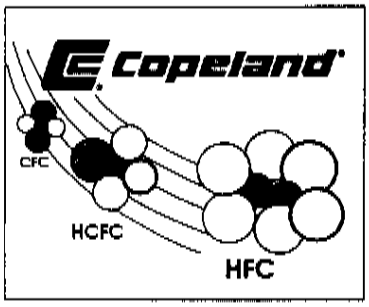


Refrigerant Changeover Guidelines

CFC-12 to HFC-134a

Leading the Industry with Environmentally Responsible Refrigerant Solutions

Copeland does not advocate the wholesale changeover of CFC refrigerants to HCFCs or HFCs. If a system is not leaking refrigerant to the atmosphere, and is operating properly, there is no technical reason to replace the CFC refrigerant. Changing the refrigerant may void the U.L. listing of the unit. However, once the decision has been made to make the change from CFC-12 to HFC-134a, the following guidelines are recommended.

CONSIDERATIONS

1. Copeland's lubricant recommendation for use with HFC-134a is a Polyol Ester (POE), Mobil EAL™ Arctic 22 CC*. This is currently the only POE lubricant approved for use in a Copeland compressor and is available from all authorized Copeland wholesalers. The use of any other POE lubricant may void the compressor warranty.

2. HFC-134a should be used only in systems where the saturated suction temperature is maintained at -10°F or higher. **It should not be mixed with any other refrigerant!**

3. The expansion valve may need to be changed. The existing CFC-12 valve when used with HFC-134a will have approximately 15% more capacity. Oversized expansion valves can result in hunting and refrigerant floodback. Consult with the thermostatic expansion valve manufacturer for the correct valve and size.

4. Filter-driers must be changed at the time of conversion. This is proper air conditioning/refrigeration practice.

   a. Solid core driers such as ALCO ADK are compatible with either CFC-12 or HFC-134a.

   b. Compacted bead type driers can use XH6 or XH9 molecular sieve material such as found in the ALCO EK or EKH series.

   c. If a loose fill type drier is to be used, XH9 molecular sieve is required.

5. HFC-134a exhibits marginally higher pressures than CFC-12 at normal condensing temperatures. We do not believe this will require readjustment of safety controls; however, you should verify this with the system manufacturer or component suppliers.

6. Systems that use a low pressure controller to maintain space temperature may need to have the cut-in and cut-out points changed due to the difference in Pressure/Temperature relationships.

7. Systems using HFC-134a may have a lower system pressure drop than with CFC-12. Because of the lower pressure drop, check with the manufacturer of any pressure regulators and pilot operated solenoid valves used in the system to be sure that they will operate with the lower pressure drop. It is possible that these controls may have to be downsized in order to operate properly.

8. Mineral oil lubricants, such as 3GS, must not be used as the compressor lubricant. Polyol Ester (POE) lubricant, Mobil EAL Arctic 22 CC, is the only lubricant that can be used in a Copeland compressor when using HFC-134a.

Before starting the changeover, it is suggested that at least the following items be ready:

1. Safety glasses
2. Gloves
3. Refrigerant service gauges
4. Electronic thermometer
5. Vacuum pump capable of pulling 250 microns
6. Thermocouple micron gauge
7. Leak detector
8. Refrigerant recovery unit including refrigerant cylinder
9. Proper container for removed lubricant
10. New liquid control device

** Mobil EAL Arctic 22 and Arctic 22 CC are currently equivalent lubricants.*

11. Replacement liquid line filter-drier(s)
12. New lubricant, Mobil EAL Arctic 22 CC (POE)
13. HFC-134a pressure temperature chart
14. HFC-134a refrigerant

CHANGEOVER PROCEDURE

NOTE: HFC-134a is not compatible with the seal material used in Moduload unloading. If your system has Moduload, it MUST be changed. Consult your Copeland wholesaler for the proper part number.

