

Top 5 Considerations for **Energy Efficient Walk-In Cooler or Freezer Operation**

danfoss.com/walk-ins

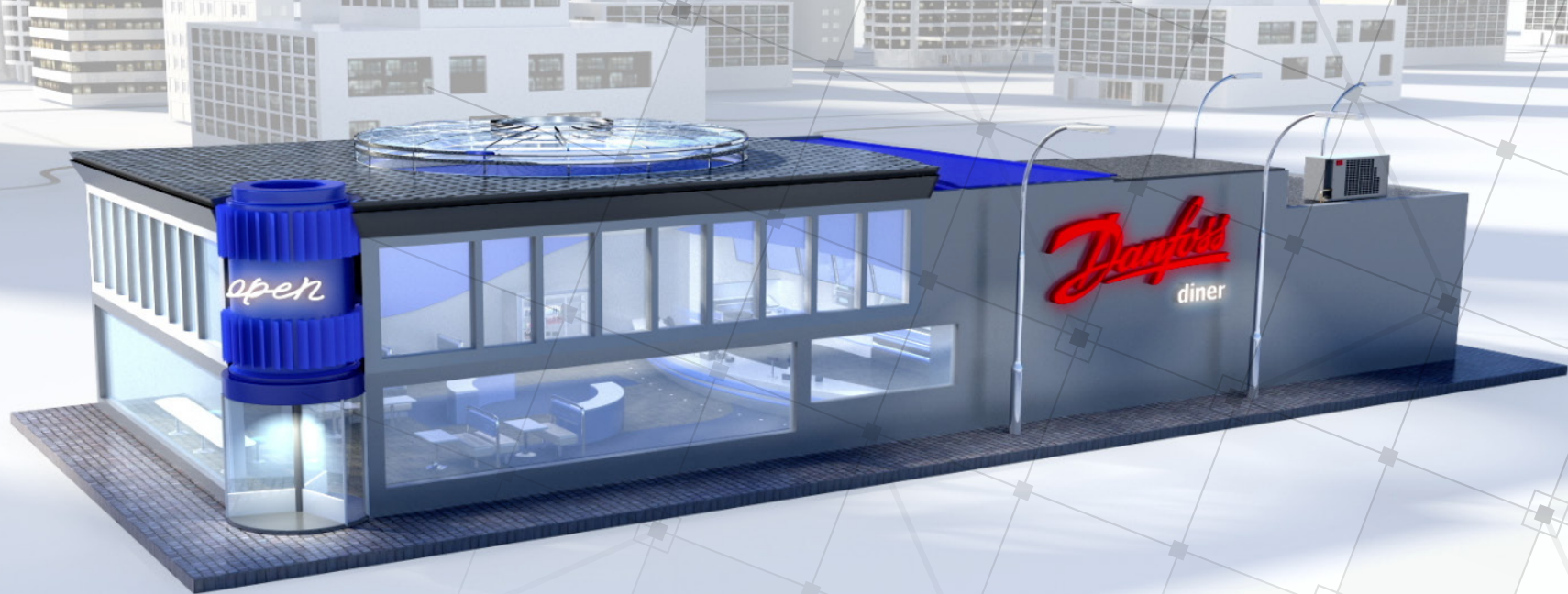


Unlock
energy savings



ENGINEERING
TOMORROW

Danfoss



If you work in facilities, refrigeration, or energy management, discovering new opportunities to increase system efficiency is a daily challenge.

Your walk-in cooler or freezer (WICF) is the natural place to look for energy efficiency gains. There are dozens of technologies and proactive approaches that can tune your performance and efficiency to your exact requirements—but those component-level gains are only part of a bigger picture when optimizing the way WICFs use energy.

This article will detail the top five considerations refrigeration contractors around the world—and major food retailers —are making in their pursuit of unlocking these energy savings.

1.

