

EFFECTS OF THE CFC-12 Production Ban On Motor Vehicle Air Conditioning Systems

Chart 1

Summary of the Regulations That Affect A/C Repair Costs

- 1987 The United States and 22 other countries sign the Montreal Protocol, calling for the phaseout of CFC production to protect the ozone layer.
- 1990: The Clean Air Act (CAA) amendments of 1990 impose new regulations on the A/C service industry
- 1992: The sale of R-12 in small cans is restricted.
- 1993: All A/C service shops must recover R-12, and their technicians must be trained and certified in the recovery procedure.
- 1995: R-12 production ceases December 31, 1995.
R-12 may be used for repair and service after phaseout.
Conservation efforts and reserves will determine availability

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native refrigerants, we attended the 39th Annual International Mobile Air Conditioning Association (IMACA) convention in November 1995. Chart 1 is a summary of the regulations that have shaped the current status of CFC-12 and the available alternative refrigerants.

At the convention, Frank Allison, executive director of IMACA, presented a paper titled "Projection of CFC-12 Supply and Usage After Production Phaseout December 31, 1995." That paper contained charts 2 and 3, which follow:

**What motorhome
owners need to
know about the
supply of this
refrigerant and
the alternatives.**

A number of questions have arisen of late regarding the availability and other aspects of CFC-12, known as R-12 or by the trade name Freon. In order to obtain some factual information about the supply of cfc-12 and also about alter-

Chart 2

CFC-12 On Hand January 1, 1996 What Can Be Identified Or Assumed And is Included In Projections

- Rate of A/C service
- Total vehicles requiring CFC-12 after January 1, 1996
- Projected usage of CFC-12 for normal A/C service
- Projected usage of CFC-12 for collision repair
- CFC-12 recovered from scraped vehicles
- Retrofit activity
- CFC-12 supply on hand January 1, 1996
- CFC-12 stockpiled by OEMs

Chart 3
What Is Not Identified Or Assumed
And Is Not Included In Projections

- CFC-12 stockpiled in service sector
- CFC-12 stockpiled by DIYers (Do-It-Yourselfers)
- CFC-12 used by off-road, agriculture, and transport refrigeration
- Annual quantity of CFC-12 reclaimed from the heating, ventilating, and air conditioning (HVAC) industry
- Illegal refrigerant sales
- CFC-12 used in HVAC industry (the HVAC industry services ice machines, vending machines, refrigerators, small display cases, and chillers. The majority of reclaimed refrigerant is returned to the HVAC industry and should not be factored into the motor vehicle air-conditioning (MVAC) supply)

Mr. Allison used data from the Industrial Market Research Study, prepared in 1993; the Automotive Cooling Institute; the American Automobile Manufacturing Association Facts and Figures 1995. After an in-depth study, Mr. Allison arrived at this conclusion: "Regardless of how you play with numbers, the beginning inventory of CFC-12 on hand January 1, 1996, will not support service on the remaining CFC-12 fleet and perform

collision repair."

Even including the OEM stockpile of 20 to 30 million pounds, which is not likely available to the aftermarket service industry, his calculations indicate a shortfall in 1998. Assuming that this report is even remotely accurate, motorhome owners will soon have to make definitive choices when faced with repairs of their over-the-road (engine-driven) air-conditioning system. Since RV chassis manufacturers

have only recently converted to R-134a refrigerant, it is possible that may apply to the owners of some late-model motorhomes as well.

It probably will be most practical; to continue using CFC-12 as long as possible, even if minor repairs are required. The consumer should be aware that the price of CFC-12 is expected to increase continually. At the beginning of 1996, 30 pound canisters of R-12 carried an average wholesale price of \$235 each. In June 1996, those same canisters were priced at more than \$500 in some areas. Part of the reason for the increase in price is taxes. In 1995, the federal excise tax for CFC-12 was \$5.35 per pound. As of January 1, 1996, it was \$5.80 per pound.