1. The system should be thoroughly leak tested with the CFC-12 still in the system. All leaks should be repaired before the HFC-134a refrigerant is added.

2. It is advisable that the system operating conditions be recorded with the CFC-12 still in the system. This will provide the base data for comparison when the system is put back into operation with the HFC-134a.

3. It is necessary to thoroughly remove the existing mineral oil lubricant from the system before the refrigerant is changed. No more than 5% residual mineral oil may be left in the system when it is recharged with HFC-134a for proper compressor operation. 1 to 2% residual mineral oil may be required to assure no loss of heat transfer if enhanced tube heat exchangers are used in the system.

I. Systems with service valves

a. Disconnect electrical power to system.

b. Front seat the service valves to isolate the compressor.

c. Properly remove the CFC-12 from the compressor.

d. Remove the mineral oil lubricant from the compressor. Hermetic compressors will have to be removed from the system and tipped up to drain the lubricant out through the suction stub.

e. Those systems that have oil separators, oil reservoirs, oil floats and suction line accumulators must have the mineral oil drained from them. Add POE lubricant to the oil separator and to the oil reservoir.

f. Replace the liquid line filter-drier with one that is compatible with HFC-134a.

g. Fill the compressor with the proper amount of POE lubricant. The oil charge is on the label of Copelaweld® compressors. Copelametic® compressor oil charges can be found in Application Engineering Bulletin 4-1281. If the lubricant charge is unknown, an authorized Copeland wholesaler can provide the technician with the information.

h. Reinstall the compressor in the system. Evacuate it to 250 microns. A vacuum decay test is suggested to assure the system is dry and leak free.

i. Recharge the system with CFC-12.

j. Operate the compressor in the system for a minimum of 24 hours, longer is better.

k. Repeat steps 3.I.a through j two more times. This will have provided three flushes of the system's lubricant.

l. To date, three complete flushes of the lubricant has shown to lower the mineral oil content down to 5% or less in the system. To be sure of the mineral oil content between flushes and to be sure that the system ultimately has 5% or less mineral oil, test kits are available from Mobil Oil, Virginia KMP, or Nu Calgon.

m. Properly dispose of the lubricant removed from the system after each flush.

II. Systems without service valves

a. Disconnect electrical power to system.

b. Properly remove the CFC-12 from the system.

c. Remove the mineral oil lubricant from the compressor. Hermetic compressors will have to be removed from the system and tipped up to drain the lubricant out through the suction stub.

d. It may be advisable to add service valves at the compressor suction and discharge connections. The compressor will have to have its lubricant changed generally three times.

e. Those systems that have oil separators, oil reservoirs, oil floats and suction line accumulators must have the mineral oil drained from them. Add POE lubricant to the oil separator and to the oil reservoir.

f. Replace the liquid line filter-drier with one that is compatible with HFC-134a.

g. Fill the compressor with the proper amount of POE lubricant. The oil charge is on the label of Copelaweld compressors. Copelametic compressor oil charges can be found in Application Engineering Bulletin 4-1281. If the lubricant charge is unknown, an authorized Copeland wholesaler can provide the technician with the information.

h. Reinstall the compressor in the system. Evacuate it to 250 microns. A vacuum decay test is suggested to assure the system is dry and leak free.

i. Recharge the system with CFC-12.

j. Operate the compressor in the system for a minimum of 24 hours, longer is better.

k. Repeat steps 3.II.a through j two more times. This will have provided three flushes of the system's lubricant.

l. To date, three complete flushes of the lubricant has shown to get the mineral oil content down to 5% or less in the system. To be sure of the mineral oil level between flushes and to be sure that the system has 5% or less mineral oil, test kits are available from Mobil Oil, Virginia KMP, or Nu Calgon.

m. Properly dispose of the lubricant after each flush.

4. With the proper amount of polyol ester in the system, the CFC-12 can now be removed. Measure and note the amount removed.

