

Up Close

Behind the Scenes with the Industry's Leading Innovators



The best replacement for R-22 is reclaimed R-22, according to the experts at Hudson Technologies Company.

REFRIGERANTS: THE ECONOMICS OF RECLAMATION

The succession of gases implicated in ozone hole depletion and global warming has been dizzying. But reclamation by way of Hudson Technologies prevents harm by incentivizing contractors to quit venting.

By Russ Klettke

Hudson can reclaim every type of refrigerant on the market.

If business schools are teaching about environmental economics, they should study the case histories of coolers, chillers, and other refrigeration technologies. And not just the equipment that sits on building roofs or next to food storage facilities. A central part of the equation is refrigerant gases.

Few know this better than one of the leading companies in the refrigerants business—Hudson Technologies, based in Pearl River, New York, with operating facilities throughout the U.S. and Puerto Rico. The company's founder, CEO and Chairman of the Board Kevin Zugibe, has been addressing environmental concerns with refrigerants since the late 1980s, when the words "ozone hole" first entered the public discourse.

"The amendment to the Clean Air Act on ozone meant there would be no more venting of CFCs after 1992," says Zugibe, who was a professional mechanical engineer with experience designing and installing air conditioning systems prior to then. That venting was of the most common refrigerant of the time, chlorofluorocarbons (CFCs); after a period of service most refrigerant gases were simply disposed of into the atmosphere.

Relatively harmless to life on the ground, the chlorine in the organic compound rose a dozen or more miles into the stratosphere, where it interacted with the ozone layer of the earth's atmosphere, destroying it (largely

over Antarctica) and allowing harmful ultraviolet radiation to reach humans and other life back on the ground.

The phasing out of CFCs is widely credited as an effective global effort to repair the ozone hole. In place of CFCs came other technologies (HCFCs and HFCs), and in particular HCFC-22, otherwise referred to as R-22.

A Faster, More Efficient Way to Reclaim Refrigerants

Zugibe, who describes himself an entrepreneur-engineer, devised a system for extracting, cleaning, and reclaiming used refrigerants in anticipation of the 1992 legislation. The equipment of that time, which distilled gases as a means to remove impurities, was slow and required a lot of energy.

"I wanted a much faster, energy-efficient, single-plate distillation mechanism," he says. So he built one himself, which today is still the fastest, most efficient reclamation machine in the world. That same machine (affectionately referred to in the industry as "the Zugibeast®") is essentially how the company cleans refrigerant gases today.

As those newer refrigerant technologies evolved, Hudson reclamation services were capable of recovery, reclamation, and reuse of all, including R-22. But this is where the environmental economics class on refrigeration technologies takes a twist. R-22 is capable of some degree of ozone depletion and, to a greater degree, it's a global-warming greenhouse gas. Air conditioning units manufactured prior to 2010 run with optimal efficiency on R-22.

So R-22 is being phased out, per the EPA. Production and importation will cease in the

U.S. and most other developed countries in 2020. So where does that leave owners of legacy coolers, those designed to run with the greatest energy efficiency on R-22?

The economic and environmental equation is not lost on Hudson. The company's technologies and services—as delivered through wholesalers and HVAC contractors—enable reclamation of existing R-22 refrigerants.

"The best replacement for R-22 is reclaimed R-22," says Chuck Harkins, vice president of sales and marketing at Hudson. "Systems designed for R-22 operate most efficiently on R-22, and since reclaimed R-22 meets or exceeds the same purity standard, it is the best alternative."

Supply-Demand Dynamics

Owners of coolers that run on R-22 may or may not be motivated by the environmental imperative to cease using it. But supply limits have effectively raised prices, providing economic incentives in a value chain of customers, HVAC contractors, and Hudson Technologies to capture, clean, and resell the refrigerant.

Another curveball to the refrigerant economic landscape came in 2013 when the EPA surprisingly allowed an increase in R-22 production, effectively lowering the price, which reduced reclamation and likely increased venting. "A glut in the market that was already oversupplied with virgin R-22 eliminated the economic incentive for proper refrigerant management and reclamation," Harkins says.

That oversupply has since settled out, but it's common for end-users to be confused by the changes in technologies and EPA regulations. "Price fluctuations have been wild," says Leah Lampton, marketing manager for

Rogers Supply Company in Illinois. She shares that the per-pound prices have ranged from \$5.50 in 2015 to \$11 in 2016–2017, then back down to \$7 in 2018. "Some people worry that R-22 will run out in the future. But we tell them if their equipment is in good shape to stick with the reclaimed product."

People like Lampton are on the front lines of this information battle about refrigerants. She distributes newsletters and posters to contractors and dealers to educate them on such things as regulatory requirements, prohibitions on venting, and the rules for refrigeration disposal. One such poster reminded technicians that compliance with EPA rules on refrigerant reclamation reduces the annual metric tons of carbon dioxide equivalent (MTCO_{2e}) by 7.3 million, about what is produced by 1.5 million cars.

Alignment Equals Fewer GHGs

The reclamation process can be operationally efficient to perform even onsite at large buildings or facilities. It's analogous to kidney dialysis in that the building chillers can continue operating while the refrigerant is diverted to the Zugibeast® cleaning process. "We can clean very fast on-site," Zugibe says.

The process Zugibe developed a quarter-century ago is fundamentally the same as what's used today, and it's still the fastest, most efficient reclamation equipment in the world, able to reclaim every type of refrigerant on the market. And with millions poured into further research and development, Hudson Technologies can also certify that reclaimed gases meet standards set by the AHRI. Hudson also provides energy consulting and design services across the globe, offering such things as web-based fault detection, diagnostics, and optimization for chilled water plants.

This private-public collaboration is hardly unusual, and it speaks to the interconnectedness of many players in the refrigerants-environment-economics equation. For Zugibe, the entrepreneur-engineer, that's consistent with his mission.

"Our business has always been built on the environmental cause," he says. "If people continue to use R-22 without venting it, we can achieve a zero global warming goal and buildings can keep using their equipment running at their optimal efficiency. Why make new molecules when you can reclaim what's already in use?"



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