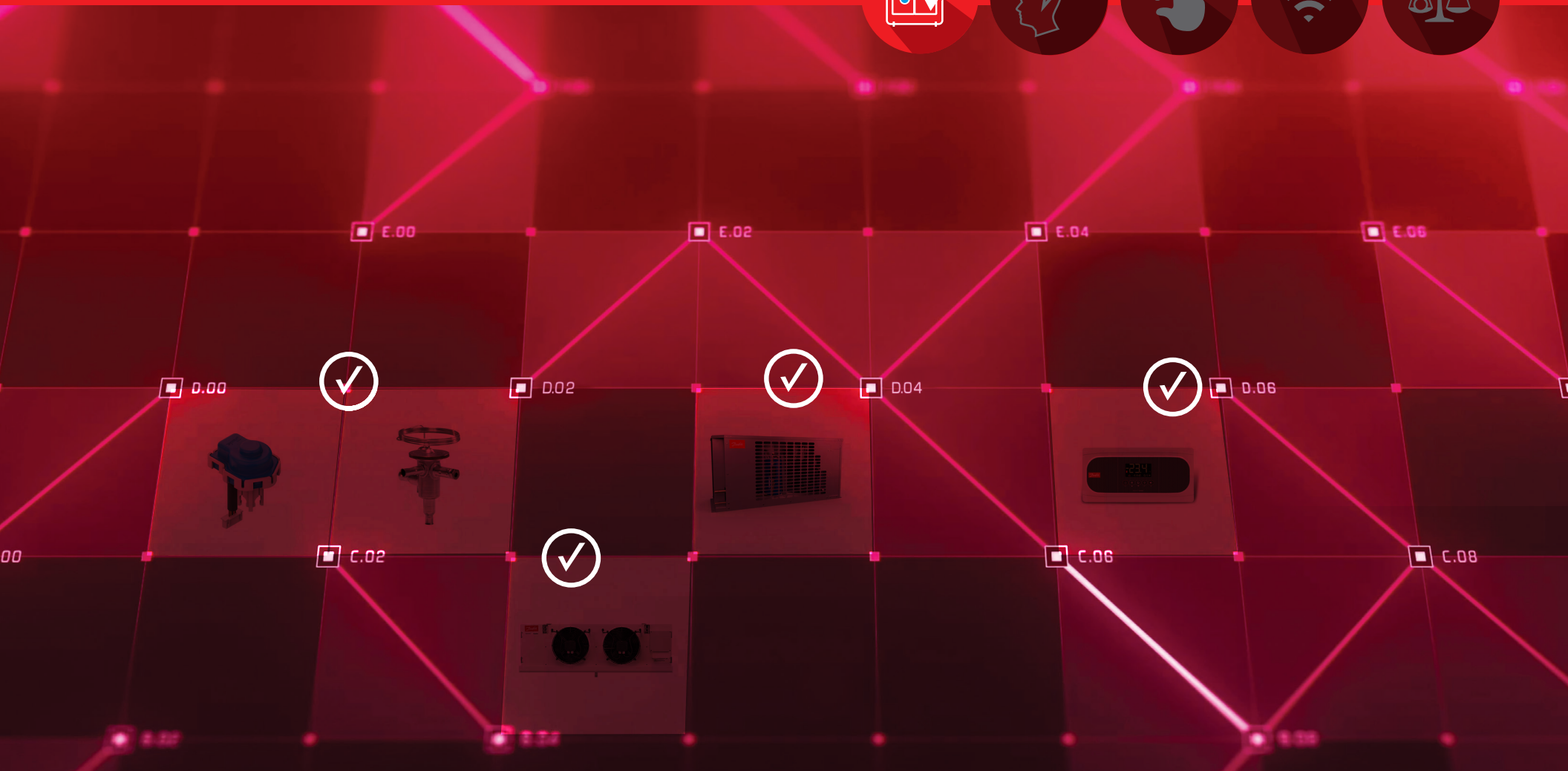
Establish its intended use

The first consideration for ensuring an energy efficient WICF operation is to understand the purpose of the refrigeration system. Preparing the WICF for its intended use ahead of time will minimize inefficient heat waste, wasteful cooling due to poor planning, etc.

Will the WICF be used for general food preservation or food storage, like a traditional household refrigerator, or is more required of the WICF?

With the right components and configuration, WICFs can serve a more precise, dedicated purpose while achieving energy efficiency. For example, a restaurant could have humidity and/or temperature sensitive needs or air-flow requirements for a WICF. Think of the parameters required for beef curing or ice cream.

Minimize
inefficient heat
waste



Determine the right system type

There are three kinds of refrigeration systems in walk-in coolers and freezers.

