

Catch-All®

FILTER-DRIERS: A CASE STUDY



It's the core that counts!

The Sporlan Catch-All Filter-Drier® plays a vital role in removing moisture, acids, foreign matter, sludge and varnish in refrigeration systems. Capturing these contaminants when introduced and/or generated eliminates their harmful effects. With HFC/POE lubricant systems, discussions often involve the potential to mishandle hygroscopic (water absorbing) POE lubricants where the water can react with the lubricant to form acid. Another aspect of contaminant control is recognizing that system chemistry can also change if a "clean system" operates at an extreme condition because of its application. Without system protection, the end result is limited system life because of contaminants generated within the system.

To demonstrate the merits of the Catch-All Filter-Drier, this document compares pertinent data points from a test performed for ARTI (Air Conditioning and Refrigeration Technology Institute) with independent testing performed for Sporlan Valve Company.



EFFECTS OF SELECTED CONTAMINANTS IN AIR CONDITIONING & REFRIGERATION EQUIPMENT

ARTI MCLR Project No. 665-53000 titled *Effects of Selected Contaminants in Air Conditioning and Refrigeration Equipment* studied the impact of contaminants in fractional horsepower refrigeration systems. Systems were fabricated with a number of refrigerants and lubricants, including R-507/POE lubricant. These systems did not have a filter-drier in order to study the effects on system components when contaminants were not removed from the system. The systems were operated continuously for 12,000 hours (nearly a year and a half) at predetermined conditions. After the study, the metering devices and compressors were analyzed to examine the effects of the tested contaminants.

Measured amounts of contaminants were intentionally injected in the test systems. The contaminants were water, acid, air, and a small percentage of CFC or HCFC refrigerant in the HFC refrigerant systems. The contaminants were chosen to imitate what can occur in actual applications.

Water was used because elevated levels can exist in systems, especially with POE oil
Acid results when oil reacts with water and is associated with high operating temperatures

Air introduced into a system simulates a poorly evacuated system

CFC or HFC refrigerant added to certain HFC systems model a poorly retrofitted system

The contaminants were added separately and as mixtures to various refrigerant/oil combinations, providing a large matrix of scenarios. For comparison, a baseline was established using control systems for each refrigerant/lubricant combination with no added contaminants.

In conjunction with the work performed for the industry, the same independent testing facility built and operated systems for Sporlan Valve Company. The Sporlan systems were built identically to the ARTI systems, and operated at the same conditions for the same time period. The only difference was the Sporlan systems included C-052-S Catch-All Filter-Driers. The purpose was to determine the C-052-S Catch-All affect on system cleanliness.

The scope of this publication examines a “snapshot” of three R-507/POE lubricant systems operating at the same high compression ratio condition (1:12.5) to show the influence of operating conditions, contaminants and the benefit of a Catch-All Filter-Drier.

The systems are:

- Unit #5 from the ARTI study. The R-507/POE lubricant “control” system with no contaminants intentionally added. No filter-drier in the system.
- Unit #20 from the ARTI study. The R-507/POE lubricant system included water (200 ppm), acid (0.1 T.A.N.), air (4% volume) and some R-502 (4% volume). No filter-drier in the system.
- Unit #160 Sporlan R-507/POE lubricant system. Identical contaminants as Unit #20, but with a Sporlan C-052-S Catch-All Filter-Drier.

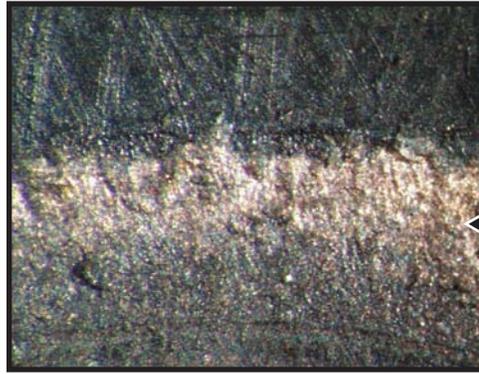
RESULTS - R-507/POE LUBRICANT SYSTEMS

Unit #5 - Control System for ARTI



Crank Shaft (loaded)

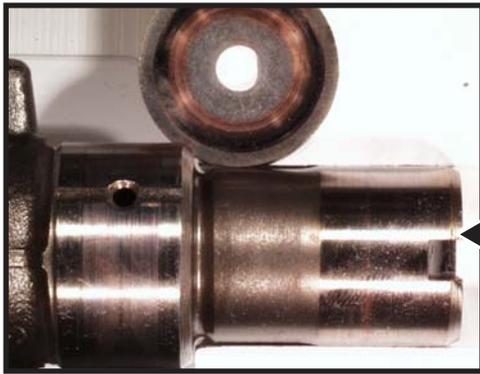
Scored/Copper Plated



Suction Reed (micro)

Corrosion/Carbon

Unit #20 - Contaminants less Filter-Drier



Crank Shaft (loaded)

Scored/Copper Plated



Suction Reed (micro)

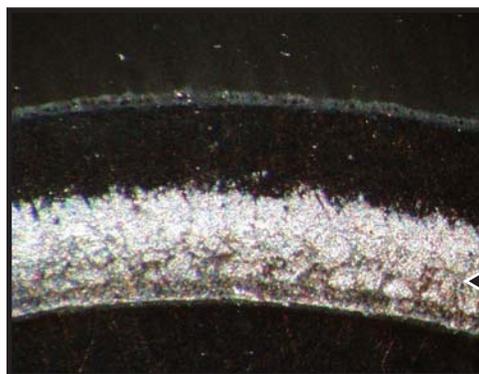
Corrosion/Copper Plating

Sporlan Unit #160 - Contaminants and Catch-All®



Crank Shaft (loaded)

Clean/Polished Wear Pattern



Suction Reed (micro)

No Copper Plating

RESULTS

FINAL POE LUBRICANT ANALYSIS

System	Water (ppm)	Total Acid Number	Total Metals (ppm)
Unit #5 R-507/POE "Control" System (no contaminants intentionally added, no filter-drier)	100	0.5	95
Unit #20 R-507/POE System (with water, acid, air and trace R-502 added, no filter-drier)	120	1.1	242
Sporlan Unit #160 R-507/POE System with Catch-All (with water, acid, air and trace R-502 added)	84	0.02	2

CONCLUSION

The R-507/POE lubricant systems were run at elevated compression ratios, explaining the high acid content and metal content in the lubricant in the systems without the Catch-All Filter-Drier. The high metal content indicates compressor wear. In addition, the water content in the lubricant of the control system rose during the test. It is unclear where the moisture originated in the system.

The lubricant in the system with the Catch-All had a lower water level, acid number and metal content. It's clear the acids were removed by the Catch-All before they could react with other materials in the system, and cause abnormal compressor wear.

Systems in the industry often run at lower compression ratios yielding different results. However, the data demonstrates how system chemistry can change without protection (less a Catch-All). The results also showed that contaminants detrimentally affect compressors, and how the Catch-All Filter-Drier maximizes system life if operational changes are caused from within the system or its surroundings.