



COMMERCIAL REFRIGERATION

● SOCIETAL IMPORTANCE

Commercial refrigeration preserves and protects food for societies around the world. Globally, studies show an average of 25% or more of harvested produce never reaches the market because of inadequate refrigeration. This percentage is often significantly higher in developing countries. Population growth increases world food production and delivery pressure, necessitating adequate refrigeration to minimize hunger, famine, and disease.

Critical Application Considerations

Consumers purchase food from supermarkets and retail food stores at the cold chain end. The equipment ranges from small kiosk-type refrigerator/freezer display cases to large refrigerated storage rooms. A large variety of perishable food products require diverse temperature controls to maximize shelf-life. As many as seven or eight different refrigerated storage areas may be required. However, equipment manufacturers must practically limit product offerings and operating temperatures may be compromised.

Fruits and vegetables typically use water spray systems to keep humidity high and sustain appropriate wet bulb temperatures

since they are intolerant to low temperatures and low humidity. Meat, milk and dairy products are stored near the freezing point with minimal humidity. Fish are kept on ice and are separated to avoid smell and taste contamination. Ice cream requires the lowest temperatures (-23°C/-11°F) to prevent crystallization and softening.

Display cases distributed throughout a modern supermarket present significant equipment and servicing challenges. Central systems circulate refrigerant throughout the store to remote units. Many connections and coils can make leak control difficult. System reliability and serviceability are essential to prevent food spoilage costs.

Environmental Considerations

Commercial refrigeration has undergone the transition from CFCs to HCFCs, and more recently to HFCs. Now, lower climate impact solutions are beginning to be employed. System efficiency and effectiveness are also critical and require LCCP approaches. Historically supermarket systems have been criticized for high leak rates. More recently,

manufacturers have made significant design improvements to reduce leaks throughout equipment life. Innovative charge minimizing designs and configurations, leak-resistant fittings and an emphasis on preventative maintenance have all resulted in lower average emissions and higher recovery rates.

Technology Trends

Traditionally, supermarket refrigeration equipment used a central system connected to remote display cases, walk-in refrigerators and freezers or self-contained display cases. Newer distributed equipment place refrigeration compressors and components closer to cases or walk-in refrigerator/

freezers, thereby eliminating lengthy tubes of refrigerant. Indirect systems use a primary refrigerant to cool a secondary fluid, which circulates through cases or equipment coils. **In each case, the choice of refrigerant will depend on the specific requirements of the application.**

Looking Forward

Currently, HFC-134a, HFC-404A and R-507 are the most common refrigerants in commercial refrigeration. As pressure to reduce GWP is recognized, there has been an increased use of hydrocarbons, carbon dioxide and even ammonia in certain markets. Experience shows that with a suitable emphasis on minimizing safety risks and effective training of service personnel, this can be done with considerable success. HFOs, alone or in blends with HFCs, have the potential to maintain high efficiency with lower direct global warming impact. However, broad commercialization, of such equipment is probably several years away. It is important that equipment designers have access to a broad choice of working fluids to optimize energy efficiency, safety, affordability, and sustainability.

Manufacturers of commercial refrigeration systems have also improved the energy efficiency of equipment by using variable speed compressors, fans and pumps with improved efficiency, low energy lighting (LEDs), night curtains and doors, among other enhancements. These improvements have been embraced by store owners and customers.

The commercial refrigeration industry is committed to providing products that preserve the world's food chain in the most safe and sustainable manner possible. While providing cooling for very diverse storage conditions, manufacturers have focused on minimizing the environmental impact of their equipment through minimizing leaks and improving energy efficiency through recent design improvements. As climate concerns require lower GWP options, this industry will employ a variety of refrigerant solutions while maintaining a high level of energy efficiency in its products.



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The Alliance is an industry coalition that was organized in 1980 to address the issue of stratospheric ozone depletion. It is presently composed of about 100 manufacturers and businesses which rely on HCFCs and HFCs.

Today, the Alliance is a leading industry voice that coordinates industry participation in the development of international and U.S. government policies regarding ozone protection and climate change.