

VIII. RETROFIT PROCEDURES

The following procedures for retrofitting from a given CFC to one of the alternative refrigerants are intended to serve as a general basis for the overall procedure involved. Use of the guidelines along with any pertinent manufacturers recommendations should assure a successful retrofit. Due to the great number and complexity of systems used within the HVAC&R community it is impossible to cover every application. Should a particular system not be covered contact the equipment manufacturer or Elf Atochem's technical support number at 1-800-RETRO95 for assistance. Certain manufacturers require specific lubricating requirements to maintain warranties, consult them for assistance when necessary. Elf Atochem believes that the following procedures are correct and in accordance with most manufacturers guidelines. Elf Atochem reserves the right to update these procedures as deemed necessary, and makes no implied warranty for retrofitted equipment. Should Elf Atochem's guidelines conflict with original equipment manufacturers' guidelines, it is recommended that the OEM's guidelines be used.

A. HERMETIC RECIPROCATING\SCROLL

RETROFIT PROCEDURE

R-12 to Forane 409A (FX-56)

Step 1.

Gather baseline data from R-12 system to be used to optimize the system with R-409A. Note the current R-12 charge, lubricant charge, existing operating temperatures and pressures, and overall system performance. (Refer to Retrofit Checklist included in Appendix A). Leak check system.

Step 2.

Recover the existing R-12 charge using standard industry recovery equipment and guidelines. Elf Atochem has a refrigerant reclamation service available to handle the recovered R-12. (Refer to Forane Rollover Program).

Step 3.

Removal of existing mineral oil from the system is not necessary because R-409A is compatible with mineral oil, polyolesters, and alkylbenzenes.

Step 4.

Replace filter driers and repair any leaks found in the initial leak check.

Step 5.

Evacuate the system using a deep vacuum (at least 500 microns) to insure that remaining traces of moisture have been removed.

Step 6.

Charge system with Forane R-409A refrigerant in the liquid phase only. The approximate R-408A charge for most applications will be 85-90% of the original R-12 charge. Refer to the pressure temperature charts for final adjustment of charge. Note: refrigerant only needs to leave the cylinder in the liquid phase and may be "flushed" into the system for final charging if necessary.

Step 7.

Place proper markings and identification on the system to indicate that the system has been retrofitted to R-409A and appropriate lubricant. Indicate the new charge of R-409A in a visible location.

Step 8.

Start the system and make final expansion valve adjustments to achieve proper superheat settings. Normal operating pressures of R-409A vary from 1-2 psi higher on the low-side and 20% higher on the high-side of most typical refrigeration applications.

B. SEMI-HERMETIC RECIPROCATING

RETROFIT PROCEDURE

R-12 to Forane 409A (FX-56)

Step 1.

Gather baseline data from R-12 system to be used to optimize the system with R-409A. Note the current R-12 charge, lubricant charge, existing operating temperatures and pressures, and overall system performance (Refer to Retrofit Checklist included in Appendix A). Leak check system.

Step 2.

Recover the existing R-12 charge using standard industry recovery equipment and guidelines. Elf Atochem has a refrigerant reclamation service available to handle the recovered R-12 (refer to Forane Rollover Program).

Step 3.

Removal of existing mineral oil from the system is not necessary because R-409A is compatible with mineral oil, polyolesters, and alkylbenzenes.

Step 4.

Replace filter driers and repair any leaks found during the initial leak check.

Step 5.

Evacuate the system using a deep vacuum (at least 500 microns) to insure that remaining traces of moisture have been removed.

Step 6.

Charge system with Forane 409A refrigerant in the liquid phase only. The approximate R-409A charge for most applications will be 85-90% of the original R-12 charge. Refer to the pressure temperature charts for final adjustment of charge. Note: refrigerant only needs to leave the cylinder in the liquid phase and can be "flushed" into the system for final charging if necessary.

Step 7.

Place proper markings and identification on the system to indicate that the system has been retrofitted to R-409A and appropriate lubricant. Indicate the new charge of R-409A in a visible location.

Step 8.

Start the system and make final expansion valve adjustments to achieve proper superheat settings. Normal operating pressures of R-409A vary from 1-2 psi higher on the low-side and 20% higher on the high-side of most typical refrigeration applications.

B. SEMI-HERMETIC RECIPROCATING

RETROFIT PROCEDURE

R-12 to Forane 134a

Step 1.

Gather baseline data from R-12 system to be used to optimize the system with R-134a and polyolester lubricant. Note the current R-12 charge, lubricant charge, existing operating temperatures and pressures, and overall system performance (Refer to Retrofit Checklist included in Appendix A).

Step 2.

