DuPont™ Suva®

REFRIGERANTS

Technical Information

Lubricant Selection During Retrofit

Lubricant selection is based upon many factors, including compressor wear characteristics, material compatibility, and lubricant/refrigerant miscibility that can affect oil return to the compressor. Before starting a retrofit, consult the compressor manufacturer about any specific lubricant recommendations for your compressors. Other sources of lubricant information are the DuPont distributor, lubricant manufacturers, and system manufacturers.

Retrofit to an HCFC refrigerant

When converting from a CFC to a service refrigerant (such as Suva® MP39), a single compressor oil change to alkylbenzene oil (AB) of the same viscosity is recommended to ensure optimum oil return. This process will normally replace 50%–80% of the existing mineral oil, and satisfies the recommendations of most compressor manufacturers.

However, field experience has shown that service refrigerants such as MP39, MP66, 408A, 409A, HP80 and HP81 work successfully with the existing mineral oil in many unitary and close-coupled systems where oil return is not a concern, such as reach-in coolers, display cases, and beverage dispensers.

Oil return to the compressor is required for proper lubrication. Systems may have poor oil return if the evaporator is distant from the compressor, the evaporator is below the compressor, or there are low line velocities. In such systems, the best way to protect the compressor is to make one oil change. Knowledgeable contractors are in the best position to determine if oil return might be a problem.

How to determine if a system can be retrofit without an oil change

There are many things to consider when deciding if a retrofit can be performed without changing the existing mineral oil. The real key is maintaining adequate oil return to the compressor for proper lubrication. What are the factors you should consider when deciding if a system has an oil return problem and will require an oil change?

- If the system has a history of compressor failure due to bad lubrication
- If the system layout has low point “traps” in the compressor suction line where oil might collect

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- If the system is properly charged with refrigerant and the control devices are working properly, poor oil return can lead to the following operating problems
  - oil "logging" in the evaporator which can cause high box temperatures
  - oil "logging" also can cause an uneven evaporator coil frost pattern
  - low compressor suction pressure
  - lubricant "slugging" to the compressor

It is important to note that small hermetic systems (generally less than 5 hp) with the compressor located close (less than 25 ft) to the evaporator are least likely to experience oil return problems. Large systems are not normally candidates for a retrofit without an oil change.

Below are some additional tips for consideration when evaluating the oil return characteristics of a system. Although these may not be appropriate for many small, close coupled hermetic systems, these tips can be very useful when trying to diagnose system problems related to poor oil return.

- Good piping design requires suction piping to be pitched in the direction of flow at about 1/4 inch per 10 feet
- Improperly located pipe hangers can cause low points that might trap oil
- Lines going through cold ambient spaces (such as below the floor in a supermarket) may trap oil
- Refrigerant velocities in vertical lines should be at least 1500 ft/min to insure good oil return; velocities in horizontal lines should be at least 750 ft/min.
- When doing the retrofit, install an "access fitting" in the compressor discharge line (at the 6 o'clock position—bottom of the pipe). This brass fitting is typically about 3 inches long with a schrader valve. Operate the system for about 48 hours after changing the oil; purge a small amount of oil from the fitting and then take a sample. Check the mineral oil concentration with a refractometer or chemical test kit. For most retrofits where an oil change is recommended, removal of 50%–80% is sufficient.

Retrofit to an HFC refrigerant with POE lubricant

HFC refrigerants such as Suva® 134a, Suva® 404A (HP62), and Suva® 507 require polyol ester lubricants (POEs) to ensure adequate oil return to the compressor. When converting from a CFC to one of these refrigerants, it is recommended that at least 95% of the existing mineral oil or AB in the system be replaced with the POE. This will require multiple oil changes, depending on the system size and design. Chemical test kits and refractometers are available to determine the concentration of mineral oil in the POE when doing the conversion.

When converting to an HFC refrigerant, the following steps should be used to replace the existing mineral oil with POE. Due to the great number of refrigeration designs in use today, these steps only serve as a guideline.

1. Before removing the CFC (or HCFC) refrigerant charge, remove the mineral oil (or AB) from all accessible points in the system. Measure the amount removed.
2. Replace with an equivalent amount of POE.
3. Operate the system for a minimum of 48 hours with the new POE and the old CFC (or HCFC) charge. Purge a small amount of oil from a sample location and then take a sample. Use a chemical test kit or refractometer to determine the oil composition.
4. Repeat Steps 1–3 until less than 5% mineral oil (or AB) remains in the system.
5. Proceed with the rest of the retrofit procedure.

Using POEs

Due to the chemical structure of the POE, they are better solvents than mineral oils. Because of this, when a system is retrofit to an HFC with a POE, the POE will tend to dissolve more of the sludge that has built up in the system. This dissolved sludge can then plug up filters which may need to be changed more frequently after the retrofit.

POEs also absorb more moisture out of the air than mineral oils. This does not normally present a problem as long as the POE containers are kept tightly closed when not being used. In addition, it may be advisable to use small containers of POE lubricants to minimize the chance of the POE absorbing moisture over a long period of time.

Lubricant selection

The following table lists the various refrigerants and the recommended lubricants.

Refrigerant	Lubricant
R-12	MO or AB
Suva® 134a	POE
Suva® MP39	MO or AB
Suva® 409A	MO or AB
R-500	MO
Suva® MP66	MO or AB
R-13	MO or AB
R-503	MO or AB
R-23	POE
Suva® 95	POE
R-502	MO or AB
Suva® 404A (HP62)	POE
Suva® 507	POE
Suva® HP80	MO or AB
Suva® 408A	MO or AB
Suva® HP81	MO or AB
R-22	MO or AB
Suva® 407C	POE
Suva® 410A	POE

Note: HCFC refrigerants such as Suva® MP39 and Suva® 409A are also compatible with POE lubricants. Some fractional horsepower replacement compressors are shipped with POE.

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(6/05) RWJ293 Printed in U.S.A.
Reorder No.: K-05722

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