

# Workplace Health and Safety Bulletin



## Use of Flammable Hydrocarbon Mixtures as CFC and HFC Substitutes in Vehicle Air-Conditioning Systems

While there are currently no restrictions on the use of flammable hydrocarbon blends in vehicle air-conditioning systems in Canada, vehicle manufacturers recommend the blends not be used. Employers must evaluate the potential health and safety risks of these products before using hydrocarbon blends as substitutes for hydrofluorocarbon refrigerants.

### Background

R134a (1,1,1,2-tetrafluoroethane), an HFC refrigerant has been factory installed in mobile air conditioning systems since the mid-1990s. It replaced ozone-depleting refrigerants which were known to be harmful to the environment. Prior to then, CFC-12 or R-12, also known as Freon, was used widely in automobile and truck air-conditioning systems until the Canadian ozone-depleting substances regulations came into effect in January 1996. The legislation prohibits the sale, import or export of CFC-12. In 2000, the Alberta government passed, the *Ozone-Depleting Substances and Halocarbons Regulation*, which prohibits the recharging of vehicle air-conditioning system with CFC refrigerants. Since then, only substitutes for CFC refrigerants have been permitted in air-conditioning systems.

Government of Alberta ■  
Employment and Immigration

For more information on this legislation



<http://www.environment.gov.ab.ca/info/library/8145>

Frequently Asked Questions, Ozone-Depleting Substances(ODS) and Halocarbons Regulations



[http://www.qp.alberta.ca/574.cfm?page=2000\\_181.cfm&leg\\_type=Regs&isbncln=0779732650](http://www.qp.alberta.ca/574.cfm?page=2000_181.cfm&leg_type=Regs&isbncln=0779732650)

Ozone-Depleting Substances and Halocarbons Regulation

There are other products on the market that may also be considered as substitutes in vehicle air conditioning systems such as flammable hydrocarbon blends and ammonia. This Safety Bulletin presents the health and safety risks associated with using substitutes that consist of flammable hydrocarbon mixtures.

## Hydrocarbon blends as refrigerants

A number of brand-name hydrocarbon blends are sold as refrigerants. The main components of these products are butane and propane. Because they do not have ozone-depleting potential, they are not regulated under Alberta's *Ozone-Depleting Substances and Halocarbons Regulation* or the federal *Ozone-Depleting Substances Regulations*. There are no restrictions on their use in Canada, nor requirements that Alberta users be certified. However, due to safety concerns, the Canadian Vehicle Manufacturers' Association (CVMA) and the Association of International Automobile Manufacturers of Canada (AIAMC) do not support or encourage the use of hydrocarbon blends as refrigerants in vehicle air-conditioning systems

In the United States, the Environmental Protection Agency (EPA) considers the use of these refrigerants unacceptable in vehicle air-conditioning systems because their flammability risk has not been assessed. A number of states have banned the use of these refrigerants in vehicle air-conditioning systems.

There is broad consensus that safety concerns associated with the manufacturing, use, servicing and disposal of hydrocarbon refrigerants have not been adequately addressed.

## Potential hazards

### Toxicity

CFCs, HFCs and hydrochlorofluorocarbons (HCFCs) have, for the most part, low toxicity. While hydrocarbons, such as propane and butane, also have low toxicity, at concentrations above 17,000 parts per million for butane and 50,000 parts per million for propane, they can affect the central nervous system, causing nausea, light-headedness, loss of coordination, and other symptoms.

### Flammability

While CFCs, HFCs and hydrochlorofluorocarbons (HCFCs) have low flammability, the hydrocarbon blends are highly flammable. Hydrocarbons in concentrations ranging from two to 10 per cent (approximately 20,000 to 100,000 parts per million) mixed with air can form an explosive mixture. If the quantity of refrigerant (300 to 1000 grams) normally injected into a vehicle air-conditioning system were released into a confined space, such as a vehicle's passenger compartment, the hydrocarbon-air mixture could produce an explosive atmosphere. An ignition source, such as an open flame or lit smoking materials, could cause an explosion.

