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Subject: Environmental Concerns

Climate Change is affecting the residents of Planet Earth faster than predicted. Can potential solutions to protecting us from this gargantuan environmental issue also jeopardize the safety of our families and homes? There are several ongoing battles in many arenas dealing with this issue. However, sometimes in our desire to correct one problem we create another. What do you know about R32 Type Refrigerants? We cannot ignore life altering issues that are generated by potential solutions to this issue as the Kigali Amendment is attempting to do. This amendment will only create more problems such as deaths, explosions, fires, and higher additional cost for material and electric. The unintentional consequences will be astronomical.

The new R32 and R54B refrigerant along with 13 other derivatives are a prime example of this dilemma. The products were developed with the expressed intention to improve the effects of refrigerants on the environment. Unfortunately, they possess some undesirable characteristics, specifically, their flammability rating, toxicity, and potential for explosion. If these refrigerants are meant to improve the environment, then why was there a need to write the AHRI report 8028 that consists of 132 pages on how to fight fires caused by these new refrigerants?

The undesirable characteristics of these refrigerants are being noticed by other countries as well. Italy's Italian Refrigeration Association has warned installers who retrofit R410A air conditioners with flammable R32 that they could face jail or a fine up to 5200 Euros. United Kingdom's F-gas registration body Refcom has backed warnings by FETA (Federation of Environmental Trade Association) who has issued warnings of serious concern following instances of R32 being retrofitted in air conditioners designed for use with R410A. These refrigerants are not interchangeable as drop-in replacements and serious injury could be the result of improper use of even mildly flammable refrigerant gases.

The fire/explosion issues associated with refrigerants are not new to the HVAC industry. There have been several fires and air conditioner explosions that were associated with specific refrigerants. By the 1920's these issues, and the toxicity problem, drove the HVAC industry to find

safer substances. These culprits, Methyl chloride, sulfur dioxide and carbon dioxide were replaced with nonflammable and less toxic chemicals. Overtime we were led to believe that the replacement refrigerants such as R12, R22, R404 and R410A along with many others were apparently detrimental to the environment. This has caused the introduction of new types of refrigerants that supposedly is better for the environment and has also reintroduced the hazards associated with fire, explosion, and toxicity. What are the potentials for disaster and who is overseeing these concerns?

It is very easy to introduce refrigerants into an unsafe condition. Simple tasks such as puncturing a cooling coil while defrosting a refrigerator or freezer, piercing a refrigerant line for a residential cooling system while driving a nail into a wall to hang a picture. Failure of cooling systems due to improper installation or defective coils would go unnoticed for a prolonged period of time. This could lead to infiltration of a larger quantity of refrigerant gas. According to Barry Karnes, Principal Engineer with the UL Group responsible for testing products associated with the HVAC industry, these new refrigerants can ignite within approximately 12 seconds, while safety controls, if used, take approximately 30 seconds to activate. Flammable gas plus oxygen and ignition source equal bomb. What can be done to alleviate these types of disasters? Will we need requirements for high pressure service ports and high-pressure safety switches on all field installed refrigerating equipment?

What systems or regulations exist to protect both people and property from potential damage caused by R32 and its derivatives? There are Fire Codes, Building Codes, government agencies (OSHA, EPA), and industry associations (ASHRAE) that are currently debating the safe use of these gases. The Ashrae Handbook is specific to refrigeration equipment and systems. Chapter 50 covers hazardous materials and the changes coming soon. (See Ashrae Handbook and Arkema Safety data attached) **The California Air Resources Board (CARB)** has already allowed their use. Is this a wise decision?

The issue of toxicity has become more relevant with the recent deaths of three guests at a resort in the Bahamas. There has been some speculation that refrigerant from a faulty cooling system may have played a role. It is known that the guests were having medical issues at least one day prior to their demise and they shared a common air conditioner system.

While the main issues with R32 seem to be environmental and safety related, there is an economic aspect that needs to be considered. At first glance these gases seem to be economically positive. Their Published Seasonal Energy Efficiency Rating (SEER) indicates that R32 and its derivatives are better than the gases they replace. But that is not the whole picture. SEER ratings are established for equipment at various ambient temperatures. These include 95, 100, 105, 115, 120 degrees. The published SEER ratings for air conditioning units are derived from the data associated with the ambient temperature of 95°. The newer refrigerants have a 20% - 30% loss of efficiency as the ambient temperatures rise. The result is a need for more capacity which will require a larger tonnage or 2nd unit. This can introduce additional problems:

- a. Home or office would require the space for a 2nd unit
- b. Will the larger second unit fit in the existing space
- c. Larger electrical services would be required
- d. Can the ductwork handle the additional air flow?
- e. Additional amounts of duct work will be needed
- f. Higher costs of building materials
- g. Using more A/C tonnage will result in higher electric bills
- h. Unit specs are to be checked for static pressure using the new SEER2 specifications
- i. Estimate 30% higher cost of equipment and added installation cost
- j. Higher costs of building materials

These new refrigerants are also being considered and/or used in the battery cooling systems for various battery powered vehicles. Is it possible for them to act as a catalyst in starting a battery fire or exacerbating an existing fire? It appears the electric vehicle manufacturers are still refining their battery safety needs and for this reason they are pulling automobiles from manufacturing. The National Highway Traffic Safety Administration has opened an investigation to examine the numerous reports of spontaneous explosions and fires associated with EVs.

Able Refrigeration has been in business since 1973 exclusively serving Southern Arizona and Sonora Mexico. We have supported green concepts since we did our first solar job in 1978. I support the efforts to improve our environment and I am very aware of the effects of the chemicals used in cooling systems regarding both the environment and human comfort. Able Refrigeration was the first company in 1995 to install units for the Sonora Desert Museum using ozone friendly R407C refrigerant. (See Contractor News Article). We have always supported safe nontoxic refrigerants for air conditioning units. (See Robur Air Cooled Chillers vs. Carrier DX Heat Pumps comparison of cooling capacity chart). Toxic coolants have been used in the past; this is not a new occurrence in the air conditioning industry. We have always taken a strong stand against them and contributed to successfully having them removed.

As an HVAC business owner who has been in the industry using these refrigerants for over 45 years, I am sleeping less, and it is now 4:00 AM as I am writing this. What do we need to do to protect people, their homes, and the environment? Is it possible to weigh environmental, safety and efficiency concerns equally, or will the outcome be determined by the lawsuits filed from the negative experiences? The industry has stated that these R32 type refrigerants will only be viable for ten years. Is R32 and its derivatives an acceptable solution? Do they make this world a better place?

Sincerely,

Ronald Hull
President

Attachments:

Arkema Safety Data included Fire Fighting advice/MSDS article
Robur Air Cooled Chillers vs. Carrier Chart
Contractor Article regarding Desert Museum
Ashrae Standards Handbook
World News Daikin looks to replace R32 in 2023 article