Select
the best fit

Self-contained

Remote condensing

Supermarket parallel rack systems

WICF with supermarket parallel rack systems use a centralized system with multiple compressors and evaporators. The majority of WICFs found in supermarkets are parallel systems and connected to a compressor rack.

Walk-in coolers and freezers with self-contained refrigeration systems are built with the evaporator and condenser housed in one unit, similar to a window air conditioning unit. Self-contained systems are best for smaller WICFs, installations where the condenser can't be put outside due to noise regulations, when dealing with a leased space where an installation is cost prohibitive, or where penetrating the building exterior is prohibited.

Remote condensing unit refrigeration systems within WICFs have the condensing unit and evaporator shipped as two separate components. Evaporators are installed inside the WICF while the condensing unit will typically be installed outdoors on a roof-top or adjacent to the building. The United States Department of Energy (DOE) dictates the condensing unit must be outdoor-rated and assembled within an enclosure. The majority of WICFs used in North American hotels, restaurants and convenience stores utilize remote condensing unit refrigeration systems. Other common examples when remote condensing unit refrigeration systems are preferred are when the space cannot accommodate the heat rejection of the WICF or where conditions aren't suitable for efficient operation.



The Right **Fit**

Nothing will have a greater impact on a walk-in cooler or freezer's performance than a properly sized and designed refrigeration system composed of components that efficiently transfer heat out of a walk-in cooler or freezer and keep contents fresh or frozen.

As in any refrigeration system, the main components of a WICF are the compressor, condenser, metering device, and unit cooler. The refrigerant, likely one with a lower GWP such as R-448A, is circulating and changing states throughout the system.



The compressor and the condenser are often supplied together as part of an assembly referred to as a condensing unit. With efficient components contained within, condensing units should maximize system performance and extend the lifespan of your WICF.



OPTYMA™ SLIM: The design of the Danfoss Optyma™ Slim condensing unit is designed using components that provide the highest efficiency, reliability and ease of installation.

An adaptive metering device, such as an expansion valve, is recommended for WICFs. A properly set expansion valve ensures that the walk-in will operate as efficiently as possible because it properly meters the correct amount of refrigerant based on evaporator need.



TU THERMOSTATIC EXPANSION VALVE AND ETS ELECTRIC EXPANSION VALVE: The Danfoss TU thermostatic expansion valve can regulate the flow of refrigerants based on the needs of the system, ensuring maximum efficiency due to maintaining tight superheat.

The ETS valves are designed for precise liquid injection in evaporators. The valve is fully balanced and uses a bipolar motor to provide precise flow regulation. These valves pair well with EKE controllers and sensors.

The unit cooler is responsible for removing the heat from within the WICF. It is also integral to controlling temperature and humidity to maintain utmost efficiency. Depending on room size or requirements, there can be multiple evaporators in a single WICF, typically mounted on the ceiling.



OPTYMA™ COOLER: The Danfoss Optyma™ Cooler is a compact and efficient unit cooler that maximizes refrigerant turbulence and ensures high efficiency and food safety.

An electronic thermostat or controller is the best way to ensure a stable internal temperature. These devices can connect the entire refrigeration system together, thereby integrating control of the box temperature, evaporator fan, defrost heater, and condensing unit via one device for easy, systemwide remote and local management and monitoring.



OPTYMA™ CONTROL: The Optyma™ Control electronic temperature controller controls compressors, solenoid valves, defrost—including a second evaporator defrost—fans, lights and crankcase heaters—while improving room efficiency by up to 30%.

Stay **Connected**

A good smart controller system, like Danfoss' Prosa IoT device and smart-phone app for Food Safety solutions, can manage several components from one device to better regulate the walk-in cooler or freezer, thereby delivering energy savings via control technologies like adaptive defrost, set point change mode, door management, door frame heater management, and light control.

Establishing a connected WICF system practically eliminates the concern of catastrophic food or energy waste. If the worst case occurs and the WICF goes down, having a connected controller that monitors your system and sends alerts to your smart

device when it recognizes an issue will provide enough notice for a local contractor or in-house maintenance staff to remotely troubleshoot the issue before perishable inventory is wasted and costly service repairs are required.