As of June 1996, there were five approved retrofit alternatives to CFC-12. These were R-134a, FRIGC (FR-12), R401c (DuPont's MP52), FREEZONE, and IKON 12. Another refrigerant, FREEZ 12, is under re-

Chart 4
Motor Vehicle Air-Conditioning Substitutes For CFC-12
Reviewed Under EPA's SNAP Program

Name(1)	Status(2)	Date	Manufacturer	Components / Reason Unacceptable							
				HCFC-22	HCFC-124	HCFC-142b	HFC-134a	HFC-152a	Propane (R-290)	Butane (R-600)	Isobutane (R-600a)
HFC-134a	ASU	3/18/94	Several				100				
R-401C	ASU	3/18/94	DuPont (not sold in US)	33	52			15			
FRIGC FR-12	ASU	6/13/95	Intermagnetics General 800-555-1442		39		59			2	
Freezone (3)	ASU	5/22/96	Freezone 504-288-2847			19	79				
Ikon-12	ASU	5/22/96	Ikon Corp. 601-868-0755	Composition Claimed as Confidential Business Information							
R-406A /GHG /McCool (4)	P	5/22/96	People's Welding 800-382-9006	55		41					4
GHG-X4 /Autofrost /Chill-It (4)	P	5/22/96	People's Welding 800-382-9006	51	28.5	16.5					4
Hot Shot/Kar Kool (4)	P	5/22/96	ICOR 800-357-4062	50	39	9.5					1.5
GHG-HP (4)	P	5/22/96	People's Welding 800-382-9006	65		31					4
FREEZ-12	under review		Technical Chemical			20	80				
OZ-12	UNA	3/18/94	OZ Technology	Flammable blend of hydrocarbons; insufficient data to demonstrate safety							
R-176	UNA	3/18/94	Arctic Chill	Contains CFC-12, which is inappropriate in a CFC-12 substitute							
HC-12a	UNA	6/13/95	OZ Technology	Flammable blend of hydrocarbons; insufficient data to demonstrate safety							
R-405A	UNA	6/13/95	Greencool	Contains a perfluorocarbon, which has extremely high global warming potential and lifetime							

view and will be "proposed acceptable" as of July 1996. Several other refrigerants are also listed as "proposed acceptable." See IMACA's table of new refrigerants (Chart 4) for the detailed list.

In order to receive an ASU (Acceptable Subject to Use) rating, a refrigerant must have specific fittings and labels to prevent cross contamination.

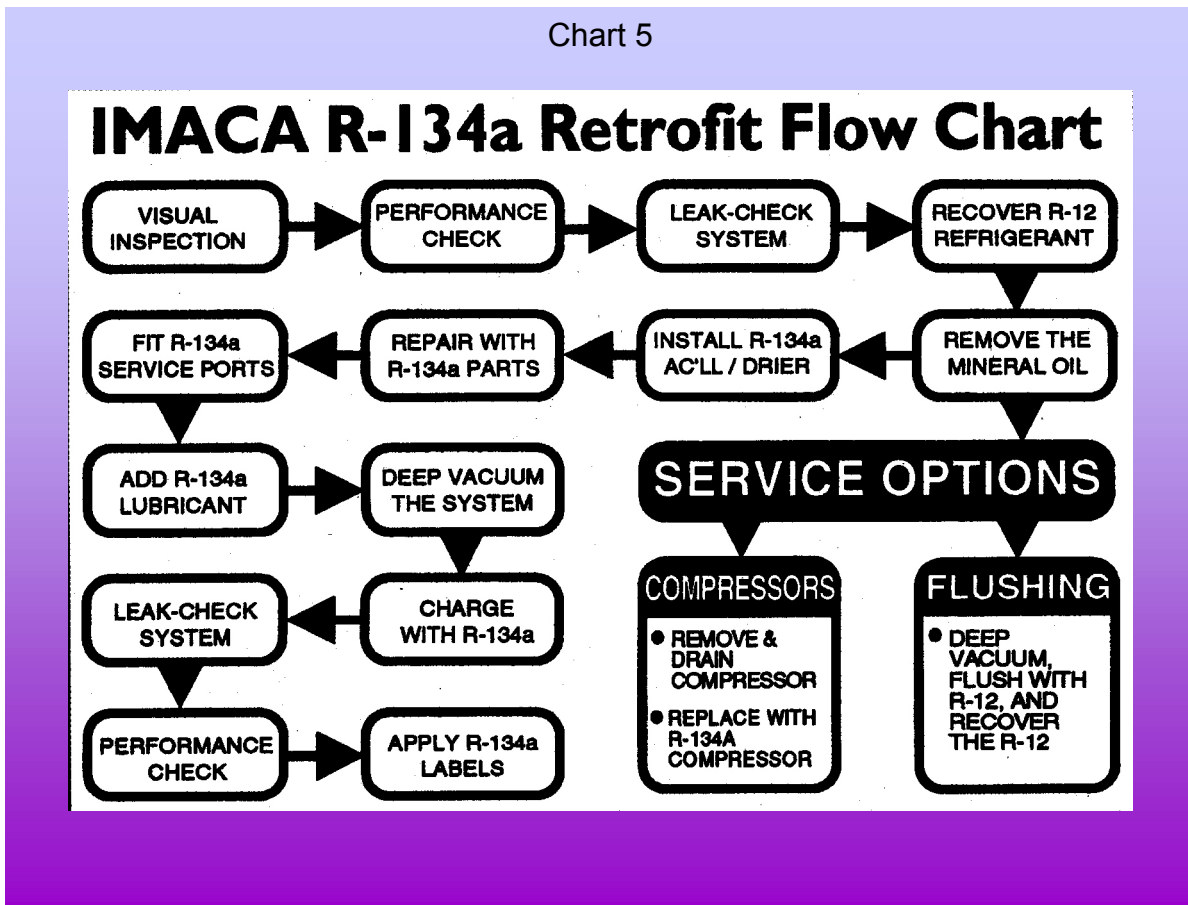
If major repairs are required, such as a compressor replacement, conver-

