

Grayway

THE REFRIGERATION CHALLENGE

Climate change has created a warm environment for natural solutions

01
CAN'T LIVE WITHOUT IT

Refrigeration is critical for
food safety, quality

03
GRAY...WE'RE BUILDING

JBS USA
Cactus, TX

04
SENSING A SOLUTION

Refrigerants and safety

05
GRAY MATTER

A matched pair:
Setbacks and opportunities

06
SHADES OF GRAY

California in the lead



Throughout its history, Gray has been a close partner with the food industry. We've built facilities for Nestlé, Pepsi, ConAgra, Tyson Foods, Kroger and others.

Refrigeration is an essential ingredient in modern food processing, storage and distribution.

Gray's history of adaptation and innovation has helped us stay abreast of changes in industrial refrigeration as both synthetic and natural refrigerants have been developed and new technologies have been applied to address cost, safety and environmental impacts.

Many of our "curious" customers have conducted extensive research to determine the system that works best for them. If you have, we're happy to install your preferred system; if not we'll work with our trusted engineering partners to recommend a system that will meet your needs and budget.

A handwritten signature in black ink, appearing to read 'Tyler Cundiff'.

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REFRIGERATION





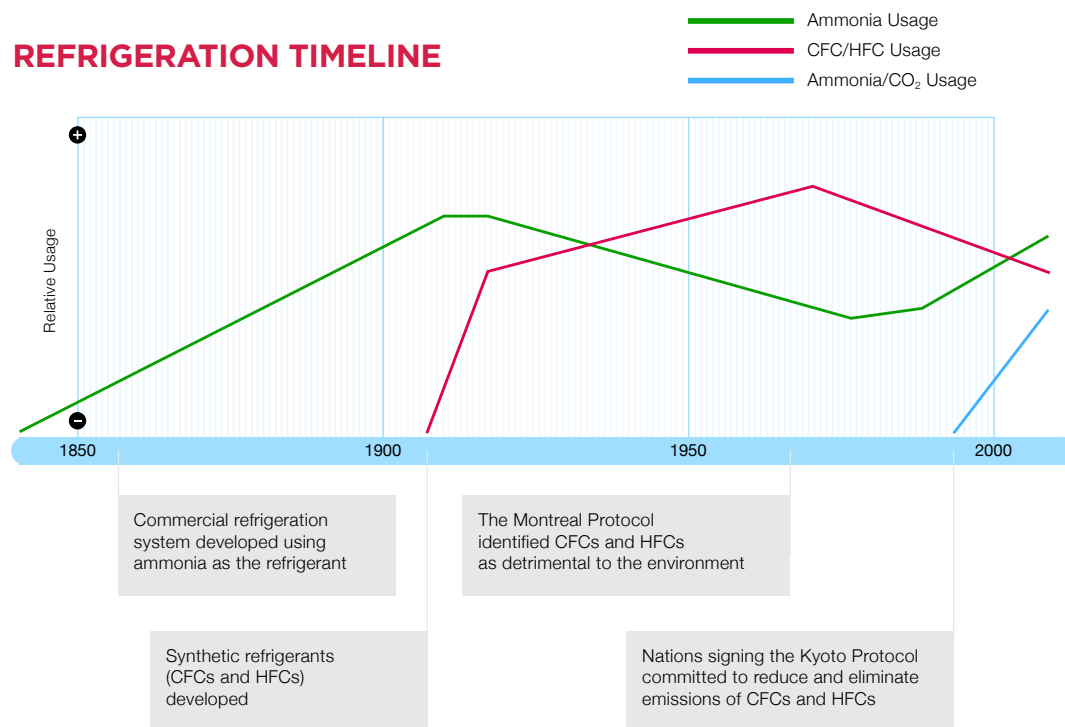
CAN'T LIVE WITHOUT IT



Refrigeration is a key ingredient
in modern food processing

From its earliest days, Gray Construction has been active in the food industry. Today Gray is ranked 7th nationally among the Top 15 Food Processing Contractors, with customers including Nestlé USA and ConAgra Foods Inc., the top producers of meals and entrees in Refrigerated and Frozen Foods magazine's list of leading producers. There are myriad options that processors have today. Considerations for initial capital cost, operating cost, efficiencies, worker safety and environmental impact are just a few. This issue of the GrayWay is devoted to examining this complex and ever-changing aspect of food processing.