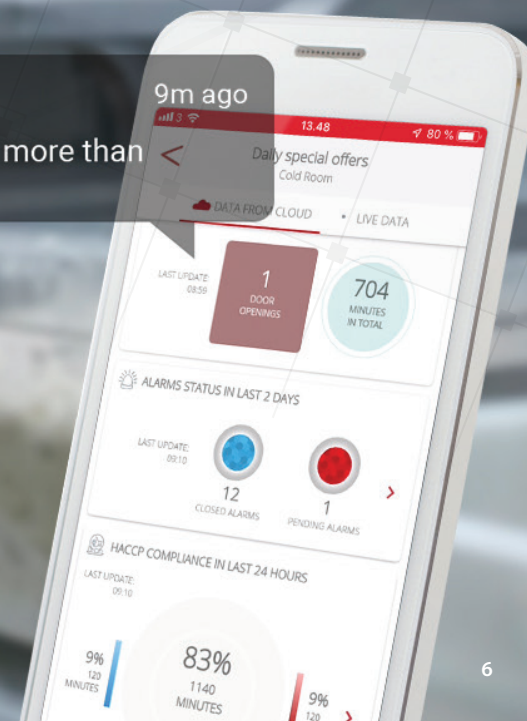
Another advantage of a connected WICF is the ability to utilize the cloud for performance, trending and health inspector safety reporting (HAACP), harnessing a platform that can recommend predictive maintenance or energy optimization services. In today's world, connected devices must be considered when building or retrofitting a WICF. Luckily, connected devices are already available in the market.

Eliminate
worst case
scenarios



ProsaLink

Temperature above 10°C for more than one hour. ⚠️



What's coming **next**

Recent legislation on energy standards at both the federal and state levels have affected the WICF market, especially systems with remote condensing units, and they must be considered when determining an energy efficient WICF operation.

The US DOE's Annual Walk-in Efficiency Factor (AWEF) is a metric that measures the ratio of heat removed from the cooler or freezer to the total energy input of the refrigeration system over one year. WICF components must test, and meet or exceed, a minimum efficiency in order to be installed. Enforcement has been underway for over two years. More information on AWEF testing is available on the DOE's website, <https://www.energy.gov/sites/default/files/2022-03/wicf-tp-nop.pdf>.

Looking ahead, a new proposal has been submitted to update testing procedures to determine if a more stringent AWEF, called AWEF2, can be achieved. AWEF2 could significantly change energy use, so keep an eye for this standard moving forward.

For those in Canada, the requirements for Natural Resources Canada (NRCan) are nearly identical to AWEF except NRCan requires the certifications to be done by a 3rd party while AWEF allows for self-certification.

Another relevant piece of legislation is the US Environmental Protection Agency (EPA)'s American Innovation and Manufacturing (AIM) Act. The AIM Act includes a phasedown of production and consumption of HFC refrigerants across the entire refrigeration industry by 85% over the next 15 years.

The availability and cost of HFC refrigerants will force the industry to approve non-HFC alternatives that are more environmentally friendly and with lower a global warming potential (GWP). To monitor potential future regulations, view the proposals made to the EPA here: <https://www.epa.gov/climate-hfcs-reduction>.

Besides federal legislation from these two major agencies, several states have gone a step further, adopting the Clean Air Act's Significant New Alternatives Policy (SNAP) Rule 20. This law prohibits HFCs in stationary refrigeration and air conditioners, specifically food retail refrigeration equipment, such as R-404A in remote condensing units. Despite the law being previously vacated by the United States District Court, many of the states that comprise the US Climate Alliance have committed to implementing SNAP Rule 20 as well as Rule 21 into law.

Understanding the considerations that must take priority when either building or retrofitting a walk-in cooler or freezer is a reliable way to ensure refrigeration systems are well-positioned to achieving the energy savings goals of refrigeration contractors and end users alike.

To learn more about Danfoss' energy efficient walk-in coolers and freezers solutions, visit www.danfoss.com/walk-ins.

The latest
Energy
standards



Go beyond cool

Danfoss has built a broad portfolio of products designed to deliver optimum protection of perishables, ensure efficient operation & extend the lifespan of your walk-in cooler/freezer system.

Learn more at [**danfoss.com/walk-ins**](https://danfoss.com/walk-ins)

