Carlyle

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Recommendations for Open Drive Reciprocating Compressor

Carlyle open drive compressors use a rotating mechanical shaft seal to prevent refrigerant from leaking to the atmosphere. The models that use these shaft seals include the 5F and 5H compressors. The seal consists of a carbon ring that rotates against a fixed mating iron plate. The faces of these parts are very flat. However, they rely on an oil film to maintain the seal between them and prevent excessive friction and wear. This bulletin outlines Carlyle's recommendations pertaining to storage of open drive compressors, checking for leaks, and seal replacement.

1. Compressor Storage:

   Compressors are shipped from the factory with a holding charge of dry air or nitrogen between 5 and 20 psig. Any compressors received without a holding charge should be checked for leaks. A lack of holding charge does not necessarily indicate a shaft seal leak. Leaks can be at fittings, gaskets, or the shaft seal. Any leaks should be repaired before the compressor is installed into a system.

   If compressors are stored for several months, the oil film on the seal face may diminish, reducing the effectiveness of the seal. In this case the holding charge may leak out through the seal. Carlyle recommends that the shaft be rotated periodically to allow oil to wet the seal face. This recommendation also applies to compressors installed in systems that do not operate for extended periods of time, such as during the winter months in cold climates. Running the compressor after long off periods will re-lubricate the shaft seal assembly and re-seal to its prior operation although there may be more oil dripping during the first 24 hours of operation.

2. Leak Detecting:

   The best method to locate leaks is with a refrigerant leak detector. Shaft seal leaks are best located after blowing out the seal area with compressed air, then using a leak detector. Proper maintenance and setting of the leak detector is critical to diagnosing a shaft seal leak. Shaft seal refrigerant leaks greater than 2-oz./ year (of R22 or equivalent) are considered excessive. Gross leaks at fittings and gaskets can be detected with a bubble solution such as "Snoop". Another option is "Leak Detector" and it is produced by Dylon Industries. To prevent rusting on the shaft, water based solutions should not be in the seal area.

3. POE Oil Effect:

   Of concern with 5F/H compressors and POE oil, is potential seal damage and leaks due to the cleaning / solvent characteristics of the POE oils. Seal leaks with HFC / POE oil combination can occur more frequently than with CFC and HCFC refrigerant applications with mineral oil or Alkylbenzene. This is an especially important consideration on retrofit applications where the POE oil solvent characteristics brings back systems contaminants that had been dormant with mineral oil or A-B. These contaminants find their way into the lubrication system of the compressor and the discharge of the oil at the oil pressure regulator is into the seal compartment. Shown in Figure A is a schematic of the oil path in a typical 5F/H compressor.

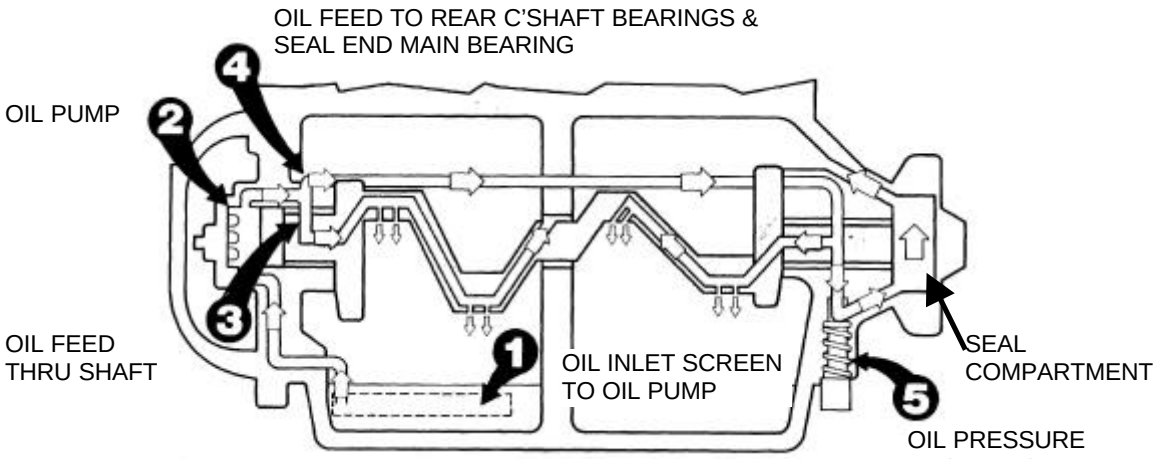

FIGURE A

We have found that these contaminants can damage the seal's carbon ring and mating cover plate surface and cause seal leaks. This emphasizes the importance of system cleanliness when working with HFC's and POE oils. Several customers have added a 3-micron filter used with our screw compressors to the 5F/H lube system to clean up the oil and remove these contaminants. These can be installed in the same oil circuit as an oil cooler. Additional protection against high-pressure drops is required. Shown in Figure B is a method to add this filter.