Removal of existing mineral oil from the system. It is important that the existing mineral oil used in the current system be removed and the remaining residual mineral oil content left in the system be reduced to a level of 5% or less. This can best be accomplished by draining the mineral oil from all accessible points in the system (compressor, oil separator, low spots in the evaporator) and replacing with an equivalent charge of polyolester lubricant. Once this has been done operate the system with the R-12 for a period of time to insure proper miscibility of the two lubricants. Test for mineral oil residual content and repeat step 2 if necessary until the desired 5% level is obtained. Experience has shown that for most systems the desired levels are reached within three cycles operating at 24 hour intervals.

Step 3.

Recover the existing R-12 charge and lubricant charge using standard industry recovery equipment and guidelines. Elf Atochem has a refrigerant reclamation service available to handle the recovered R-12 (refer to Forane Rollover Program).

Step 4.

Replace filter driers with new cores or compacted bead desiccant and examine sight glass for compatibility to new moisture level indication levels necessary (150 ppm). Due to the ability of the new line of refrigerants to retain moisture it is highly advised that this step is not omitted.

Step 5.

Evacuate the system using a deep vacuum (at least 500 microns) to insure that remaining traces of moisture have been removed.

Step 6.

Charge compressor with proper polyolester lubricant charge and Forane 134a refrigerant. The approximate R-134a charge for most medium and high temperature applications will be 90% of the original charge. Refer to the pressure temperature charts for final adjustment of charge. It is not recommended to charge by visual indication through the sight glass due to the nature of the refrigerant and lubricant to appear "cloudy" in the liquid portion of the system, even at the proper charge.

C. SCREW

RETROFIT PROCEDURE

R-12 to Forane 409A (FX-56)

Step 1.

Gather baseline data from R-12 system to be used to optimize the system with R-409A. Note the current R-12 charge, lubricant charge, existing operating temperatures and pressures, and overall system performance (Refer to Retrofit Checklist included in Appendix A). Leak check system.

Step 2.

Recover the existing R-12 charge using standard industry recovery equipment and guidelines. Elf Atochem has a refrigerant reclamation service available to handle the recovered R-12 (refer to Forane Rollover Program).

Step 3.

Removal of existing mineral oil from the system is not necessary because R-409A is compatible with mineral oil, polyolesters, and alkylbenzenes.

Step 4.

Replace filter driers and repair any leaks found during the initial leak check.

Step 5.

Evacuate the system using a deep vacuum (at least 500 microns) to insure that remaining traces of moisture have been removed.

Step 6.

Charge system with Forane 409A refrigerant in the liquid phase only. The approximate R-408A charge for most applications will be 85-90% of the original R-12 charge. Refer to the pressure temperature charts for final adjustment of charge. Note: refrigerant only needs to leave the cylinder in the liquid phase and can be "flushed" into the system for final charging if necessary.

Step 7.

Place proper markings and identification on the system to indicate that the system has been retrofitted to R-409A and appropriate lubricant. Indicate the new charge of R-409A in a visible location.

Step 8.

Start the system and make final expansion valve adjustments to achieve proper superheat settings. Normal operating pressures of R-409A vary from 1-2 psi higher on the low-side and 20% higher on the high-side of most typical refrigeration applications.

C. SCREW

RETROFIT PROCEDURE

R-12 to Forane 134a

Step 1.

Gather baseline data from R-12 system to be used to optimize the system with R-134a and polyolester lubricant. Note the current R-12 charge, lubricant charge, existing operating temperatures and pressures, and overall system performance (Refer to Retrofit Checklist included in Appendix A).

Step 2.

Removal of existing mineral oil from the system. It is important that the existing mineral oil used in the current system be removed and that the remaining residual mineral oil content left in the system be reduced to a level of 5% or less. This can best be accomplished by draining the mineral oil from all accessible points in the system (compressor, oil separator, low spots in the evaporator) and replacing with an equivalent charge of polyolester lubricant. Once this has been done operate the system with the R-12 for a period of time to insure proper miscibility of the two lubricants. Test for mineral oil residual content and repeat step 2 if necessary until the desired 5% level is obtained. Experience has shown that for most systems the desired levels are reached within three cycles operating at 24 hour intervals.

Step 3.

Recover the existing R-12 charge and lubricant charge using standard industry recovery equipment and guidelines. Elf Atochem has a refrigerant reclamation service available to handle the recovered R-12 (refer to Forane Rollover Program).

Step 4.

Replace filter driers with new cores or compacted bead desiccant and examine sight glass for compatibility to new moisture level indication levels necessary (150 ppm). Due to the ability of the new line of refrigerants to retain moisture it is highly advised that this step is not omitted.

Step 5.

Evacuate the system using a deep vacuum (at least 500 microns) to insure that remaining traces of moisture have been removed.

Step 6.