5. Before the final flush, be sure all leaks are repaired, liquid control devices and any other system components are changed. Install the correct liquid line filter-drier. Driers must be compatible with the refrigerant and lubricant.

6. Be advised that POEs are very hygroscopic. They will very quickly absorb moisture from the air once the container is opened. Once the lubricant is added to the compressor, the compressor should be quickly installed. Like an open container, an open compressor with POE will absorb moisture. Add the correct amount of lubricant to the compressor. It is important that the system contain not more than 5% mineral oil. More than 5% may contribute to premature compressor failure and or system capacity problems. Mineral oils are not miscible with HFC-134a. The lubricant may log in the evaporator resulting in system capacity loss. It is for this reason that the flushing process must be done with the CFC-12 in the system.

7. Once the compressor is installed and the system is closed, the system must be evacuated to and hold 250 microns or lower.

8. Charge the system with the HFC-134a. Charge to 90% of the refrigerant removed in item 4.

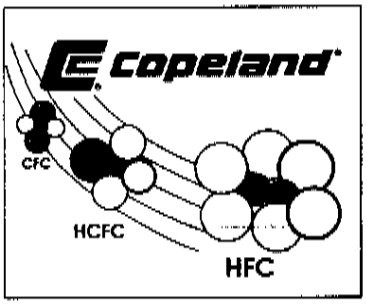
9. Operate the system. Record the data and compare to the data taken in item 2. Check and adjust the TEV superheat setting if necessary. Make adjustments to other controls as needed. Additional HFC-134a may have to be added to obtain optimum system performance.

10. Properly label the components. Tag the compressor with the refrigerant used (HFC-134a) and the lubricant used (Mobil EAL Arctic 22 CC). The proper color code for HFC-134a is Light Sky Blue PMS (Paint Matching System) 2975.

11. Clean up and properly dispose of the removed lubricant. Check local and state laws regarding the disposal of refrigerant lubricants. Recycle or reclaim the removed refrigerant.

CAUTION: These guidelines are intended for use with HFC-134a only, not for refrigerants which are similar to HFC-134a. *Other refrigerants may not be compatible with the materials used in our compressors or the lubricants recommended in this bulletin resulting in unacceptable reliability and durability of the compressor.*

The information contained herein is based on technical data and tests which we believe to be reliable and is intended for use by persons having technical skill, at their own discretion and risk. Since conditions of use are beyond Copeland's control, we can assume no liability for results obtained or damages incurred through the application of the data presented.



Refrigerant Changeover Guidelines

CFC-12 to MP66

Leading the Industry with Environmentally Responsible Refrigerant Solutions

Copeland does not advocate the wholesale changeover of CFC refrigerants to HCFCs or HFCs. If a system is not leaking refrigerant to the atmosphere, and is operating properly, there is no technical reason to replace the CFC refrigerant. In fact, changing the refrigerant may void the U.L. listing of the unit. However, once the decision has been made to make the change from CFC-12 to the interim MP66, the following guidelines are recommended.

CONSIDERATIONS

1. Copeland's lubricant recommendation for use with MP66 refrigerant is a Polyol Ester (POE), Mobil EAL™ Arctic 22 CC*. This is currently the only POE lubricant approved for use in a Copeland compressor and is available from all authorized Copeland wholesalers. The use of any other POE lubricant may void the compressor warranty. Refer to item 10 this section for a list of other approved lubricants for use with MP66 or Application Engineering Bulletin 17-1284 for a complete list of all Copeland approved lubricants.

2. MP66 should be used only in systems where the saturated suction temperature is maintained between -40°F and +10°F. **It should not be mixed with any other refrigerant!**

3. The expansion valve may need to be changed. The existing CFC-12 valve when used with MP66 will have approximately 25% more capacity. Oversized expansion valves can result in hunting and refrigerant floodback. Consult with the thermostatic expansion valve manufacturer for the correct valve and size.