5H40 Full Flow Oil Filter Modification

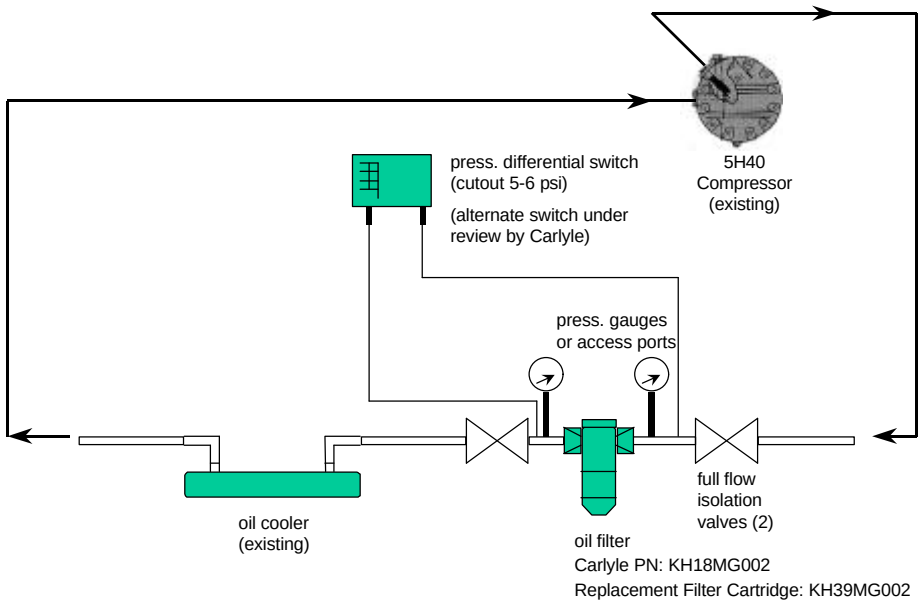

Figure B

Note: On retrofits, 2 or 3 filter changes may be required. A "contaminated" system may require more.

4. Expected Oil Leakage:

It is the nature of this type of seal to leak oil. Internal system pressure continually forces oil across the seal face to the outside. The oil is what creates the seal for refrigerant gas inside the system, and lubrication for the seal surfaces. This oil will eventually drip from the compressor. A seal that loses oil at a normal rate of 1 to 2 drops per day will leak less than an ounce of refrigerant per year. Our seal supplier also notes that some applications can result in leaks several times this level. *An oil leak at the seal should not be diagnosed as a refrigerant leak until the compressor has been checked using a leak detector as outlined in #2 above.*

5. Seal Replacement:

After a shaft seal has been properly diagnosed as leaking and shaft rotation does not stop the leak, it is necessary to replace the shaft seal. Carlyle recommends that if the compressor is new, (has less than 20 hours of run time) and the bellows is tight on the crankshaft, that only the carbon ring and the mating iron plate be replaced.

All surfaces should be lubricated with compressor oil during the installation. During the installation of the carbon ring and cover plate it is important to avoid touching the sealing surfaces of the carbon ring and cover plate. These surfaces should be sprayed with “clean” oil. This oil should not be installed with fingers or wet cloth. This will normally fix the leak. If this fails to fix the leak, then the complete seal should be replaced.

For compressors that have been in service that are properly diagnosed with a seal leak, there may be corrosion near where the bellows seals on the crankshaft. If minor corrosion is present, the crankshaft may be cleaned with a fine “Scotch Brite” pad before installing a new seal. It is very important to thoroughly clean the seal cavity area with a clean cloth. If a solvent is used, it must be compatible with the system refrigerant and oil. Any debris from the abrasive pad or the shaft, which remains inside the compressor, could eventually cause subsequent leaks, or a compressor failure. The new seal should be installed according to the instructions included in the replacement kit. All surfaces should be lubricated with compressor oil during the installation.

Good repair practices are essential to maintaining the cleanliness of the system. Whenever the compressor is open to the atmosphere, it should be evacuated with a vacuum pump for a sufficient amount of time to remove any moisture that has been absorbed into the oil.