



# The Invisible Opportunity: Refrigerant Management Challenges and Solutions

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# Essential Knowledge About Refrigerants

- Refrigerants are incredibly powerful greenhouse gases
- Emitted refrigerants are the problem
- Main goals: boost efficiency/stop leaks/reclaim/denature
- Better refrigerants are on the way
- Many reasons to get involved with this issue

# Refrigerants: Powerful GHGs

- GWP = Global Warming Potential
- GWP of Carbon Dioxide = 1
- GWP of Methane = 34
- Refrigerants:
  - R410 (current air conditioners)
  - R134A (car air conditioners)
  - R404A (grocery store coolers)

Gas	GWP
Carbon Dioxide	1
Methane	34
R410A	2,088
R134A	1,430
R404A	3,921

# Implications of GWPs



DEHUMIDIFIER	
MODEL	HANAD70A
POWER SOURCE	115V~ 60Hz, 1Ph
RATED CURRENT	8.9A
RATED INPUT	765W
CSA SAFETY CURRENT	8.1A
REFRIGERANT	R410a/7.75ozs
MOISTURE REMOVAL	70PINTS/DAY
EEV	1.8L/KW.H
DESIGN PRESSURE	HIGH 540PSIG LOW 300PSIG

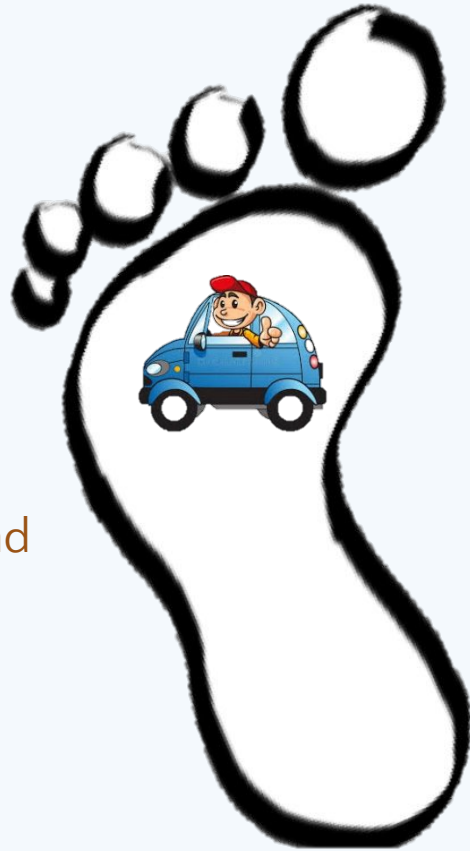
This dehumidifier holds **7.75** ounces of R410A, which has a GWP of 2088

Burning 1 gallon of gasoline yields **18.9 pounds** of CO<sub>2</sub>

Leaking 7.75 ounces of R410A yields **1011 pounds** of CO<sub>2</sub>e or “CO<sub>2</sub> equivalent”

# CO<sub>2</sub> Equivalence

The average American drives 13,500 miles/year, and the average U.S. car gets 24.7 mpg



This activity uses 545 gallons of gasoline and generates a carbon footprint of 10,300 pounds of CO<sub>2</sub>

1 pound of R410a has the same Global Warming Potential as 2088 pounds of CO<sub>2</sub>

So about 5 pounds of R410a can create a greenhouse gas footprint equivalent to that of an average car driven for one year



One could find that much R410a

in 50 air conditioning units

The average American supermarket uses 3,500 pounds of R-404 and leaks 25% of that annually.

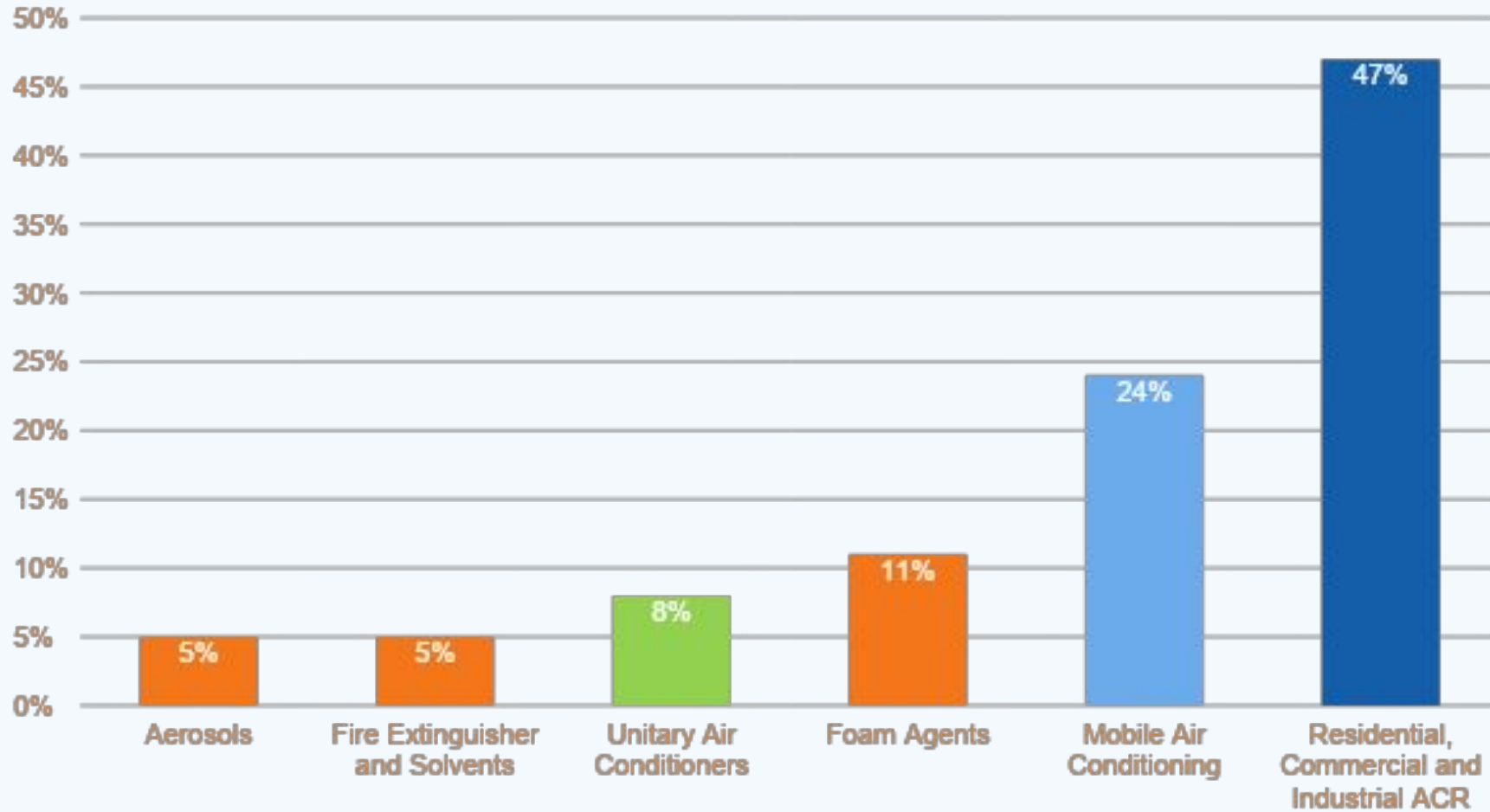
This 875 pounds of refrigerant, with a GWP of 3921, generates a carbon footprint of 3,400,000+ pounds of CO<sub>2</sub>.