4. Filter-driers must be changed at the time of conversion. This is proper air conditioning/refrigeration practice.

   a. Solid core driers such as ALCO ADK, are compatible with either CFC-12 or MP66.

   b. Compacted bead driers can use XH6 or XH9 molecular sieve material such as found in the ALCO EK or EKH series.

   c. If a loose fill type drier is to be used, XH9 molecular sieve is required.

5. MP66 exhibits marginally higher pressures than CFC-12 at normal condensing temperatures.We do not believe this will require readjustment of safety controls; however, you should verify this with the system manufacturer or component suppliers.

6. Systems that use a low pressure controller to maintain space temperature may have to have the cut-out and cut-in points changed. With MP66, the pressure setting must reflect an average temperature of the refrigerant in the evaporator. Because of refrigerant glide (see Copeland booklet 92-81, "Guide To Refrigerant Mixtures"), the refrigerant entering the evaporator for a specific suction pressure will be approximately 8°F colder than the refrigerant vapor at the outlet of the evaporator (not considering superheat). Therefore, the average refrigerant temperature will be at a midpoint pressure/temperature equivalent.

Example: A -5°F refrigerated space usually requires that the refrigerant temperature in the evaporator be approximately -15°F. Using MP66, the entering liquid temperature may be as cold as -19°F and the vapor temperature before superheat may be -11°F. Taking the saturated vapor pressure at -11° F gives us the exit pressure at the evaporator of 3.3 psig. Considering a 2 psig pressure drop in the suction line, the pressure control cut-out should be set at 1.3 psig.

The cut-in point will be based on the vapor pressure/temperature value. Let's assume that the space temperature can rise to -2°F before the compressor is turned on. -2°F vapor pressure is 7.6 psig. Set the cut-in at 8 psig.

7. Because of glide, pressure regulators such as EPRs may have to be reset. Contact the EPR manufacturer for correct settings.

** Mobil EAL Arctic 22 and Arctic 22 CC are currently equivalent lubricants*

8. Due to refrigerant glide, it is important that when measuring and/or adjusting TEV superheat, the pressure and SATURATED VAPOR TABLES be used. Example: The pressure measured at the TEV bulb is 7 psig. The Pressure/Temperature (P/T) chart shows that the saturated vapor temperature for 7 psig is -3.2°F. If the actual refrigerant temperature measured is 6°F, the superheat is 6.2°F.

To measure sub-cooling at the condenser outlet or at the TEV inlet to verify that a solid column of liquid is present, measure the pressure and the refrigerant temperature at the location that the sub-cooling information is needed. Compare it to the saturated liquid temperature from the SATURATED LIQUID TABLES. Example: A pressure of 175 psig is measured at the condenser coil outlet. From the P/T chart, 175 psig is 110.2°F saturated liquid temperature. If the actual refrigerant temperature is 105°F, the liquid is sub-cooled 5.2°F.

9. Systems using MP66 may have a lower system pressure drop than with CFC-12. Because of the lower pressure drop, pilot operated solenoid valves and pressure regulators may not operate. Check with the manufacturer of any pressure regulators and pilot operated solenoid valves used in the system to be sure that they will operate properly. These controls may have to be downsized.

10. Mineral oil lubricant alone, such as 3GS, cannot be used as the compressor lubricant. Copeland recommends Polyol Ester (POE) lubricants, specifically Mobil EAL Arctic 22 CC at a minimum concentration of 50%. A mixture of 3GS mineral oil (MO) and Zerol 200TD Alkyl Benzene (AB) with at least 50% alkyl benzene, or pure Virginia KMP MS 2212, can also be used.

