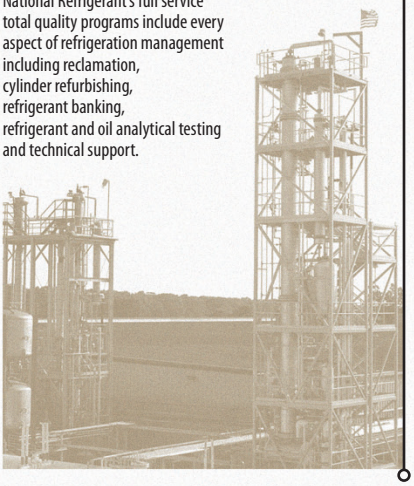
NATIONAL™ news

A Newsletter from National Refrigerants, Inc.

National News
Fall 2010

In this Issue:

National Refrigerant's full service total quality programs include every aspect of refrigeration management including reclamation, cylinder refurbishing, refrigerant banking, refrigerant and oil analytical testing and technical support.



Feature:

What Have You Heard About The Future Of Refrigerants?

Making Sense Of The Issues Behind The Rumors

In 2010 we began the transition away from HCFC 22 in new installations. The amount of R-22 available for service has also been cut back and will continue to be reduced until R22's production phase out in 2020. R123 can still be used in new equipment and its production will not end until 2030, but these phase-out dates will be here sooner than we realize. But even while we are settling into widespread use of HFCs, there is already legislative activity proposed to regulate HFCs. While certain situations have influenced the choice of HFC products in some markets, there are currently no federal or international regulations to reduce or eliminate any HFC products.

Let's look at some of the rumors, the underlying issues related to them, and offer some clarification about what is likely to happen in the short term, and possibly the long term, regarding the use of HFC refrigerants.

Rumor: R-410A is only a transition product. AC systems will ultimately be made with something else.

Issues: *Regulations, Supply/Demand, Global Warming*
Clarification: When considering all of the available refrigerants to replace R-22, it was initially determined by the AC manufacturers that R-410A was the best choice for new systems based on performance and cost. Since then, R-407C has become a strong choice for air conditioning due to its characteristics being similar to R-22. From an environmental standpoint, R-407C has a GWP lower than R-22 and R410A (1710 versus 1810 versus 2088). From a technical standpoint, R-407C can be used to retrofit AC systems as well as be installed in new systems. It is always possible that a new, better refrigerant will be invented for AC units, but it will take 3 to 5 years of toxicity testing and up to 10 years of equipment design and application development before the industry can use any new refrigerant. For right now, R-407C and R-410A are the best technical and economic choices compared to all of the other refrigerants that are commercially available for AC systems.

Rumor: HFC production will be limited by the Department of Energy (DOE) beginning 2012.

Issues: *Regulations, Global Warming.*
Clarification: DOE does not have the authority to regulate refrigerant production or, for that matter, which refrigerants can be used in

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Ask the Expert

Please forward all questions for publication to info@refrigerants.com

Questions & Answers regarding refrigerants, lubricants, chemicals, or regulations.

How are R-22 retrofit blends performing in the real world? Are you seeing problems with temperature glide or POE oils?

All blends are going to have some degree of fractionation and temperature glide to deal with. History has shown that in a direct expansion (TXV) application, regardless of size of the system, a higher glide blend will not have any trouble operating and being controlled by the system components. We have years of experience with R-12 retrofit blends like R-401A and R-409A, and we have recently seen many supermarket retrofits to R-407A without problems from temperature glide.

What seem to cause the biggest problems are differences from the properties of R-22. It is important not only to match properties like capacity, which translates into run time on most systems, but also properties that affect valve operation and line sizing. Retrofitting with a blend that requires replacing major components is not very cost effective, and systems that operate with increased pressure drops or undersized valves end up costing more in energy use. R-407A and R-407C are proving to be the best overall property match to R-22, which means the system performs the way it was designed for R-22.

Finally, oil circulation is important in any system. R-22 systems have most often been designed to carry oil with refrigerant around the system. New HFC blends will not be soluble enough with mineral oil to provide adequate mineral oil circulation. Some blends have added hydrocarbons to solve this problem, but they might still strand oil in some system components. In general, HFC products will need some amount of POE to guarantee proper oil return.

Experience has shown that adding POE to a mineral oil system is not as much of a problem as initially feared. Systems with contaminants, water, or extreme heat conditions have shown problems with POE, but many systems have also been retrofitted with no evidence of chemical reaction with the POE. It is a system-by-system issue that needs to be evaluated prior to retrofit. Addition of POE or replacement of all of the oil has been proven time and again to give good oil return with the new HFC refrigerants.

If an air conditioner charged with R-410A leaks, will the remaining charge have to be removed and replaced or can the system just be topped off after repair?

