Operation and Maintenance
Planning for the CFC Phaseout

INTRODUCTION Because of the phaseout of the manufacture of CFCs by 1996, the owners of most air conditioning and refrigeration equipment (AC&R) must determine now the manner in which they want to respond to this situation. There are several possibilities; continue to use the existing refrigerant, convert the refrigerant to an alternate, or replace the equipment. It must be remembered that only the manufacture of the refrigerants will be prohibited, not the use of them.

CONTAINMENT A decision to continue using the existing refrigerant will result in increasing costs due to a decreasing supply of that refrigerant. At some time in the future, the owner will be faced with either of the other options. At the least, the owner should attempt to contain the refrigerant by updating purge units on low pressure centrifugal chillers, and eliminating leaks on all systems.

CONVERSION A decision to convert the equipment to a new refrigerant will require detailed engineering and economic analyses of the existing system. An engineering analysis to determine the current and predicted performance should be made. Changes to components may be necessary to utilize the new refrigerant or to return performance to acceptable values.

REPLACEMENT A decision to replace the equipment can be made for a number of reasons. When the equipment is near the end of its useful life, conversion is not cost effective. When capacity is already marginal, either new properly sized equipment or additional equipment will be necessary to provide the capacity required.

NEXT STEPS The owner should decide **now** what steps will be taken for each system. The strategy should cover the possibility of an equipment failure occurring before the plan is implemented. The owner may decide at that time to convert or replace the equipment as the plan determines.

The following pages describe some of the recommendations involved in the conversion of systems to alternate refrigerants.

Our advice is intended to complement the equipment manufacturers' recommendations - not replace them. If you have doubts about any particular procedure, contact your equipment service representative.

STRATEGIC CHOICES FOR EXISTING CHILLERS

CONTAINMENT Containment - maintain the original type of refrigerant in the chiller by utilizing service products and techniques as listed below:

L P Chillers Low pressure chillers - CFC-11, CFC-113

1. Install high efficiency purge unit
2. Install pressure sealing system to keep unit slightly pressurized to prevent air infiltration when unit is shutdown
3. Install a relief valve assembly in place of the rupture disc
4. Install service valves to isolate components that need to be serviced during regular maintenance schedules
5. Use good service practices such as frequent leak testing and using refrigerant recovery devices when removing the refrigerant.

H P Chillers High pressure chillers - CFC-12, R-500, HCFC-22

1. Install service valves to isolate components that need to be serviced during regular maintenance schedules
2. Use good service practices such as frequent leak testing and using refrigerant recovery devices when removing the refrigerant.

CONVERSION Conversion - converting to a non-CFC refrigerant

of CFC-11 or –113 Converting a CFC-11 or CFC-113 chiller to HCFC-123

1. Perform an engineering analysis to determine chiller performance after conversion
2. Replace all original gaskets and O-rings that are not compatible with HCFC-123
3. Replace or rewind a hermetic motor whose materials are not compatible with HCFC-123
4. Replace impeller with one designed specifically for HCFC-123 to regain lost capacity
5. Flush system of mineral oil as per manufacturer's recommended procedures
6. Add new refrigerant and refrigerant oil
7. Install equipment room ventilation system and refrigerant monitor in accordance with requirements of ASHRAE 15-1992, Safety Code for Mechanical Refrigeration
8. Train operators in new safety and operating procedures specific to HCFC-123
9. Install refrigerant containment devices listed previously and use proper containment service techniques.

of CFC-12 or R-500 Converting a CFC-12 or R-500 chiller to HFC-134a

1. Perform an engineering analysis to determine chiller performance after conversion
2. Replace motor assembly due to higher horsepower requirements
3. Replace gearset to increase the impeller speed to recover lost capacity
4. Flush system of mineral oil as per manufacturer's recommended procedures
5. Add new refrigerant and an ester-based refrigerant oil
6. Install equipment room ventilation system and oxygen monitor in accordance with requirements of ASHRAE 15-1992, Safety Code for Mechanical Refrigeration
7. Install refrigerant containment devices listed previously and use proper containment service techniques.

REPLACEMENT Replacement - replacing a CFC chiller with a non-CFC chiller

with HCFC-123 Replacing with a HCFC-123 chiller

1. All necessary containment equipment plus room ventilation and refrigerant monitoring equipment in accordance with ASHRAE 15-1992, Safety Code for Mechanical Refrigeration, must be included.

with HCFC-22 or HFC-134a Replacing with an HCFC-22 or HFC-134a chiller

1. Room ventilation and oxygen monitoring equipment in accordance with ASHRAE 15-1992, Safety Code for Mechanical Refrigeration, must be included.

CONVERTING UNITARY AIR CONDITIONING OR MEDIUM AND LOW TEMPERATURE REFRIGERATION SYSTEMS

CONVERSION Medium and low temperature CFC-12 or R-502 refrigeration systems may be converted to HCFC-22, or medium temperature CFC-12 systems may be converted to HFC-134a. An engineering analysis must be performed which examines the compressor capacity, condenser size, refrigerant line size, suction line insulation, electrical characteristics, controls, and receiver pressure limits. A redesigned system may be necessary to provide the evaporator temperature required in the system; low temperature systems may require compound or two stage systems. HCFC-22 is scheduled to be out of production by the year 2020, but this is subject to an earlier phaseout.

from CFC-12 Converting from CFC-12 to HCFC-22

1. Conduct an engineering analysis
2. Compressor change required
3. Condenser will be slightly oversized, resulting in lower condensing temperature (not detrimental)
4. Suction lines will be oversized; oil return must be checked
5. Thermostatic expansion valves must be changed and distributors must be checked
6. Suction lines and accumulators must be insulated.

from R-502

Converting from R-502 to HCFC-22

1. Conduct an engineering analysis
2. Compressor may be reused
3. Condenser will be slightly oversized, resulting in lower condensing temperature (not detrimental)
4. Suction lines will be oversized; oil return must be checked
5. Thermostatic expansion valves must be changed and distributors must be checked
6. Suction lines and accumulators must be insulated.

from CFC-12

Converting from CFC-12 to HFC-134a

1. Conduct an engineering analysis
2. Compressor may be reused
3. Completely remove and clean residual mineral oil from system using manufacturer's recommended procedures
4. Replace existing filter-driers, filters, moisture indicators and strainers with new ones compatible with new refrigerant and oil
5. Check entire system for leaks
6. Evacuate and charge system
7. Operate system and adjust controls as necessary.