
"Fluorocarbons: Balanced Solutions For Society"

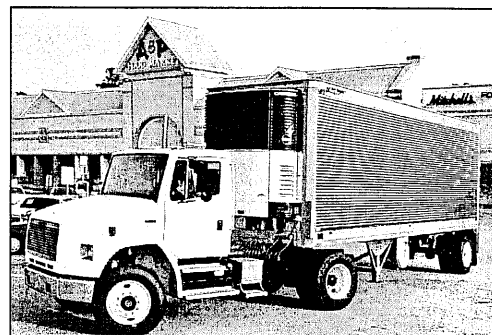
Transport Refrigeration...A Working Example

A Worldwide Perspective

Transport refrigeration is essential in today's society, to preserve and protect food, drugs and medical supplies for people worldwide. It includes transport of refrigerated products with reefer ships, intermodal refrigerated containers, refrigerated railcars and road transport including trailers, diesel trucks and small trucks.

Environmental Consideration for Transport Refrigeration

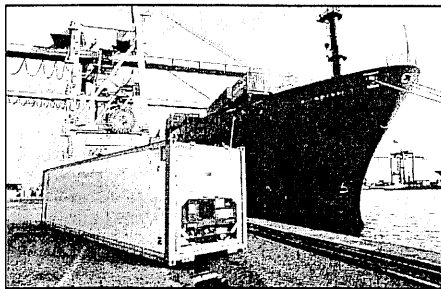
The difficult working environment in all transport refrigeration markets requires that equipment operate reliably in a wide range of ambient temperatures. Refrigerant selection requires consideration of the refrigerant effect on the environment, the equipment energy efficiency and the safety of those working on or near the equipment. It is also critical that the refrigerant be widely available to facilitate service while the unit is away from its home base. Since the mid-1980s, transport refrigeration systems have undergone a transition from using ozone depleting refrigerant compounds, including chlorofluorocarbons (CFCs) to low or non-ozone depleting compounds, such as hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs). Ammonia, hydrocarbons and carbon dioxide are being used to a lesser extent.



Perishable goods delivery to supermarkets

Refrigerant Selection

To achieve accurate, cost effective temperature control of commodities and maximum product quality under all operating conditions, the refrigerant selection, refrigeration system design, materials and operating methods are critical. Transport refrigeration equipment must be capable of operating efficiently in exterior temperatures that range from -40°C to 55°C while maintaining precise internal temperatures that range from -35°C to 22°C . Under extreme ambient operating conditions, it is especially important that the refrigerant discharge pressures and temperatures remain within safe operating limits. Currently, only the HFCs satisfy these harsh conditions and stringent safety requirements, while simultaneously meeting customer control requirements.



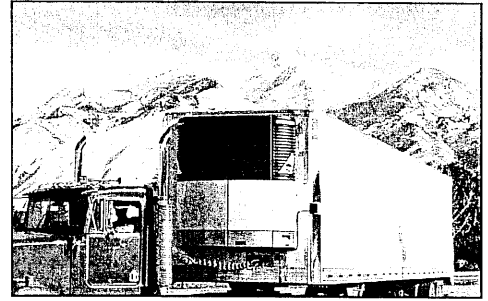
Shipboard container refrigerated transport

There are important safety considerations that effect refrigerant selection. Transport refrigeration equipment must be serviced worldwide. Flammable refrigerant introduction presents significant problems for the service technicians who are accustomed to working with non-flammable refrigerants, and may be a particular problem in developing countries.

Extensive training in safe handling practices for both the equipment and use of flammable refrigerants is required. In addition, container units may be placed inside a ship's hull where the refrigerant could concentrate leading to a significant increase in the risk of a fire. It would be very difficult to eliminate all ignition sources from all areas where these refrigeration systems are used.

HFCs - The Balanced Solution

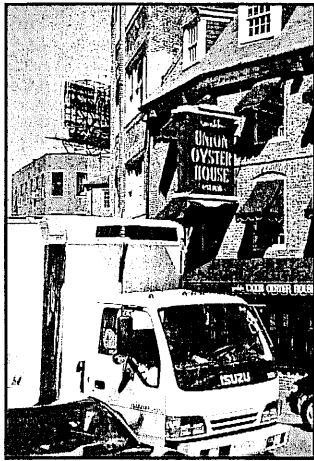
When all factors are considered, HFCs offer the best solution for meeting the transport refrigeration requirements. Commercially available throughout the world, HFCs are energy efficient, low in toxicity, cost-effective, can be used safely and are reusable. Use of HFCs in energy efficient equipment reduces fossil fuel consumption and with it emissions of carbon dioxide, the most prevalent greenhouse gas.



Longhaul transport of refrigerated goods

Industry Principles

The environmental superiority of HFCs in transport refrigeration systems must be complemented with responsible HFC use. The transport refrigeration industry commits to providing products with the best LCCP that is technically, and financially available. This will differ across the various products and applications, and will continuously be evaluated as technology develops. In addition to significant operating efficiency improvements, the industry has already taken action to reduce refrigerant emissions by designing leak tight equipment, minimizing system charge and recycling refrigerants.



Refrigerated transport for local delivery

The industry actively promotes the following general principles that should be followed for all refrigerants:

- Use in tight systems that are leak tested and then frequently monitored after installation to eliminate direct refrigerant emissions;
- Recovery, recycling and reclaiming of all refrigerants;
- Training of all personnel involved in the refrigerant handling;
- Compliance with standards, which govern proper refrigeration installation and maintenance of machinery spaces (e.g. ISO 5149 , ASHRAE 15);
- Equipment sizing to match the specific need, thereby minimizing the refrigerant amount;
- Design and installation and operation to optimize energy efficiency; and
- Minimize number of connections through which refrigerant flows.

**Balanced solutions for Society Transport Refrigeration is the
Perfect Example of The Concept.**

Energy Efficiency, Reduced CO2 Emissions, Availability, Affordability.

HFCs --- the RIGHT Choice for Transport Refrigeration

The Alliance for Responsible Atmospheric Policy is a leading industry voice which coordinates industry participation in the development of reasonable international and U.S. government policies regarding ozone protection and global climate change.



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