

Supermarket Industry Update On Refrigerants Webinar

Questions & Answers



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Q: How much refrigerant is sold compared to how much is recycled?

- Contractor

A: According to an ARI study, in 2003 the refrigerant recovered from systems were about 60 million lbs., or 17% of the refrigerant produced. Less than 10 million of the 60 million lbs. recovered were reclaimed, i.e., purified to new refrigerant standards by a certified reclaimer, and 4 million lbs. were destroyed. The remaining 46 million lbs. were recharged into systems and some of this would have been recycled (cleaned) in the field before recharging. As R-22 production reduces in the next several years, it is expected that higher prices will increase the amount reclaimed or recycled.



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Q: I keep hearing about the possibility of accelerating the R-22 phase out. Any news on this?

- *Supermarket End User*

A: An accelerated HCFC phase-out schedule has been agreed on by the signatories of the Montreal Protocol, including the U.S. The original change was to accelerate the 2040 phase-out in developing countries such as China, to 2030. Developed countries such as the U.S., were also affected in the 2010 production step down to 35% of baseline production which was reduced to 25%. Before the change, R-22 production was expected to be adequate for service needs until 2015, when a shortage was predicted. With the cap reduction, supplies will be tighter and some shortages could occur as early as 2010.

This makes it even more urgent for end-users to specify HFCs(R-410A, R-404A, R-507 or R134a) in new equipment as soon as possible.



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Q:What is a distributed system?

-Commercial Refrigeration Contractor

A: “Distributed systems” refers to multiple smaller systems, rather than one large central system, used in Supermarkets. These smaller systems, air-cooled or water-cooled, can be installed directly in the merchandising area, on a mezzanine or roof instead of in a separate equipment room. The advantages of a distributed system are a reduction in copper refrigerant lines, reduced charge and refrigerant leaks, reduced construction costs, and increased energy efficiency. For these reasons, distributed systems are becoming more popular.

It’s also important to note that secondary loop central refrigeration systems are also gaining interest, due to the advantages of reduced refrigerant charge and reduced leaks, as well as improved temperature control and other benefits.



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Q: What is the energy impact at the two stage versus conventional racks?

-Supermarket End User

A: By two stage, we assume you mean a cascade system in which, a higher temperature refrigeration system cools the condenser of the low temperature refrigeration system. These systems are more energy efficient, since the cascade system allows for two stages of compression. The very low condensing temperature of the low temperature system provides much lower liquid temperature, and thus greater enthalpy difference and reduced mass flow across the low temp evaporator. Vapor injected compressors, or mechanical subcooling in the system, can provide a substantial portion of these benefits, often for less cost.



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Q: What is the CO₂ emissions from one pound of R404A?

- Supermarket End User

A: This is referred to as the “direct effect.” Which is, the product of annual percentage leak rate, amount of refrigerant in system, and the refrigerant GWP number. R-404A has a GWP = 3,260. Thus, leaking one lb of R404A to the atmosphere would be equivalent to leaking 3260 lb (1482 kg) of CO₂.



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Q: Can you provide R-22 phase-out, % vs year and base year?

-Refrigeration OEM

A: With the acceleration in HCFC phase-out recently agreed to under the Montreal Protocol, the January 2010 HCFC production cap has been reduced from 35% of the 1989 ODP baseline, to 25%. This will further reduce supplies of R-22 for service beginning in 2010. The next step-down occurs January 2015, to 10% of the baseline. In January 2020, the cap reduces to 0.5% of the baseline. This remaining 0.5% is reserved by the EPA for R-123, and so R-22 production and import comes to an end January 2020.

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Q: Do you know the exact wording for phase out of new equipment using R-22 On 2010. I have heard the ban is not to allow new refrigerant in new equipment produced after 2010. Which is correct?

-Refrigeration OEM

A: The wording of the ban prohibits the use of newly produced (virgin) R-22 in equipment manufactured after January 2010. Manufacturers have decided not to produce equipment designed for R-22 after January 2010, since it will be illegal to charge the equipment with virgin R-22, and recycled or reclaimed R-22 supplies will certainly be inadequate for new equipment after Jan 2010.

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Q: Have DuPont or Honeywell made any indications of any intention to develop a viable low GWP refrigerant for low temperature refrigeration applications?

-Refrigeration OEM

A: They have only announced low GWP refrigerants intended for automotive air-conditioning, similar in characteristics to R-134a.

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Q: Is there any indication that the reclaim market will be restricted or limited on the amount of recovered R22 that can be cleaned up and provided to the aftermarket as ARI700 gas?

-Refrigeration OEM

A: In general, no. There is one piece of draft legislation in congress that would require destruction of some recovered R-22 in order to allow new R-22 to be used. In effect this bill is an attempt to limit the use of reclaimed R-22 as you suggest, but there is little indication that the bill is getting traction in congress.

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Q: What are the most efficient system options to help make energy refrigerators?

-Consultant

A: Refrigeration manufacturers use many design features to increase energy efficiency. A partial list would include: more thermal insulation, higher efficient compressors, more efficient or larger condenser and evaporator heat exchangers, high efficiency fans and motors, more efficient or larger condenser and evaporator heat exchangers and in some high end refrigerators, variable speed compressors.

