



DOWFROST™ Heat Transfer Fluids

Secondary Loop Refrigeration and DOWFROST™ Fluid Contribute to Wal-Mart “Green Initiative”

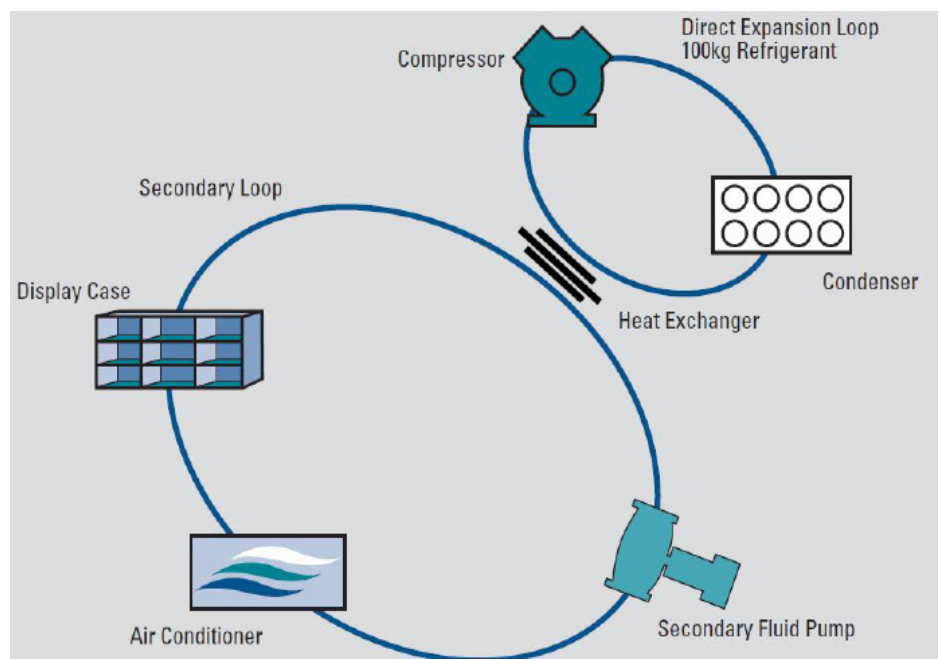
The world’s largest retailer is now taking steps to lead the way in retail store sustainability. Wal-Mart Stores, Inc., which operates 6,200 retail locations worldwide, has launched an internal Green Initiative designed to reduce greenhouse gas emissions by 20 percent in seven years while trimming energy use by 30 percent, reducing solid waste, and increasing truck fleet fuel efficiency.

In 2005, Wal-Mart opened experimental Supercenter stores in Aurora, Colorado, and McKinney, Texas, to identify and assess the value of green technologies in actual retail operations. While the stores operate just like other Wal-Mart Supercenters, behind the scenes they are living laboratories testing new technologies that can help Wal-Mart meet its ambitious sustainable development goals.

Independent engineers, architects and contractors work together with Wal-Mart facilities staff to identify store operating systems and practices that save energy, conserve natural resources, and reduce pollution. The most promising technologies tested and proven by the experimental stores will not only contribute to greener operations across Wal-Mart’s chain, but could also be adopted for use in other commercial facilities worldwide.

Secondary Loop Refrigeration Technology Reduces Emissions and Operating Costs

One of the significant technology trials at the 206,000-square-foot Aurora Supercenter involves the



Schematic diagram of a secondary loop refrigeration system. (Courtesy of The Steve Perkins Agency).

central refrigeration system that provides cooling to chilled food display cases across the store. Instead of a traditional direct expansion (DX) refrigeration system, Wal-Mart has installed a secondary loop refrigeration system containing DOWFROST™ Inhibited Propylene Glycol-based Heat Transfer Fluid. The system – which cools the store’s meat, dairy, produce and other medium-temperature chilled food display cases – is designed to reduce the use of refrigerant gas and to limit the potential for gas leaks into the environment.