sion has evolved over the past few years. Initially it was recommended that all components be replaced. After extensive fleet testing, the recommendations have changed considerably. Chart 5, titled "IMACA R-134a Retrofit Flow Chart," is a diagram of the current retrofit procedure.

FRIGC is a blend of refrigerants-59 percent R-134a, (Tetrafluoroethane), 39 percent R124 (Chlorotetrafluoroethane), and 2 percent R600 (normal butane). At this concentration, butane

synthetic oil (POE) to make a blend of 70% mineral oil and 30 % POE. It is not necessary to replace the receiver-dryer or accumulator. However, if a replacement is used, an R134a compatible version should be installed.

The R401c requires barrier hoses, because of the high rate at which it leaks through flexible hosing, so it is not considered to be a suitable replacement. Although approved by the EPA. It is not marketed in the United States.



sion to an alternative refrigerant should be considered. Many repair facilities, may service only a limited number of refrigerants, so the choice should be given careful consideration.

R-134a operates at a slightly higher pressure for a given temperature than does CFC-12, and its cooling efficiency is slightly less. It is significantly less expensive than CFC-12, and the price is expected to decrease as its production volume increases. R-134a was the first approved substitute for R-12. The procedure for retrofit-

is not flammable. According to the manufacturer, FRIGC operates at nearly identical pressures as CFC-12 even at high ambient temperatures, and it is compatible with the mineral oil used to lubricate CFC-12. Assuming the system requires no repairs, the retrofit procedure involves recovering the CFC-12, installing FRIGC service ports, vacuuming the system, and charging with FRIGC. The mineral oil does not have to be drained from the compressor. The manufacturer recommends the addition of Polyol Ester

FREEZONE is a blend of R134a and R142b and was rated ASU as of May 22, 1996. The pressure/temperature curve of FREEZONE is almost identical to that of R12. FREEZONE and FREEZ 12 are almost identical compounds. The target market will probably be vehicles more than six or seven years old. Compared to newer auto air-conditioning systems, these older vehicles are more likely to require extensive component repairs or modification in order to accommodate the

slightly higher pressures and slightly lower efficiency of R134a. Retrofitting with FREZONE involves removing and recycling R-12, vacuuming the system, changing the high-and low-pressure fittings, and charging with FREEZONE. According to the manufacturer, it is not necessary to replace any component or to change the lubricant in the compressor. A small amount of lubricant is already mixed in FREEZONE. The manufacturer of FREEZ 12 suggests adding 3 ounces of ester lubricant. At the time of this writing, the proposed pricing is less than that of CFC-12.

IKON 12 has obtained an acceptable-subject-to-use rating but is not currently available for retrofits. No other alternatives currently are EPA-approved for automotive use. Specifically, OZ-12 and HC 12a are not suitable because of flammability concerns (FMC, March 1994, page 14, "Consumer Alert: LP-Gas-Based Refrigerant Substituted for CFC-12"). R406a, marketed under the trade name "McCool," has been approved for HVAC use and recently received a "proposed acceptable" rating for automotive use. R176, distributed as "Artic Cool" or "Artic chill," is not acceptable because it contains CFC-12. R405a is not acceptable because it contains perfluorocarbon. HFC-152a is flammable and is approved in the manufacture of new household refrigerators and freezers only.