R-410A is technically a zeotropic blend and some equipment manufacturers' literature states that systems that have leaked R-410A should have their charge removed and replaced. In reality, the separation characteristics of the two chemicals in R-410A are so small that there will only be a slight change in composition upon leakage. If the system was simply topped off after repair, there would be no practical change in system operation compared to the original charge. It should be noted, however, that if a leak occurred on the low side of the system such that air or moisture was drawn into the system, then the charge should be replaced along with the filter/drier to make sure these impurities are removed.

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AC/R equipment. DOE does have the authority to mandate minimum efficiency of equipment, which might have a role in determining what refrigerant is used for a particular piece of equipment. The requirement to continually meet and exceed mandated efficiency requirements is a challenge that industry has successfully faced for many years.

Rumor: HFCs with higher GWPs will be targeted by regulation first.

Issues: *Regulations, Global Warming.*
Clarification: There are currently no regulations that limit the use of a particular refrigerant based on its GWP. So far, all proposed legislation that Congress has worked on does not target specific refrigerants, but rather proposes to place a GWP-weighted cap on refrigerants classified as HFCs .

Rumor: Hydrocarbons will be used in appliances and vending machines.

Issue: *Flammability*
Clarification: Hydrocarbons have been used in Europe in small refrigeration appliances where charge sizes are very small. They have not been used in any refrigerator or freezer as big as the typical 18 to 20 cubic foot frost free models that are seen in the US. Current Underwriters Laboratory listings, building codes and fire codes in the US do not allow the use of flammable refrigerants indoors without specially designed safeguards. Nevertheless, applications have been submitted to EPA to approve four hydrocarbon refrigerants as acceptable substitutes, subject to use conditions, for ozone-depleting CFC-12 and HCFC-22 in household refrigerators, freezers, and combination refrigerator and freezers, and retail food refrigeration (stand-alone units only).

Rumor: CO_2 will replace HFCs in many applications because it has very low GWP and it is very efficient.

Issues: *Global Warming, Performance.*
Clarification: CO_2, by the very definition of GWP, has a value of 1. This makes the chemical attractive from an environmental standpoint, but the performance of CO_2 is questionable in most locations around the US. Many of the studies showing CO_2 as a good refrigerant were conducted in northern European countries where the ambient temperatures do not get very high. In over 2/3 of the territory around the US, warmer temperatures will generate very high operating pressures and efficiency in the condenser drops off dramatically. CO_2 equipment costs may be significantly affected in order to control the pressure and run safely.

Rumor: R-134a can't be used in automotive air conditioning beginning 2011.

Issues: *Regulations, Global Warming.*
Clarification: There is a European regulation that will eliminate R-134a in automotive air conditioning for new car models introduced after 2011. However, this does not mean that R-134a will not be used in auto AC in Europe after 2010. There is currently no restriction proposed or in place that restricts the use of R-134a in auto AC in the US. Auto manufacturers are looking for ways to tighten auto AC systems while also looking for an alternative refrigerant that can be used in all models around the world rather than have one product for designs in Europe and R-134a elsewhere. CO_2 was initially proposed for auto AC but now the focus is on HFO-1234yf, which is a fluorinated olefin that has an unsaturated chemical bond. This means it will break down easily in the atmosphere (which gives it a low GWP value), but it may also break down easily in a system. It is also weakly flammable, which will limit its use in other applications in the short term. HFO-1234yf is currently undergoing review by EPA to determine if it is a suitable substitute for R-134a in auto AC.

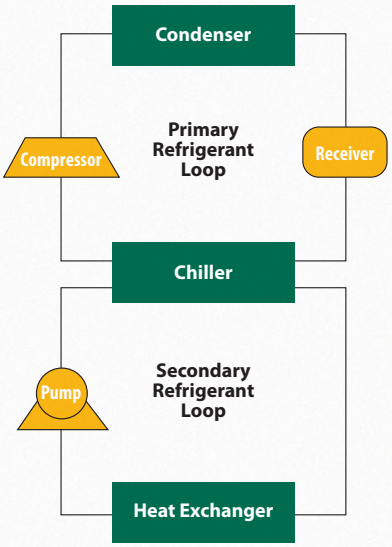
Conclusion

No one can predict exactly what products will come along in the long term. If the environmental pressure on HFCs is enough to push the industry to low or no GWP compounds, then it will take time to solve the efficiency, toxicity, flammability, and application-specific problems that will arise. Industry should pursue initiatives to make their equipment tighter. Technicians should pursue Best Practices that will reduce or eliminate release of refrigerant. Equipment owners need to emphasize regular system maintenance instead of waiting for a problem to occur. Proactive measures by all involved should hopefully lead to responsible long term policies. The focus in the near term, however, is to continue with the lowest GWP fluorocarbon products that will work safely and operate efficiently. ■

Medium-Temperature Secondary Loop Systems Using 35% Inhibited Propylene Glycol

Refrigeration systems consume the majority of the energy in a supermarket and typically operate with direct expansion refrigerant/air coils located in the display cases and walk-in coolers. The compressors are usually located in a remote part of the store in a machine room. The large amount of piping and fittings used in the supermarket refrigeration can lead to refrigerant leakage. Due to the need to eliminate or at least reduce refrigerant leaks, major equipment manufacturers are designing medium temperature secondary refrigeration systems for use with 35% inhibited propylene glycol.