REFRIGERATION TIMELINE



Almost all food producers need some type of refrigeration system in their process to manufacture their product and to ensure product quality and safety. Those systems can represent a major cost, both initially and operationally, and have been the subject of intense regulatory interest inspired by environmental and worker safety concerns.

Complex industrial refrigeration systems today share the same basic physical and mechanical processes invented over a century and a half ago. The predominant refrigerant is ammonia, a natural compound used in one of the first commercial refrigeration systems. It continues to be the subject of attention and controversy today in spite of its use around the world as an efficient and cost-effective refrigeration agent. However, that's changing. To understand the industry a little better, here's a brief history of refrigeration.

Because of the health risks associated with ammonia during its early use, synthetic refrigeration agents discovered in the

1920's, were considered a safe and stable alternative. During the 1970's, concerns arose about these agents and their impact on the environment. Chlorofluorocarbons (CFCs), were found to compromise the ozone layer of our atmosphere that protects us from our sun's ultraviolet rays. Hydrofluorocarbons (HFCs), a replacement for CFCs have also been identified as a significant contributor to the growing threat of climate change. The end to the use of these synthetic agents is now mandated as a result of The Montreal Protocol, entered into force in 1989 and the Kyoto Protocol, in force since 2005, and a number of other environmental agreements.

What does that mean to the many companies that rely on refrigeration systems for their business to operate?

Through research and development, ammonia-based refrigeration system designs have been continually improved to focus on higher efficiencies and better controls and containment systems, creating a much safer work environment as well as more environmentally-friendly installations. In addition, many large companies have partnered with industrial refrigeration engineering companies to develop hybrid systems which use both ammonia and CO₂ in their facilities.

An ammonia/CO₂ based system offers many advantages to the processor who operates it. The environment also reaps the benefits of a hybrid system because it uses much less ammonia, which means any leak or catastrophic failure will result in a greatly reduced environmental impact and potential health threat.

DEFINITIONS: WHAT ARE WE TALKING ABOUT?

Refrigeration:

Basic heat transfer: Removing heat from a space and transferring it elsewhere, using a refrigerant that attracts heat. Common refrigerants include ammonia, carbon dioxide and chlorofluorocarbons.

Ammonia:

NH₃. Made up of nitrogen and hydrogen, it is colorless with a strong, pungent odor, is lighter than air and doesn't burn easily.

Carbon Dioxide:

CO₂. Made up of oxygen and carbon, is colorless and odorless in low concentrations. It is released when fossil fuels are burned and in other chemical processes. As a liquid it is used in refrigeration systems under high pressure.

Chlorofluorocarbons (CFCs):

Organic compounds that contain carbon, chlorine and fluorine. Hydrochlorofluorocarbons also include hydrogen. CFCs and HCFCs are commonly known by the trade name Freon, owned by DuPont.

CHOOSING A SYSTEM: COMPLEX AND COSTLY

Educate yourself, check references



Walter Teeter

Walter Teeter has been in the industrial refrigeration business since 1989. "There's been more change in the last five years than I'd seen the previous 15," said the president of Republic Refrigeration.

No surprise many are confused. But some companies that rely on refrigeration have the resources and motivation to navigate this changing environment.

U.S. Foodservice is one. With 250,000 customers and more than 60 locations spread across the country, "it's very important for us to make the right decisions," about refrigeration systems, said Art Roman, director of design and construction. "It's critical."

Roman considers initial installation, ongoing energy, operational staffing, ongoing maintenance and safety compliance to determine life cycle cost for a system. "We want a system that will give good operating characteristics over the lifespan of the building and will be easy to expand," he said.

Teeter said Freon can be less costly to install but energy and refrigerant run higher than ammonia and carbon dioxide systems. CO₂, he said, is the most effective at very low temperatures but, because it's less commonly used, installation is more specialized. Ammonia is generally the least costly to install and operate but is more heavily regulated. Ammonia and CO₂ get the environmental nod, as neither harms the ozone layer or contributes to climate change.