R-22 is commonly used in HVAC systems; because of its significantly higher operating pressures, it is not an acceptable replacement for R-12. Components designed for R-12 cannot withstand these higher pressures. In addition, R-22 is incompatible with the polymer and rubber products used in MVAC hoses and "O" rings. Deterioration of these products plus the smaller molecular size allows R-22 to diffuse from the system to the atmosphere. The last reason for not using R-22 as a replacement for R-12 is that it is illegal. Any substitutes for R-12 must be submitted to the EPA for review, and as of this writing, no one has submitted R-22.

When considering a retrofit, one should contact the vehicle manufacturer to obtain specific recommendations and to inquire as to whether a

factory-approved retrofit kit is available. Because of differences in operating pressures and temperatures of the available refrigerants, recommendations may differ depending upon where the vehicle is used "for instance, the Southwest generally experiences higher ambient temperatures and lower humidity than the Southeast; so, an Arizona technician may have a different opinion than a Florida tech-

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nician.

According to the EPA, "Under Section 609 of the Clean Air Act, only people who repair or service air conditioning systems for consideration—that is, for payment, whether it is monetary or some other form—are required to be properly certified and to use equipment approved by the Environmental Protection Agency. That means that a do-it-yourselfer (DIYer) can work on his own car without being certified or having to buy recovery or recycling equipment."

Before deciding to retrofit or service your own vehicle, you should be aware of the following considerations. Like technicians, do-it-yourselfer are not allowed to vent R-12 or any R-12 substitute to the atmosphere. In addition, only certified technicians are allowed to purchase R-12, and the EPA is considering whether to also restrict the sale of R-134a. If the do-it-yourselfer becomes certified, he or she can purchase refrigerants and then "top off" his or her own vehicle. Venting should not occur if the topping-off procedure is done properly. If he or she wants to do more extensive work, such as replacing components, he or she must be sure to recover the refrigerant before opening the system.

"The refrigerant does not need to be extracted into EPA-approved recovery/recycling equipment; it can be extracted into homemade equipment, for example, but it must not be vented! Venting refrigerant can lead to fines of \$25,000 per violation."

The EPA's February 1995 fact sheet titled "Your Vehicle Air Conditioner And The CFC-12 Production Ban" notes that vehicle owners of systems using CFC-12 need to know the following:

- ✓ While *production* of new CFC-12 will be prohibited after 1995, its *use* will still be allowed. Since these systems were designed to use CFC-12, all vehicle manufacturers recommend that it continue to be used as long as CFC-12 is available.

- ✓ Service technicians must be certified to capture and to recycle the refrigerant during servicing of vehicle air conditioners. It is against the law to vent CFCs to the atmosphere.

- ✓ It is good practice to request that leaky air conditioners be repaired rather than just "topped off" with additional refrigerant. Such repairs prolong system life, reduce emissions, and conserve existing supplies of CFC-12. Leak repair is not required under federal law, but it is required in some areas for example, Florida; Wisconsin; parts of Southern California; Austin, Texas; Albuquerque, New Mexico; and possibly others.

- ✓ Vehicle owners having major repairs done on their air-conditioning systems should consider modifying (retrofitting) the system to use an OEM-recommended alternative to CFC-12. The modifications required will differ according to the make and model of the vehicle. Information on specific recommended changes should be available from your vehicle's manufacturer through your dealership or through a qualified independent service facility. The retrofit should be done only by qualified service facilities.

- ✓ As the supply decreases and the cost of CFC-12 increases, more owners may find it makes sense to have their systems modified to use an OEM-recommended alternative to CFC-12.

- ✓ Consumers need to beware of false claims about substitute refrigerant.

ants. They should purchase only alternatives that have been listed as acceptable by EPA based on health and safety considerations.

✓ Consumers who believe they are not getting satisfactory answers to their questions about retrofits or who have concerns about the recommendations they are receiving are encouraged to seek a second opinion.

The effect of the CFC-12 production ban on motor vehicle air-conditioning (MVAC) systems is sometimes confusing, sometimes frustrating, but always changing. It is not going to go away, and it cannot be ignored. We hope this article has addressed some of your concerns. The EPA has a great deal of information on this subject, including brochures, pamphlets, and fact sheets that are available by calling the Ozone Protection Hotline at (800) 296-1996, 10:00 a.m. to 4:00 p.m., Monday through Friday, Eastern time.