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Q: When will synthetic refrigerants be available and will the cost be about the same or substantially more or less than current HFC refrigerants?

-Supermarket End User

A: The major refrigerant producers have announced new low-GWP refrigerants and the production of will require heavy investments. Therefore, they have also said they will not commit to production until the auto manufacturers have decided to use the new refrigerants. If they do, the refrigerant prices will be much higher than current HFCs.

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Q: Is R410A the best option for secondary cooling refrigeration systems in MT applications?

-Manufacturer

A: R-410A has a significant efficiency advantage vs R-404A in medium temperature applications. Considering all characteristics, we believe R-410A is the best performing refrigerant in medium temperature, for secondary loop or direct expansion (DX) applications. For low temperature, the efficiency advantage is less, and if liquid injection is required, as it likely would be for low temperature DX, the energy efficiency would be worse than R-404A.



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Q:Are supermarkets policies on refrigerants tailored for specific countries or are they moving in a unified direction globally? In other words, do their head offices have to ensure and report compliance at all global offices as a rule?

-Manufacturer

A: Government policies on refrigerants are differ from country to country. Therefore, global supermarket chains must tailor any reporting to meet each country's requirement. In the US, there are no national reporting requirements, but the U.S. EPA has the authority to audit US supermarket's refrigerant records to determine compliance with EPA regulations.

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Q:What is the best alternative to R22 for milk cooler applications considering the economics and field serviceability?

-Manufacturer

A: Most manufacturers, including the supermarket refrigeration equipment industry, have adopted R-404A and R-407C as the best alternative to R-22.

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Q:What are you finding to be contractors' main concerns and/or needs related to understanding and using CO₂ and other secondary refrigerants?

-Industry Trade Publication

A. We are a manufacturer and can only relate specific concerns that we have heard or would expect from contractors. When CO₂ is used as a primary refrigerant, the concerns would likely be: equipment availability, system cost and complexity, energy consumption, leak detection, pressure containment during shutdown, and the need for training of technicians. When CO₂ is used as a secondary coolant, the main concern would most likely be technician training. Other issues above are primarily associated with primary refrigerant applications.



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Q: Please explain in going green what one HP equates to in CO₂ emissions. Or even better what is one ton of refrigeration equal to in CO₂ emissions. Your thoughts on some simple terminology.

-Supermarket End User

A: CO₂ emission calculations are not based on HP or tons, but on energy usage (kWh), which impacts power plant CO₂ emissions. This is referred to as the “indirect effect“. Thus, we need to know power draw (kW) and run time (hours). The generally accepted conversion metric for U.S. power plants is 0.65 Kg CO₂ Per kWh. This conversion metric is very country-specific depending on the mix of its energy sources (Coal, Hydro, Nuclear, etc.). kWh can be determined based on Annual Bin Analysis Model.



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Q:1) Some comparisons show the efficiency and direct GWP of the R404 worse than the R22, even for low temperature systems. When we talk about medium temperatures, the situation is even worse. So, why the trend for supermarkets is the use of the R404a? What are the advantages of its use?

A: R-22 is less efficient than R-404A at low temperature when the effect of liquid injection is included. For medium temperature, R-22 is more efficient than R-404A, but some supermarkets want to commonize on one refrigerant. Also, US EPA regulations limiting leaks do not apply to HFCs like R-404A, and there is concern about a US R-22 shortage, due to the Montreal Protocol HCFC phase-out. Emerson encourages HFCs, such as R-404A and R-507 for these reasons.

Q: 2) What is the importance of the theoretical COP and compressor COP when evaluating the use of a refrigerant? I mean, the R410 has a bad theoretical COP and compressor COP when compared with Other Refrigerants, But Its Real COP (The System) Is Better. Is This Right?

-Manufacturer

A: R-410A evaporator heat transfer coefficients are 30% better than R22; R-410A has 30% lower pressure drop resulting in A/C performance as good as or slightly better than R-22 because it tends to operate at higher evaporator temperatures. Compressor isentropic efficiency is as good or better with R-410A vs R-22. R-410A allows optimized heat exchangers with smaller tubes and less charge, offsetting refrigerant and copper cost.

Supermarket Industry Update On Refrigerants Questions & Answers

Q: When do you recommend changing from R-22 to R-410A for new packaged HVAC units?

-Petroleum Company

A: For new equipment, specify R-410A today.

- All US HVAC manufacturers have selected R-410A as the best refrigerant to replace R-22 in new equipment
- Residential and commercial R-410A products and components are available from U.S. OEM and component manufacturers
- R-410A is efficient and over the last 10 years R-410A equipment has proven to be equal or better in reliability



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Q: Has the service industry matured to properly service the R-410A equipment?

A: Yes, HVAC manufacturers have been producing R-410A equipment for more than 10 years. Product Reliability has been as good, or better, than R-22 equipment, and the technology is well proven. OEM and component manufacturers, including Emerson, have been training and educating service technicians on R-410A for several years.