Before starting the changeover, it is suggested that at a minimum the following items be ready:

1. Safety glasses
2. Gloves
3. Refrigerant service gauges
4. Electronic thermometer
5. Vacuum pump capable of pulling 250 microns
6. Thermcouple micron gauge
7. Leak detector
8. Refrigerant recovery unit including refrigerant cylinder
9. Proper container for removed lubricant
10. New liquid control device
11. Replacement liquid line filter-drier(s)
12. New lubricant
    a. Mobil EAL Arctic 22 CC (POE)
    b. or Zerol 200TD (AB) or Virginia KMP MS 2212 (AB)
13. MP66 pressure temperature chart
14. MP66 refrigerant

CHANGEOVER PROCEDURE

1. The system should be thoroughly leak tested with the CFC-12 refrigerant still in the system. All leaks should be repaired before the MP66 refrigerant is added.

2. It is advisable that the system operating conditions be recorded with the CFC-12 still in the system. This will provide the base data for comparison when the system is put back into operation with the MP66.

3. The system should be electrically shut off and the refrigerant properly removed from the system. Measure the quantity of refrigerant removed. This will provide a guide for recharging the system with MP66 (see item 9 this section).

4. The mineral oil lubricant must be removed from the compressor crankcase. Hermetic compressors will have to be removed from the piping and the lubricant drained out through the suction stub. It is advisable to do an acid test on the oil.

5. Measure the amount of lubricant removed. It should be within 4 to 6 ounces of the compressor's factory oil charge. The lubricant charge is indicated on the name plate of Copelaweld® compressors. Copelametic® compressor oil charges can be found in Application Engineering Bulletin 4-1281. If the lubricant charge is unknown, an authorized Copeland wholesaler can provide the technician with the information.

If the amount of lubricant removed is less than 50% of the factory charge, it will be necessary to flush the excess lubricant from system.

Those systems that have oil separators, oil reservoirs, oil floats and suction line accumulators must have the oil drained from them. If the liquid control device is going to be replaced, it is advisable that the suction line, liquid line and evaporator coil be blown clean using properly regulated dry nitrogen.

NOTE: Properly dispose of the lubricant.

6. Before the new lubricant is installed into the compressor, be sure all leaks are repaired, liquid control devices and any other system components are changed. Install the correct liquid line filter-drier. Driers must be compatible with the refrigerant and lubricant.

7. Be advised that POEs are very hygroscopic. They will very quickly absorb moisture from the air once the

container is opened. Once the lubricant is added to the compressor, the compressor should be quickly installed. Like an open container, an open compressor with POE will absorb moisture. Add the correct amount of lubricant to the compressor. It is important that the system contain at least 50% POE. On systems using enhanced surfaces in the heat exchanger, excessive mineral oil can adversely effect the heat transfer due to logging. Therefore, it is desirable to have no more than 20% mineral oil in systems employing these type surfaces.

8. Once the compressor is installed and the system is closed, the system must be evacuated to 250 microns or lower. A vacuum decay test is suggested to assure the system is dry and leak free.

9. REFRIGERANT CHARGING WITH "NEAR AZEOTROPES." Refrigerant MP66 is a near azeotropic mixture (see Copeland booklet 92-81 "Guide to Refrigerant Mixtures"). It is important that during initial charging or "topping" off a system that the refrigerant be removed from the charging cylinder in the liquid phase. Many of the cylinders for the newer refrigerants use a dip tube so that in the upright position liquid is drawn from the cylinder. DO NOT vapor charge out of a cylinder unless the entire cylinder is to be charged into the system. Refer to charging instructions provided by the refrigerant manufacturer.

With the system in a 250 micron or lower vacuum, liquid can be charged into the system high side. The initial charge should be about 80% of the amount of refrigerant removed from the system.

Put the system into operation and observe its performance. Additional refrigerant may have to be added to the operating system to obtain optimum performance.

When adding refrigerant to an operating system, it may be necessary to add the refrigerant through the compressor suction service valve. Because the refrigerant leaving the refrigerant cylinder must be in the liquid phase, care must be exercised to avoid damage to the compressor. It is suggested that a sight glass be connected between the charging hose and the compressor suction service valve. This will permit your adjusting the cylinder hand valve so that liquid can leave the cylinder while allowing vapor to enter the compressor.