Synthetic hydrochlorofluorocarbon (HCFC) and hydrofluorocarbon (HFC) refrigerants are greenhouse gases

Advantages of Secondary Loop Refrigeration

- Reduced refrigerant gas emissions
- Constant, even refrigeration
- Protects food quality
- Simpler, less costly system
- Lower refrigerant requirements
- Reduced maintenance expense
- Potential energy savings

considered to be up to 3,000 times more damaging to the environment than equivalent amounts of carbon dioxide (CO₂). Under the Montreal Protocol signed in 1987 and effective on January 1, 1989, the U.S. and other developed nations are obligated to reduce their consumption of HCFCs

while progressing towards a total phase out of the materials in order to protect the Earth's stratospheric ozone layer. In the U.S., compliance is enforced under federal regulations by the Environmental Protection Agency (EPA).

Steve Perkins, a consultant on the Aurora Project, says traditional DX systems can be a significant source of refrigerant emissions due to the amount of refrigerant circulating under high pressure from a store's mechanical center to refrigerated display cases through thousands of feet of copper piping. Vibration, thermal expansion, and the hundreds of valves and fittings within a typical DX system all contribute to a typical refrigerant leakage rate of 10 to 30 percent across the system. Supermarkets in the U.S. can face fines for noncompliance with EPA regulations when HCFC emissions exceed allowable limits. This makes maintenance of DX systems an ongoing necessity and a source of considerable expense.

Less Refrigerant Gas and Lower Potential for Leaks

The secondary loop refrigeration system installed by Wal-Mart at Aurora uses an abbreviated expansion loop and a larger, low-pressure, secondary loop filled with DOWFROST™ Inhibited Propylene Glycol-based Heat Transfer Fluid. Traditional DX systems use a single, high-pressure direct expansion loop. The secondary loop design limits the use of refrigerant gas by the system and reduces the potential for refrigerant leaks.

Secondary loop technology addresses and solves many of the shortcomings found in conventional DX systems. The primary refrigerant charge volume requirement is 65 to 85 percent lower, and the shorter direct expansion loop eliminates many valves, fittings and connections that are potential sources of refrigerant leakage.

The main reason Wal-Mart chose the secondary loop system is that it is environmentally friendly. The

secondary loop operates at much lower pressure using ABS plastic pipe instead of copper, and it generates significantly fewer emissions. Nationwide studies indicate secondary loop systems have, on average, almost 50% lower annual maintenance costs when compared to conventional DX systems. Not only do secondary loop systems provide cost savings and energy efficiency over the life of the system, installation and startup are less complicated, time-consuming, and costly because far less refrigerant-grade copper pipe is used and there are fewer connections and valves to be installed, tested and adjusted.

Improved Chilling Performance Protects Food Quality

In addition to cutting refrigerant emissions, Wal-Mart also wanted to improve display case cooling performance and protect food quality. Traditional DX refrigeration systems are prone to fluctuations in temperature. This inconsistent cooling can contribute to prolonged defrost cycles and product shock, resulting in decreased product shelf life, product shrinkage, reduced visual appeal, and other product issues. The secondary loop system at Aurora provides even, constant refrigeration to chilled food display cases throughout the store at equivalent or lower operating energy expense.

Advantages of DOWFROST™ Fluid

In Aurora, the secondary coolant fluid is a mixture of 35 percent DOWFROST™ Inhibited Propylene Glycol-based Heat Transfer Fluid and 65 percent deionized water. This mixture is considered environment-friendly with no known impact on the ozone layer nor contribution to global warming.

DOWFROST™ Fluid is the preferred choice for secondary loop supermarket applications because the fluid is low in acute oral toxicity. DOWFROST™ Fluid is often used in systems where incidental contact with food, beverages, or contamination of potable water

supplies as well as ground or surface water resources could occur. The fluid's ingredients are Generally Recognized As Safe (GRAS) and are approved as direct food additives by the FDA. This minimizes concerns about potential spills or fluid leaks in food store operations.

When properly installed and maintained, the special package of inhibitors in DOWFROST™ Fluid provides extended performance and eliminates the corrosion problems that plague many refrigeration systems. DOWFROST™ Fluid also offers efficient low-pressure pumpability at temperatures down to 0°F (-17.8°C), in contrast to secondary loops utilizing CO₂, which require expensive high-pressure piping and related equipment.



The Wal-Mart Supercenter in Aurora, Colorado, evaluates the latest green technologies in actual retail operations.

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