CO₂ appears to be growing in popularity for various reasons, particularly in CO₂/NH₃ cascade systems. Ammonia systems, the tried and true backbone of industrial refrigeration, will almost certainly continue as a major presence.

How to sort this out?

Educate yourself and "team up with a reputable partner," said Eric Brown of Alta Refrigeration. Gray has installed all these systems and works with refrigeration subcontractors to analyze life cycle costs and other considerations for customers.

Above all, Brown said, check references. "To the untrained eye," two systems may look identical but the quality of design and installation could affect efficiency by up to 20 percent.

Roman says it's important to include all the players during the design phase, including those responsible for construction and maintenance, managing energy costs and safety, and regulatory compliance.

JBS USA / Cactus, Texas

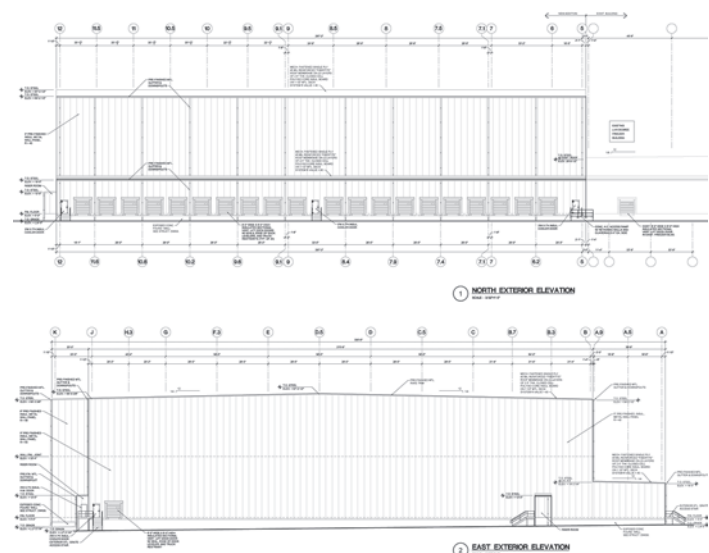
JBS USA is breaking ground this summer on an expansion of its beef processing and packaging plant in Cactus, Texas.



JBS USA, one of the largest beef processors in the United States, chose Gray Construction to provide a full range of design-build services for the 108,000 square foot project. The facility will include a low temperature warehouse cooler and blast freezer with insulated metal panels throughout to meet thermal requirements. A 60-foot-high bay area will also support a fully automated storage and retrieval system (AS/RS).

The project will require close coordination among Gray, AS/RS racking vendors and JBS as it will be built around three sides of JBS' existing freezer facility and will involve relocating the refrigeration engine building. Once the expansion is complete early next year, the entire plant will employ 3,600 people and operate two full shifts daily.

JBS S.A., a Brazilian-based multinational company, was founded by José Batista Sobrinho in 1953 when he opened a small slaughtering plant with a daily slaughtering capacity of only 5 head. It became the world's largest meat processor with its 2007 acquisition of Swift & Co. U.S. and Australia. JBS S.A. has a presence in all of the world's consumer markets and has beef processing plants in Brazil, Argentina, the U.S. and Australia.



Exterior elevation plans for JBS USA.

SAFETY: SENSING A SAFE SOLUTION

Design, installation, operation

All refrigerant gases, if inhaled, are dangerous but ammonia has the disadvantage – or advantage – of being offensive when people get a whiff of it.