Secondary loop systems often employ propylene glycol as a heat transfer fluid because it changes temperature as it gains or loses heat energy without changing phase. It is inert to all common piping materials and most non-metallic gaskets and seals. Propylene glycol has proven to be the most suitable secondary fluid since it is nontoxic, nonflammable, does not contribute to global warming and provides optimal performance compared to other secondary fluid alternatives.



The primary loop consists of a compressor and air-cooled condenser. The liquid refrigerant flows from the condenser to a heat exchanger, which is the primary system evaporator, and is controlled by an expansion device. The refrigerant leaves the heat exchanger as superheated vapor and is circulated back to the compressor.

The secondary loop consists of a pump and heat exchanger. On the other side of the primary loop's heat exchanger, heat is removed from propylene glycol in the secondary loop. This cold glycol then flows to the cases and picks up heat from the food. Finally, it is returned to the pump and the process is repeated. This application is nearly identical to a chilled water loop used in comfort cooling, except the system is designed for lower evaporator temperatures and uses a water and glycol mixture instead of just water.

The secondary loop system is an environmentally friendly design because it eliminates the circulation of high pressure refrigerant throughout the floor area, which reduces refrigerant charge and minimizes refrigerant leaks. The system design is simpler than a multiplex direct expansion system and is easier to service and maintain. Temperature control is also more stable because the system employs the warm fluid side for defrost which shortens defrost time and minimizes temperature fluctuations in the product case. Secondary loop systems are not appropriate for every application but they can be ideal for meeting the refrigeration, energy and environmental needs of supermarkets. ■

California Refrigerant Management Regulation

The Refrigerant Management Program regulation requires facility registration, leak detection and monitoring, leak repair, retrofit or retirement, and recordkeeping for anyone who owns or operates a facility with a stationary non-residential refrigeration system using 50 lbs. or more of a high-GWP refrigerant (includes all CFCs, HCFCs and HFCs). Reporting and payment of an implementation fee is required for any person who owns or operates a facility with a stationary system using 200 lbs. or more of a high-GWP refrigerant. Required service practices apply to any person who services an appliance using a high-GWP refrigerant. Reporting and recordkeeping requirements apply to distributors, wholesalers, and reclaimers of high-GWP refrigerants.

Facilities are classified depending on the largest refrigeration system at the facility (not the cumulative charge of all refrigeration systems):

- Large = 2000 pounds or more
- Medium = 200 – 1999 pounds
- Small = 51 – 199 pounds

For all facilities January 1, 2011:

- Leak Detection & Monitoring
- Leak Repair
- Recordkeeping

Registration requirements:

- Large facilities: 2012
- Medium facilities: 2014
- Small facilities: 2016

Annual Implementation Fee upon initial registration for operation and annual renewals:

- Large facilities: $370
- Medium facilities: $170
- Small facilities: no fee

Annual Facility reporting:

- Large facilities: 2012
- Medium facilities: 2014
- Small facilities: no reporting

For more detailed information please go to **www.arb.ca.gov/cc/reftrack/reftrack.htm**

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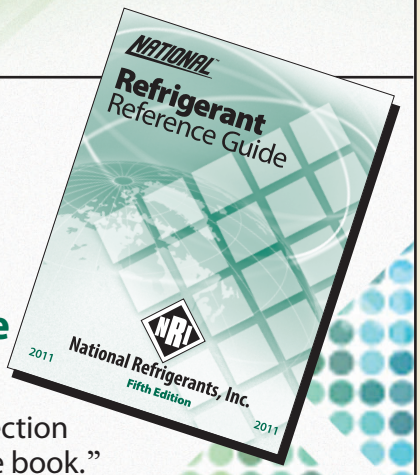

Refrigerant Reference Guide
Fifth Edition 2011

This book has been called the "largest collection of refrigerant product information all in one book."

INCLUDES:

- **Technical data on commercially available products**
- **Tutorial on refrigerant blend behavior**
- **Information on very low temperature systems and oil additives**
- **Expanded retrofit procedures, including the most recent advances in R-22 retrofit blends**
- **Updated EPA regulations and web links**

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On The Web

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- Easily accessible downloads of technical support information, Material Safety Data Sheets and more