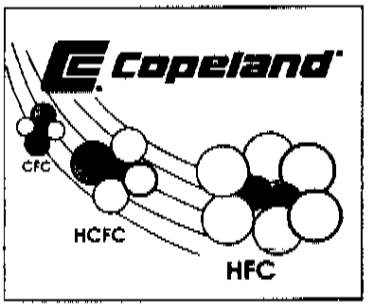
10. Operate the system and record the operating conditions. Compare this data to the base data taken in item 2 this section. Make adjustments as needed.

11. Properly label the components. Tag the compressor with the refrigerant used (MP66) and the lubricant used. The proper color code for MP66 is Light Gray Green PMS (Paint Matching System) 413.

12. Clean up and properly dispose of removed lubricant. Check local and state laws regarding the disposal of refrigerant lubricants. Recycle or reclaim the removed refrigerant.

CAUTION: These guidelines are intended for use with MP66 only, not for refrigerants which are similar to MP66. *Other refrigerants may not be compatible with the materials used in our compressors or the lubricants recommended in this bulletin resulting in unacceptable reliability and durability of the compressor.*

The information contained herein is based on technical data and tests which we believe to be reliable and is intended for use by persons having technical skill, at their own discretion and risk. Since conditions of use are beyond Copeland's control, we can assume no liability for results obtained or damages incurred through the application of the data presented.



Refrigerant Changeover Guidelines

CFC-12 to MP39

Leading the Industry with Environmentally Responsible Refrigerant Solutions

Copeland does not advocate the wholesale changeover of CFC refrigerants to HCFCs or HFCs. If a system is not leaking refrigerant to the atmosphere, and is operating properly, there is no technical need to replace the CFC refrigerant. In fact, changing the refrigerant may void the U.L. listing of the unit. However, once the decision has been made to make the change from CFC-12 to the interim MP39, the following guidelines are recommended.

CONSIDERATIONS

1. Copeland's lubricant recommendation for use with MP39 is a Polyol Ester (POE), Mobil EAL™ Arctic 22 CC.* This is currently the only POE lubricant approved for use in a Copeland compressor and is available from all authorized Copeland wholesalers. The use of any other POE lubricant may void the compressor warranty. Refer to item 10 this section for a list of other approved lubricants for use with MP39 or Application Engineering Bulletin 17-1284 for a complete list of all Copeland approved lubricants.

2. MP39 should be used only in systems where the saturated suction temperature is maintained at -10°F or higher. **It should not be mixed with any other refrigerant!**

3. The expansion valve may need to be changed. The existing CFC-12 valve when used with MP39 will have approximately 25% more capacity. Oversized expansion valves can result in hunting and refrigerant floodback. Consult with the thermostatic expansion valve manufacturer for the correct valve and size.

4. Filter-driers must be changed at the time of conversion. This is proper air conditioning/refrigeration practice.

   a. Solid core driers such as ALCO ADK, are compatible with either CFC-12 or MP39.

   b. Compacted bead driers can use XH6 or XH9 molecular sieve material such as found in the ALCO EK or EKH series.

   c. If a loose fill type drier is to be used, XH9 molecular sieve is required.

5. MP39 exhibits marginally higher pressures than CFC-12 at normal condensing temperatures. We do not believe this will require readjustment of safety controls; however, you should verify this with the system manufacturer or component suppliers.

6. Systems that use a low pressure controller to maintain space temperature may have to have the cut-out and cut-in points changed. With MP39, the pressure setting must reflect an average temperature of the refrigerant in the evaporator. Because of refrigerant glide (see Copeland booklet 92-81, "Guide To Refrigerant Mixtures"), the refrigerant entering the evaporator for a specific suction pressure will be approximately 8°F colder than the refrigerant vapor at the outlet of the evaporator (not considering superheat). Therefore, the average refrigerant temperature will be at a midpoint pressure/temperature equivalent.