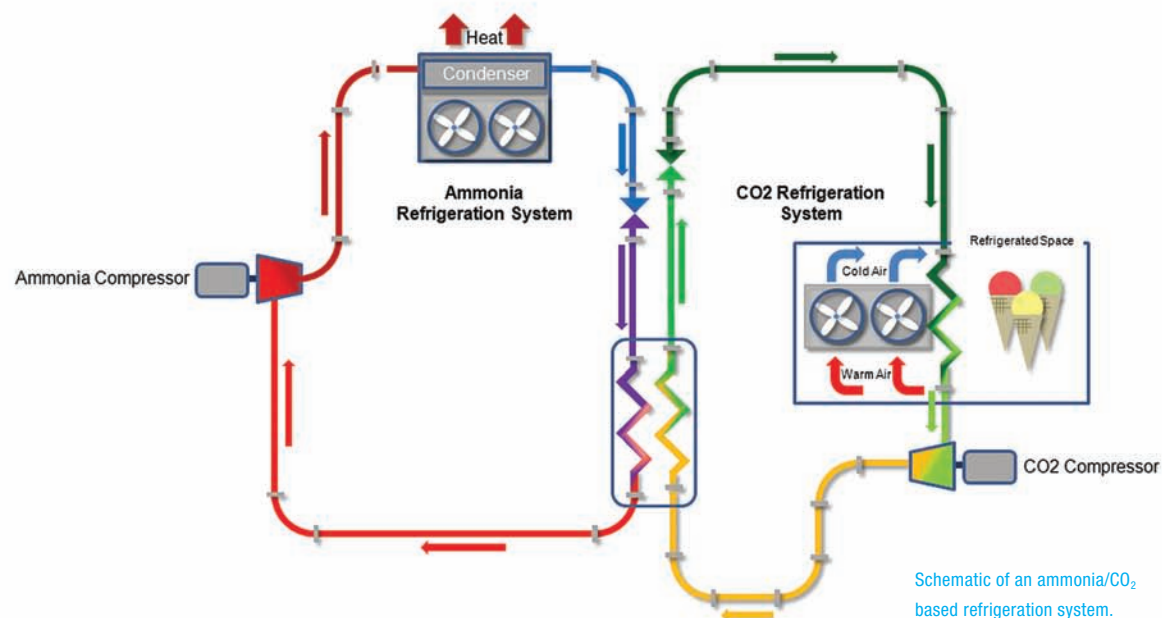
“Ammonia’s pungent odor is like a built in alarm system,” said Art Roman of U.S. Foodservice. But ammonia is toxic so “you have to be very careful about how you handle it.”



Ammonia has been used as a refrigerant so long and so widely in industrial construction that safety programs are well developed, Roman said. “People know how to handle it safely to protect against leaks and catastrophic events.”

Roman said that, because of strict safety requirements, ammonia systems are often better maintained than others and so can be more efficient and safer.

For Eric Brown of Alta Refrigeration the safety issues with all refrigerants relate to the quality and technical sophistication of the installation. “Doing what the code requires isn’t, in our opinion, enough.”



Schematic of an ammonia/CO₂ based refrigeration system.

Bruce Badger, president of the International Institute of Ammonia Refrigeration (IIAR), said ammonia’s advantages environmentally and economically make a compelling case for its use, “but it is our job to make sure it’s done safely.”



Bruce Badger

With CO₂, Brown cited the inherent dangers that could exist with pressures potentially exceeding 1,000 PSI. He also noted that since “you can’t see it, you can’t smell it,” if there is a leak in a well-insulated space “you could be suffocating and not know it.”

Brown thinks odorizing CO₂ and the synthetics like natural gas would be tough: “The pressurization cycle in industrial installations of refrigeration systems would distill out the chemical producing the odor.”

A strong advocate for ammonia, Brown says most safety problems are in older systems, some dating back 80 years but still in use. “These are the ones that are giving the industry a bad name.”



Nestlé, the world’s largest food producer, noted in a statement on its website that the move to synthetics was “often motivated by a desire to improve plant safety by avoiding the hazards of some natural refrigerants.”

However, when evidence began accumulating that synthetics harmed the larger environment, Nestlé reconsidered. In 1986 the food producer began moving from synthetic refrigerants such as CFC and HCFC to naturals like ammonia and CO₂, citing environmental concerns.

Nestlé concluded that with “proper design, construction and operation,” a modern natural system could be safe.

REGULATORY FUTURE: A CHANGE AGENT

Regulations move the industry

“Most change in the refrigeration industry is regulatory driven,” says Walter Teeter, a veteran of the field.

That’s been the case as restrictions on synthetic refrigerants have grown with concern about their impact on the environment. Some European countries allow only natural refrigerants, and California has legislation favoring them.

So, what does the future hold?

Eric Brown at Alta Refrigeration thinks market forces driven by economic and environmental concerns, will all but eliminate synthetics before governments do. Art Roman at U.S. Foodservice said reducing energy usage and costs is a company-wide priority and regulatory guidance could impact refrigeration choices.

