Cold storage with carbon dioxide

In United States Cold Storage’s distribution warehouse in Pennsylvania, USA, Danfoss control valves secure the safe and steady flow of refrigerants in the carbon dioxide and ammonia cascade refrigeration setup.

Before installing the CO₂/NH₃ option USCS compared this type of setup with a two-stage ammonia system and found several things in favour of the CO₂ system:

1. Cheaper installation: Five to ten per cent cheaper than other options.
2. Efficiency: Carbon dioxide offers more efficient cooling at very low temperatures (-50 deg. C).
3. Safety: CO₂ is neither flammable nor poisonous, so frozen foods will not be harmed in case of leaks. Also, by introducing CO₂ to the cycle the amount of ammonia can be reduced by up to 90%. No ammonia can be found in storage areas.
4. Potentially lower energy costs with blast freezing.

"The plant has been running without problems since April 2005 and although calculations did not show any savings in operation costs, the USCS plant has lowest energy consumption per cubic foot among all the company’s warehouses," says Mr. Christensen.
The Danish company, Danfoss, was selected to supply all the valves and controls to ensure a steady and safe flow of refrigerants on both sides of the cascade system.

The valves that control the flow of refrigerants belong to Danfoss’ award winning iCv valve platform, which consists of the pilot operated iCs valve and the motor operated iCm valve. Both valve types are based on a modular platform and offer new levels of serviceability and flexibility in daily use and operating costs.

"The iCv valve family is the result of the ongoing development in valve technology. As CO₂ systems became more popular the market needed valves that could handle pressure requirements of CO₂ based systems. The valves are also smaller and easier to mount, which is good for daily maintenance as it reduces downtime and makes repairs and replacements easy for cooling technicians," say Niels Vestergaard, Director Technical Business Relations, Danfoss. Each valve consists of three parts: a valve body, a function module and a top cover. They can be used with any refrigerant but with a working pressure of 52 bar they are perfectly suited to CO₂ applications. Leakages are greatly reduced through direct welding and solder connections. Compared to the old motor valve design, the number of sealings in the ICM valve have been reduced by 80%. At the same time it has even been possible to improve the service-ability of the valve.

"Operation costs and safety are key issues for American companies. These valves fit the ticket and helped us bring the entire system together to the satisfaction of the customer, says Ole Christensen.

Danfoss offer a complete range of valves, controls and safety equipment for industrial refrigeration systems including CO₂ systems.