Example: A 35°F refrigerated space usually requires that the refrigerant temperature in the evaporator be approximately 25°F. Using MP39, the liquid entering the evaporator may be as cold as 21°F, and the vapor temperature before superheat may be 29°F. Taking the saturated vapor pressure at 29°F gives us the exit pressure at the evaporator of 24.8 psig. Considering a 2 psig pressure drop in the suction line, the pressure control cut-out should be set at 22.8 psig.

The cut-in point will be based on the vapor pressure/temperature value. Let's assume that the space temperature can rise to 37°F before the compressor is turned on. 37°F vapor pressure is 31.6 psig. Set the cut-in at 32 psig.

7. Because of glide, pressure regulators such as EPRs may have to be reset. Contact the EPR manufacturer for correct settings.

** Mobil EAL Arctic 22 and Arctic 22 CC are currently equivalent lubricants.*

8. Due to refrigerant glide, it is important that when measuring and/or adjusting TEV superheat, the pressure and SATURATED VAPOR TABLES be used. Example: The pressure measured at the TEV bulb is 30 psig. The Pressure/Temperature (P/T) chart shows that the saturated vapor temperature for 30 psig is 35.2°F. If the actual refrigerant temperature measured is 45.0°F, the superheat is 9.8°F.

To measure sub-cooling at the condenser outlet or at the TEV inlet to verify that a solid column of liquid is present, measure the pressure and the refrigerant temperature at the location that the sub-cooling information is needed. Compare it to the saturated liquid temperature from the SATURATED LIQUID TABLES. Example: A pressure of 140 psig is measured at the condenser coil outlet. From the P/T chart, 140 psig is 100.2°F saturated liquid temperature. If the actual refrigerant temperature is 95°F, the liquid is sub-cooled 5.2°F.

9. Systems using MP39 may have a lower system pressure drop than with CFC-12. Because of the lower pressure drop, pilot operated solenoid valves and pressure regulators may not operate. Check with the manufacturer of any pressure regulators and pilot operated solenoid valves used in the system to be sure that they will operate properly. These controls may have to be downsized.

10. Mineral oil lubricant alone, such as 3GS, cannot be used as the compressor lubricant. Copeland recommends Polyol Ester (POE) lubricants, specifically Mobil EAL Arctic 22 CC at a minimum concentration of 50%. A mixture of 3GS mineral oil (MO) and Zerol 200TD Alkyl Benzene (AB) with at least 50% alkyl benzene, or pure Virginia KMP MS 2212, can also be used.

Before starting the changeover, it is suggested that at least the following items be ready:

1. Safety glasses
2. Gloves
3. Refrigerant service gauges
4. Electronic thermometer
5. Vacuum pump capable of pulling 250 microns
6. Thermocouple micron gauge
7. Leak detector
8. Refrigerant recovery unit including refrigerant cylinder
9. Proper container for removed lubricant
10. New liquid control device
11. Replacement liquid line filter-drier(s)
12. New lubricant
    a. Mobil EAL Arctic 22 CC (POE)
    b. or Zerol 200TD (AB) or Virginia KMP MS 2212 (AB)
13. MP39 pressure temperature chart
14. MP39 refrigerant

CHANGEOVER PROCEDURE

1. The system should be thoroughly leak tested with the CFC-12 refrigerant still in the system. All leaks should be repaired before the MP39 refrigerant is added.

2. It is recommended that system operating conditions be recorded with the CFC-12 still in the system. This will provide the base data for comparison when the system is put back into operation with the MP39.

3. The system should be electrically shut off and the refrigerant properly removed from the system. Measure the quantity of refrigerant removed. This will provide a guide for recharging the system with MP39 (see item 9 this section).

4. The mineral oil must be removed from the compressor crankcase. Hermetic compressors will have to be removed from the piping and the lubricant drained out through the suction stub. It is advisable to do an acid test on the oil.