Charge compressor with proper polyolester lubricant charge and Forane 134a refrigerant. The approximate R-134a charge for most medium and high temperature applications will be 90% of the original charge. Refer to the pressure temperature charts for final adjustment of charge. It is not recommended to charge by visual indication through the sight glass because of the nature of the refrigerant and lubricant to appear "cloudy" in the liquid portion of the system, even at the proper charge.

E. AUTOMOTIVE

RETROFIT PROCEDURE

R-12 to Forane 134a

Automotive air conditioners, also known as mobile air conditioners (MACs), even though small in size do not lack in complexity. MACs pose a special problem for retrofitting due to the presence of elastomer hoses (several materials); variable system operation (compressor RPM is a multiple of engine RPM); multitude of compressor types (rotary vane, piston, scroll, etc); expansion device type (fixed orifice tube or thermal expansion valve (TXV), etc. All of the above, plus a variety of vehicle specific problems, such as age, geographic location, etc. make retrofitting a MAC a challenging project.

All refrigerant and system handling regulations that apply to stationary air conditioners and refrigeration units, also apply to MACs. In addition, a set of Society of Automotive Engineers (SAE) J-standards specific to mobile applications also apply. A summary of all these standards is included in chapter II of this manual for your information. One of the most important regulations deals with the retrofitting of the service ports. Typically, MACs have 2 service ports, one on each side of the system. The high side is a 3/16" flare fitting and the low side a standard 1/4" refrigeration flare fitting, both with external threads. After a system retrofit is completed, these fittings must be changed to FORANE-134a approved fittings per SAE J-639 (internal, metric threads) in such a way that the CFC-12 original fittings are permanently disabled.

Regarding the refrigerant choice for a retrofit, overwhelmingly, the mobile air conditioning industry has chosen HFC-134a as the leading candidate and Elf Atochem fully supports this position. However, while HFC-134a is the only pure refrigerant available, there are several other candidates in the market in the form of blends, and servicemen should be aware of them to avoid possible cross contamination of refrigerants in their equipment. The Mobile Air Conditioning Society (M.A.C.S.) has petitioned the U.S. EPA to ban the use of any refrigerant other than HFC-134a for MAC retrofits.

For lubricant oils, there is currently a choice of 2 synthetic materials: Poly Alkaline Glycols (PAGs) or Polyolesters (POEs). Although it varies with the car manufacturer, most have chosen PAGs as their OEM fluid, as well as their retrofit fluid. However, in some instances a manufacturer may recommend the use of a PAG for OEM and a POE for retrofits. Be sure to check with the vehicle manufacturer for any oil specifications if available. If no oil is specified for retrofits, then use the recommended OEM oil.

The retrofit procedure that follows is a recommendation developed and tested by Elf Atochem in a fleet of vehicles, and is based on SAE, M.A.C.S. and industry recommendations. In general, if a vehicle manufacturer has developed a specific retrofit procedure, that procedure and not the one listed here should be followed.

Step 1.

Thoroughly leak check and evaluate the system for signs of previous leaks, defective components, etc. Replace or repair as necessary after charge and recovery. Empty systems should be charged with a small amount of CFC-12 to leak check.

Step 2.

Recover CFC-12 charge into a suitable container by means of approved recovery equipment.

At this point it should be decided whether the system will be power flushed with CFC-12 to remove the original mineral oil or not. Power flushing means pumping liquid CFC-12 refrigerant in a closed loop that includes the system. This procedure is performed with a special unit, sometimes contained in the refrigerant recovery equipment, that pumps the refrigerant into the system, recovers it, separates any dissolved oil and reintroduces the oil-free refrigerant to the loop. By running this process for a relatively short period of time (about 30 min.) most of the mineral oil is removed from a system. The decision to power flush a system should be made based on car or compressor manufacturer recommendations, age of the system, labor cost and proper equipment availability. The following steps assume that a system will be power flushed, with special instructions for non-flushed systems.

Step 3.

Pull a system vacuum to 29 in of Hg for 5 min. (if not flushing evacuate at the same level for 45 min. and go to step 7).

Step 4.

Connect the power flushing equipment and flush for 30 min. or longer. Systems with a TXV will need external heat to 'open' the valve.

Step 5.

Recover liquid CFC-12 refrigerant used to flush and evacuate to 29 in of Hg for 30 min.

Step 6.

Add the recommended amount of HFC-134a compatible lubricant per system/compressor manufacturer's specifications. Usually 6 to 8 fl. oz.

step 7.

Install SAE approved HFC-134a fitting disabling all other CFC-12 fittings in the system.

Step 8.

Recharge with FORANE-134a using 90% by weight of the original CFC-12 charge.

Step 9.

Leak check system again, paying special attention to any connections that may have been worked on.

Step 10.

Clearly label the system indicating it has been retrofitted to HFC-134a and a synthetic oil.