incorporating high quality synthetic esters, the universal compressor lubricant offers improved performance in high temperature or contaminated environments when compared to PAO's and other synthetic hydrocarbons.
- Facilities with multiple rotary screw compressor makes and models can now easily transition to the universal compressor lubricant; one fluid for use in all these systems. Additional benefits to this include:
 - Reduction in inventory levels
 - Risk reduction of cross-contamination as a result of having multiple fluid types on hand
 - Potentially eliminating duplication of suppliers needed for different lubricant types
 - Purchasing staff cost savings from having to write multiple purchase orders
- When compared to the leading OEM compressor lubricants, the universal compressor lubricant offers a significant cost savings.

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Universal Lubricant Compatibility

When understanding the true compatibility of a universal lubricant, the first step is to identify the possible symptoms of incompatibility. Those symptoms listed below address only the results of an incompatible lubricant mixture, and not the result of the incompatibility on the machine or its performance.

- Base fluids can adversely react with the other base fluids once mixed, rejecting each other
- Mixing of base fluids can adversely impact the solubility of additives in the new mixture
- In some cases, the base fluid can react with the other products additives causing a chemical reaction
- Additives are not always compatible with one another, forming insolubles or causing adverse reactions
- Additives from different fluids may neutralize each other, altering performance

With this in mind, the SAP 1000 uses a proprietary blend of base fluids to ensure compatibility with synthetic hydrocarbons, PAO's, PAG's and various types of esters. Beyond base fluids, compatibility of additive chemistries has also been validated.



As seen above, the picture at the top is one example of the SAP 1000's compatibility with a competitive fluid. This picture exhibits no separation of the two fluid chemistries across any mixture ratio. Fully soluble and miscible together, clear and bright, and no residual film on the test tube walls help to confirm this. The picture below is a leading competitor's universal fluid which would see no compatibility issues in drain and fill or top-off scenarios but is incompatible in 60%/40% - 40%/60% ratios such as would be seen if a line were to break or an air/oil separator failure.

Universal Lubricant Limitations

While there is no one-size-fits-all lubricant for air compressors, the SAP 1000 benefits outlined above show many clear advantages over typical aftermarket replacement fluids. As with any air compressor lubricant however, there are limitations.

- By its nature, the SAP 1000 is not optimized for rotary vane, reciprocating and some centrifugal compressors. With an ISO46 viscosity this fluid is too light for reciprocating compressors and the base fluid selection will not perform the detergent characteristics commonly found in diesters for rotary vane units. Centac centrifugal compressors require PAG based lubricants, but other centrifugal systems would operate fine with this fluid.
- The SAP 1000 is not compatible with silicone lubricants occasionally found in compressors. The properties of silicone resist compatibility with most any other base fluid, limiting options for transition to a common fluid type. There are flush procedures available to transition from a silicone but are found to be costly and time consuming.
- While the SAP 1000 is compatible with food grade lubricants, this product is not NSF H-1 certified for incidental food contact. Because of this, mixing this product with a food grade lubricant would result in the compressor no longer operating with a lubricant that meets this standard.

Universal Lubricant Property Comparison

The comparison of basic properties via ASTM test methods with leading PAO/Synthetic Hydrocarbon and PAG/POE lubricants as compared to SAP 1000 show comparable results to one another. Viscosities @ 100°C are indicative of fluid thickness at operating temperatures and all show results over 7cst. Flash Point and Fire Point are well within a margin of repeatability to be considered equivalent and Foam Tendency shows strong results. Water Separability is good for the PAO/Synthetic Hydrocarbon and the SAP 1000, and no separation is expected with PAG's.

See Property Comparison Chart - Page 3

Given the comparative results (p.3), it can be concluded that in addition to the tangible benefits of a universal fluid across the industry, there are also no performance limitations to adversely impact compressor operation in the use of this product.

Conclusion

The introduction of the SAP 1000 allows for facilities to more easily manage multiple rotary screw compressor makes and models with one compatible fluid for most all machines. While other ester based compressor lubricants claim top-off compatibility with competitive fluids, only SAP 1000 has been validated for full compatibility in any ratio with base fluids and additives against leading OEM and aftermarket chemistries.

| Properties | Test Method | Leading Competitor A | Leading Competitor B | SAP I000 |
|-------------------------|-------------|----------------------|----------------------|-------------------------|
| Base Fluid Type | - | PAO/Synthetic | PAG/POE | Proprietary Ester Blend |
| Viscosity @ 40°C (cst) | ASTM D445 | 47.5 | 46.1 | 46.7 |
| Viscosity @ 100°C (cst) | ASTM D445 | 7.6 | 7.8 | 7.3 |
| Viscosity Index | ASTM D2270 | 126 | 139 | 118 |
| Flash Point °C (°F) | ASTM D92 | 252 (485) | 263 (505) | 258 (496) |
| Fire Point °C (°F) | ASTM D92 | 281 (537) | 290 (554) | 288 (550) |
| Copper Strip Corrosion | ASTM D130 | 1b | 1b | 1b |
| Water Separation | ASTM D1401 | 40 / 40 / 0 | 0 / 0 / 80 | 40 / 40 / 0 |
| Foam Tendency/Stability | ASTM D892 | 0/0, 10/0, 0/0 | 0/0, 0/0, 0/0 | 0/0, 0/0, 0/0 |