5. Measure the amount of lubricant removed. It should be within 4 to 6 ounces of the compressor's factory oil charge. The lubricant charge is indicated on the name plate of Copelaweld® compressors. Copelametic® compressor oil charges can be found in Application Engineering Bulletin 4-1281. If the lubricant charge is unknown, an authorized Copeland wholesaler can provide the technician with the information.

If the amount of lubricant removed is less than 50% of the factory charge, it will be necessary to flush the excess lubricant from the system.

Those systems that have oil separators, oil reservoirs, oil floats and suction line accumulators must have the oil drained from them. If the liquid control device is going to be replaced, it is advisable that the suction line, liquid line and evaporator coil be blown clean using properly regulated dry nitrogen.

NOTE: Properly dispose of the lubricant.

6. Before the new lubricant is installed into the compressor, be sure all leaks are repaired, liquid control devices and any other system components are changed. Install the correct liquid line filter-drier. Driers must be compatible with the refrigerant and lubricant.

7. Be advised that POEs are very hygroscopic. They will very quickly absorb moisture from the air once the

container is opened. Once the lubricant is added to the compressor, the compressor should be quickly installed. Like an open container, an open compressor with POE will absorb moisture. Add the correct amount of lubricant to the compressor. It is important that the system contain at least 50% POE. On systems using enhanced surfaces in the heat exchanger, excessive mineral oil can adversely effect the heat transfer due to logging. Therefore, it is desirable to have no more than 20% mineral oil in systems employing these type surfaces.

8. Once the compressor is installed and the system is closed, the system must be evacuated to 500 microns or lower. A vacuum decay test is suggested at this time to assure the system is dry and free of leaks.

9. REFRIGERANT CHARGING WITH "NEAR AZEOTROPES." Refrigerant MP39 is a near azeotropic mixture (see Copeland booklet 92-81 "Guide to Refrigerant Mixtures"). It is important that during initial charging or "topping" off a system that the refrigerant be removed from the charging cylinder in the liquid phase. Many of the cylinders for the newer refrigerants use a dip tube so that in the upright position liquid is drawn from the cylinder. DO NOT vapor charge out of a cylinder unless the entire cylinder is to be charged into the system. Refer to charging instructions provided by the refrigerant manufacturer.

With the system in a 500 micron or lower vacuum, liquid can be charged into the system "high side." The initial charge should be about 80% of the amount of refrigerant removed from the system.

Put the system into operation and observe its performance. Additional refrigerant may have to be added to the operating system to obtain optimum performance.

When adding refrigerant to an operating system, it may be necessary to add the refrigerant through the compressor suction service valve. Because the refrigerant leaving the refrigerant cylinder must be in the liquid phase, care must be exercised to avoid damage to the compressor. It is suggested that a sight glass be connected between the charging hose and the compressor suction service valve. This will permit your adjusting the cylinder hand valve so that liquid can leave the cylinder while allowing vapor to enter the compressor.

10. Operate the system and record the operating conditions. Compare this data to the base data taken in item 2. Check and adjust the expansion valve superheat setting if necessary. Make adjustment to other controls as needed.

11. Properly label the components. Tag the compressor with the refrigerant used (MP39) and the lubricant used. The proper color code for MP39 is Coral Red PMS (Paint Matching System) 177.

12. Clean up and properly dispose of removed lubricant. Check local and state laws regarding the disposal of refrigerant lubricants. Recycle or reclaim the removed refrigerant.

CAUTION: These guidelines are intended for use with MP39 only, not for refrigerants which are similar to MP39. *Other refrigerants may not be compatible with the materials used in our compressors or the lubricants recommended in this bulletin resulting in unacceptable reliability and durability of the compressor.*

The information contained herein is based on technical data and tests which we believe to be reliable and is intended for use by persons having technical skill, at their own discretion and risk. Since conditions of use are beyond Copeland's control, we can assume no liability for results obtained or damages incurred through the application of the data presented.