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# EXAMINATION OF THE USE OF R-32 REFRIGERANT IN PTAC AIR CONDITIONERS

**ENEREF INSTITUTE RECOMMENDS THE USE OF AN  
ENERGY- EFFICIENT, LOW-FLAMMABLE REFRIGERANT WITH  
A SIGNIFICANTLY LOWER GLOBAL WARMING POTENTIAL**

Chemical refrigerants, which transfer heat in cooling systems, such as air conditioners, must balance four key factors: efficiency, greenhouse gas mitigation, flammability and toxicity. These factors inextricably

work together; increasing one of them necessarily means affecting another. For example, to create a more efficient refrigerant, you must either make it flammable or contribute to global warming.

The best chemical refrigerant is the one that optimizes the balance of these four factors—and the best refrigerant at this time is R-32.

Difluoromethane (R-32) is a next-generation air conditioner refrigerant because it offers the perfect balance of all four factors. R-32's low global warming potential (GWP) is only 1/3 of that of today's most common window air conditioning refrigerant, R-410A. High in energy efficiency and low in flammability and toxicity, R-32 is also a recyclable, non-ozone depleting refrigerant.

Refrigerants are the chemicals used in cooling systems, such as air conditioners and refrigerators, to disperse thermal energy or unwanted heat.

## R-32 REFRIGERANT MARKET

The adoption of the Montreal Protocol in 1987 to reduce ozone-depleting chemicals resulted in shifts to refrigerants with progressively lower environmental impacts.

**Fact: R-410A contains 50% R-125 and 50% R-32.**

Some AC manufacturers have already made investments in changing to R-32. These include LG, Daikin, Friedrich, Amana, Goodman, Carrier, Johnson Controls, Lennox, Rheem, Nordyne, Panasonic and Trane. Moreover, R-32 has already been

adopted as the standard refrigerant in countries where sustainability and global warming is deemed important, including the UK, Australia, Switzerland, New Zealand, Denmark, Japan, Thailand, India and Brazil, with other countries, like Sweden, currently in the approval process.

## R-32 IS SAFE

R-32 is classified as an A2L refrigerant, where the “A” designates “virtually non-toxic” and the “L” designates “low flammable.” The classifications are defined in ASHRAE 34. An A3 grade refrigerant represents a more highly flammable refrigerant such as R-600 or R-290.

Therefore, an A2 classification is significantly safer than A3. And A2L refrigerants, like R-32, are safer still.

The burn velocity of R-32 is very slow—only 12.6 feet per minute. By comparison, the burn velocity of R-600—used today by Denmark's Vestfrost, who sells nearly one million refrigerators and freezers annually—is a rapid 78.6 feet per minute.

**Fact: R-32 has an extremely slow burn rate of 12.6 feet per minute, meaning that one could easily walk away from burning R-32.**

To ignite R-32, a flame above 1000°F is needed—much higher than other refrigerants, such as R-600 (butane), which ignites

at just 689°F. Two separate and independent conditions must occur simultaneously to ignite R-32.

First, enough refrigerant must leak to create a vapor concentration of more than 14.5% in the air. This would entail over 24 standard 8000-BTU air conditioning units leaking into a 100-square-foot room. Secondly, there must be an ignition flame or spark with temperatures above about 1000°F to create the slow-burning fire.

**Fact: Labels of flammability on R-32 air conditioning units have raised unrealistic fire concerns.**

By comparison, the ignition temperature of a matchstick is 446°F. One could ignite R-32 with a blowtorch—typically between 1100°F to 1500°F.

Because they are sealed within the air conditioner, refrigerants in window air conditioners are particularly safeguarded from fire hazards, unlike many other highly flammable household products like hair spray (isobutene), perfume (ethanol), nail polish (ethyl acetate), hand sanitizer (ethane), cooking oil (hydrocarbon) and a number of cleaning products.

All air conditioners contain compressor oil or lubricants as well as refrigerants. In the event of a fault in the system, the lubricant mixed with R-410A would create



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**R-32 HAS AN EXTREMELY SLOW BURN RATE OF 12.6 FEET PER MINUTE, MEANING THAT ONE COULD EASILY WALK AWAY FROM BURNING R-32.**

*Labels of flammability on R-32 air conditioning units have raised unrealistic fire concerns.*

a flammable mixture, whereas adding lubricant to R-32 makes it less flammable. Upcoming testing by the AHRI will likely confirm that R-410A and R-32 have about the same flammability, once lubricated.

## R-32 IS MORE EFFICIENT

R-32 is 40% more efficient than R-410A, but with only 1/3 of the global warming potential. Air conditioner efficiency is measured by the amount of energy needed to evaporate the refrigerant; the higher the latent heat of vaporization, the more energy it absorbs, and thus the more efficient the refrigerant. R-32 has a latent heat of vaporization of 360.24 kJ/kg, compared to R-410A's 256.7 kJ/kg.

**Fact:** Because R-32 is more efficient than R-410A, less refrigerant is needed, increasing the life of the air conditioner.

## R-32 IS LOW IN GLOBAL WARMING POTENTIAL

All refrigerants by nature are greenhouse gases and are rated according to GWP.

One kilogram of R-410A has a GWP of 2100, whereas the same amount of R-32 has a GWP of only 675. Moreover, because less R-32 is needed, its GWP is effectively even lower.

**Fact:** R-32 has 1/3 the global warming potential of R-410A,

## the most common refrigerant in window air conditioners.

The major concern of GWP is leakage during air conditioning service and repair. Worse still, refrigerants may be intentionally or illicitly released into the atmosphere during service.

HFCs with high GWP, including R-410A, will be “phased down” by the EPA’s SNAP program beginning in 2015. Last year, the EPA included R-32 on their approved refrigerant list, and the European Union enacted the revised F-gas regulation in 2006 to lower their GWP by eliminating the use of R-410A in stand-alone supermarket refrigerators and freezers.

Manufacturers, retailers and servicers will benefit from being prepared for this transition.

## R-32 HAS ZERO OZONE DEPLETION

The Earth’s ozone layer protects us from the sun’s UV radiation. Some refrigerants still used in older systems in non-OECD countries could deplete the ozone layer. UV radiation causes non-melanoma skin cancer and plays a major role in malignant melanoma development.

**Fact:** R-32 has zero Ozone Depletion Potential while the commonly used refrigerant R-22 has 0.05 ODP.

## R-32 IS GREEN

**R-32 is better.** Transitioning to R-32 refrigerant would realize a significant reduction in carbon emission. If all R-410A currently in window air conditioners were replaced by R-32, the total CO<sub>2</sub> equivalent impact would be reduced by 24%.

**R-32 is low-toxic.** ASHRAE standards classify refrigerants according to their toxicity. An “A” refrigerant is a virtually non-toxic substance, while a “B” refrigerant is toxic.

**Fact:** R-32, classified as A2L, is virtually non-toxic, low-flammable and recyclable.

**R-32 is recyclable.** R-410A is 50% R-32 and 50% R-125 and is difficult to separate into its constituent components—which means that it cannot be easily recycled. This further increases the lifetime environmental cost of an R-410A system. A single-component refrigerant like R-32 is easier to reuse and recycle.

## CONCLUSION

While all cooling system refrigerants have an environmental footprint, R-32 offers a unique balance of energy efficiency, greenhouse gas mitigation and very low flammability. Therefore, Eneref Institute encourages consumers, retailers and governing agencies to expedite the transition from R-410A to R-32.



**FACT**

**R-32 HAS ONLY ONE THIRD  
THE GLOBAL WARMING  
POTENTIAL OF R-410A.**

*R-32 offers a unique balance of energy  
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