Mechanics working in vehicles' engine compartments face the risk of explosion if leaking refrigerant contacts a source of ignition. Many electronic leak-detection systems use a heated element or flame, which could act as an ignition source. This situation endangers service technicians performing normal service checks. Another invisible hazard exists because leaking hydrocarbon refrigerants are heavier than air and can flow along the ground. In this situation, the explosive hydrocarbon and air mixture could ignite at some distance from the source of the leak, putting at risk others in the vicinity.

## Compatibility issues

As existing vehicle systems have not been designed for refrigerants composed of flammable hydrocarbon blends, the blends can degrade hoses or gaskets designed for fluorocarbons. Using hydrocarbons in air-conditioning systems, therefore, makes the systems more prone to leakage. As well, using hydrocarbon blends in a vehicle whose systems are not designed for those blends, voids the vehicle's warranty.

Also, mixing of flammable hydrocarbon blends will cause contamination of the refrigerant in the recovery/recharge equipment making it unsuitable for reuse. Decontamination of the recovery/recharge equipment and disposal of the contaminated refrigerant is costly. To avoid unnecessary costs and equipment down time, checking the refrigerant for the presence of contamination by flammable hydrocarbons before servicing any vehicle is advised.

## Environment Canada recommendations

Environment Canada's *Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air-Conditioning Systems* recommends that vehicle operators consider the following points before using flammable hydrocarbon blends to replace refrigerants:

- Confirm that the product is compatible with hoses and gaskets before retrofitting.
- Remove all refrigerant already in the air-conditioning system before adding a different type of refrigerant. A mix of different refrigerants within a system may not work and could damage the system.
- Adjust the quantity of refrigerant being added to the air-conditioning system. The density of the hydrocarbon blend may be different than the density of the original refrigerant, affecting the system's proper operation.
- Verify that the refrigerant comes with an identification number from the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and whether or not the refrigerant is flammable. A label in the engine compartment should be applied that contains this information as a warning to service mechanics.
- Check with the vehicle manufacturer or supplier of the air-conditioning system about the refrigerant's safety, vehicle-system compatibility and performance.
- Verify that recovery and recycling equipment is designed for the specific refrigerant being recovered. Recovery-equipment fittings are different than those used for R-134a. Ensure they are compatible with those in the vehicle.

## Employer responsibilities

Part 10 of Alberta's Occupational Health and Safety (OHS) Code addresses fire and explosion hazards. The OHS Code states that employers must evaluate the potential of a flammable substance to create an explosive atmosphere when the substance is stored, handled, processed or located at work sites. Employers must develop procedures and precautionary measures appropriate to the nature of the hazard to prevent the substance from igniting. As well, employers who use flammable hydrocarbon refrigerants must ensure that workers are competent to handle and use flammable refrigerants. Furthermore, when these refrigerants are used in vehicles, employers are to notify vehicle operators of the product's potential hazards.

For more information, contact:


- Canadian Vehicle Manufacturers' Association (CVMA)  
(416) 364-9333  
[info@cvma.ca](mailto:info@cvma.ca)
  - Association of International Automobile Manufacturers of Canada (AIAMC)  
(416) 595-8251
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## Contact us:

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### Province-Wide Contact Centre

 Edmonton & surrounding  
area:  
780-415-8690

 Throughout Alberta:  
1-866-415-8690

 Deaf or hearing impaired

- In Edmonton: **780-427-9999**

or

- **1-800-232-7215**  
throughout Alberta

### Web Site


 [www.worksafe.alberta.ca](http://www.worksafe.alberta.ca)

## Getting copies of OHS Act, Regulation & Code:

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### Queen's Printer

 [www.qp.gov.ab.ca](http://www.qp.gov.ab.ca)

 Edmonton 780-427-4952

### Workplace Health and Safety

 <http://employment.alberta.ca/whs-ohs>

Call any Government of Alberta office toll-free  
Dial 310-0000, then the area code and telephone number you want to reach

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