That's the same annual carbon footprint as how many average American cars?



# Where are refrigerants used?



# Basic Solutions

- Boost efficiency
- Improve end-of-life reclamation rates
- Prevent, detect and repair leaks
- Phase in low-GWP refrigerants

“I ... thought you should know that there is NO, NADA, ZILCH, enforcement of federal refrigerant reclamation. Every HVAC contractor knows there is no enforcement. ... Most HVAC contractors do not recover refrigerant. They just cut the lines during replacement, and vent the gas. I say this as a very experienced HVAC tech who talks to many in the industry.” – *Lloyd Hamilton*

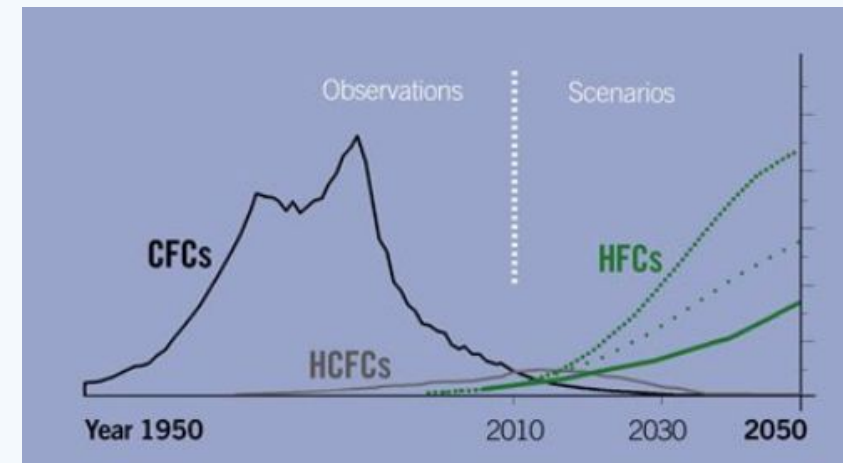


# A Simple History of Modern Refrigerants

Era	Refrigerants	Ozone Depletion?	High GWP?	Difficult to Denature?
Early	CFCs	Yes	Yes	Yes
Transition	HCFCs	A little	Moderate	Yes
Current	HFCs	No	Yes	Yes
Future	F-Gases/Natural	No	No	Yes/No

5%\*

- 1987 Montreal Protocol
  - Phased out CFCs (Class I Ozone Depleting Substances)
  - Phased in HCFCs (Class II Ozone Depleting Substances)
  - Phased out HCFCs and Phased in HFCs
- 2015 – EU F-gas Regulation
- 2016 – Kigali Amendment to the Montreal Protocol





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# HVAC Technicians = leak stoppers

- Understand your HVAC tech's opinions on refrigerant recycling
- Greater complexity/customization/age = leaks more likely
- Setup: request transparent pressure test before charging system
- Regular maintenance: topping off is cheaper than fixing leaks
- **A leaking system eats more energy, wears out sooner and may be breaking the law, but repair costs often exceed savings**
- Better refrigerants are coming, but usually replacing the whole system is the only way to use them





John Ciovacco

# Why get involved?

- According to Project Drawdown:

“The operational costs of refrigerant leak avoidance and destruction are high, resulting in a projected net cost of **\$903,000,000,000** by 2050.”

# What You Can Do

- Join the Refrigerants Working Group of the HV Climate Solutions Network
- Learn about refrigerant management issues
- Audit and track refrigerants in places you are responsible for
- Participate in a Climate Smart Communities commission
- Educate friends and neighbors on the issue of appliance recycling
  - Copy, revise and post the web page: [www.sustainablewarwick.org/refrigerants](http://www.sustainablewarwick.org/refrigerants)
  - Copy, revise and distribute the brochure
- Encourage local governments to make recycling appliances cheaper/more convenient
- Support strong refrigerant laws in NY
- Support US participation in the Kigali Amendment



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