At the International Institute of Ammonia Refrigeration, Bruce Badger predicts that as concerns mount about synthetics in the atmosphere regulations to reduce leakage, that have traditionally applied to ammonia systems, will apply industry wide.

Just don’t look for regulatory easing.

“I’ve rarely seen a regulatory agency that’s gone the other direction. It’s generally towards more restriction,” observed Roman.

To learn more, please visit:

GreenChill

www.epa.gov/greenchill

International Institute of Ammonia Refrigeration

www.iiar.org

Industrial Refrigeration Consortium

www.irc.wisc.edu



Jim Gray and Stephen Gray

GRAY MATTER

A matched pair: Setbacks and opportunities

When our parents came back from service in World War II, but before they married in 1947, each went to work.

Mom taught school for a few years before starting a family and opening her paint, drapery and wallpaper store. James Norris, our dad, joined his father at the family-owned ice plant in Glasgow, Kentucky.

In this GrayWay we examine the industry that cost dad his first post-war job in that little ice plant, and then gave rise to Gray Construction: industrial refrigeration.

Dad learned some valuable lessons when modern refrigeration eliminated demand for the blocks of ice that used to keep food fresh and people cool. He learned that technological advances will wait for no one, and that change is inevitable in business and in life. Most importantly he learned – and taught us – that the difference between a setback and an opportunity depends upon your response.

We’re living in times that provide setbacks aplenty. For almost two years now, national and international financial markets have been in turmoil. And although the global economy seems more stable today than it did last year, we face worries about the euro, employment hasn’t bounced back, and credit is still tight.



Gray's family-owned ice plant, Glasgow, KY

But every day we get up and work with great customers who are seeking out new opportunities that lie ahead. Our business is to help them build the facilities they need to seize those opportunities.

No one knew when dad lost his job at the ice plant that one day Gray Construction would be building plants where workers would produce thousands of automobiles in one day or flash freeze food that would travel across the continent. We don’t know today what opportunities await us, but we know they’re out there and we’ll get ready for them.

Jim Gray
Chairman and
Chief Executive Officer

Stephen Gray
President and
Chief Operating Officer

LESSONS FROM CALIFORNIA



Bob Moore
President
Gray-I.C.E. Builders

California often leads the nation in addressing environmental threats. That was the case when AB-32, The California Global Warming Solutions Act, became law in 2006 with the goal of reducing greenhouse gases to 1990 levels by 2020.

Among the gases targeted by the Air Resources Board, which is aggressively implementing the law, are the CFCs, PFCs and HCFCs commonly used in industrial refrigeration and cooling systems.

Since ammonia's impact on both ozone depletion and global warming is non-existent, it is a favored alternative refrigerant. The Board's rules place stringent regulations regarding leak detection, monitoring and repair requirements on systems using synthetic refrigerants but exempt systems using ammonia or CO₂, or a hybrid of the two.

The effect will be to virtually eliminate systems using the synthetic refrigerants because the costs will simply be too high.

Working with refrigeration subcontractors, Gray-I.C.E. Builders has installed ammonia systems in California, including in the King's Hawaiian Bakery Facility, produces and packages over 6,000 pounds of King's sweet bread each hour. (See GrayWay August 2007).

Although ammonia is not harmful once it's fully released into the air, all of the refrigerants – synthetic and natural – are toxic at close range and in high concentration. Ammonia has the advantage of a distinct, and offensive, natural odor that people smell even at non-toxic concentrations. The key to safety with an ammonia system is to have adequate detection where people usually aren't present and detailed safety procedures for what to do if a leak is detected.



King's Hawaiian Bakery, Torrance, Calif.

MAINTENANCE TIPS

The goal of the Gray team is for you to enjoy your building long after we've left the job site. Steve Higgins, Gray's Service Team Manager, offers these maintenance tips to help you avoid expense and headaches during the summer season.

- **Perform a thorough review of your HVAC system. Switch HVAC controls from heating to cooling as appropriate. Check the filters and belts and replace them as needed. Lubricate fan and motor bearings and clean coils as necessary.**
- **It may also be time for the annual fire system and pump test to ensure your system is performing correctly.**



Steve Higgins
Service Team Manager
Gray Construction

"The goal of the Gray team is for you to enjoy your building long after we've left the job site."



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