Is the Cost of Refrigeration Freezing Your Grocery's Profits?

Refrigeration accounts for at least 60% of the average grocery's energy use. Below are refrigeration system improvements that can reduce energy use by as much as 24%.

Evaporator-fan Motors

Replacing existing shaded pole motors on evaporator fans with electrically commutated motors will reduce the energy consumption of refrigerator and freezer cases by 40 to 70 percent. Drop-in replacement designs have made this retrofit relatively simple for a technician to perform. Additionally, most evaporator-fan motors in walk-ins run continuously even though full airflow is usually required only about half the time. Consider introducing advanced controls that slow the fans when full-speed operation is unnecessary.

Anti-sweat Heaters

The latest anti-sweat heater controls sense humidity in the store's ambient air and reduce the operation of the anti-sweat heaters in low-humidity conditions. They promise significant savings and quick payback, and they are relatively easy to install.

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Smart Defrost Controllers

When installed in walk-in freezers, a smart defrost controller monitors several variables and optimizes the number of daily defrost cycles. Adding these kits to walk-in freezers can save hundreds of dollars a year, depending on the size of the freezer.

Floating Head Pressure

Taking advantage of lower ambient temperatures to reduce refrigerant temperatures is a form of free cooling. One approach is to allow the pressure of the vapor coming out of the compressor (the head pressure) to float—that is, to drop with reduced ambient temperatures. This requires an expansion valve capable of operating at lower pressures and flow rates. Such valves are now commercially available. In addition, refrigerant pressures must be kept high enough to avoid flashing—the unwanted vaporization of refrigerant. In one field test, operating a system with floating head pressure reduced annual electricity costs by 4.9 percent relative to operating with fixed head pressure.

Ambient and Mechanical Subcooling

Reducing the temperature of the liquid refrigerant below its condensation temperature is called subcooling. This can be done either by using ambient air or water to remove heat from the liquid refrigerant (ambient subcooling) or by using an additional refrigeration system (mechanical subcooling). Colder refrigerant means either more cooling per pound of refrigerant delivered to the display case or shorter compressor run times because less refrigerant is needed, both of which can decrease energy use. Ambient subcooling is often more cost-effective than mechanical subcooling because it requires less equipment.

Heat-recovery Systems

Heat-recovery systems are available that capture waste heat from refrigerators to make hot water for use in the store. A 7.5-horse-power compressor can heat all of the hot water a midsize supermarket would use in its kitchen cleanup and bathroom sinks. Usually, enough waste heat is also available to supply hot water coils for space heating in cold weather.

Display Case Shields

Aluminum display-case shields can reduce refrigeration load by 8 percent when applied overnight and by 40 percent when applied over a 24-hour holiday, relative to the load required without the shield. Products are kept colder when the shields are attached and remain colder for several hours after the shields are removed.

Consider Desiccant Dehumidification

In humid climates, much of the energy used in air conditioning goes to removing moisture from the air. Desiccant dehumidification can be a cost-effective solution for removing this moisture because it uses natural gas instead of electricity. In some cases, air-conditioning equipment can be sized smaller when desiccant dehumidification is in place because the A/C is only used to cool dry air.