ENGINEERING TOMORROW

Article | Food Safety

Food safety? Focus on **system performance, reliability** and **connectivity**.

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The ongoing transition to low-GWP refrigerants, price instability, and greater use of flammable refrigerants means commercial refrigeration engineers are looking for new ways to reduce the refrigerant charge and lower GWP and CO_2 emissions.

Meanwhile, manufacturers are also under increasing pressure to make systems more efficient, while maintaining and enhancing cooling performance.

But while refrigeration components need to deliver on these new standards, food safety – and hence reliability – cannot be compromised. There is strict legislation to adhere to, and consumers need to be protected.

How do you make all this happen?

In this article, we'll look at the relationship between food safety and refrigeration, and the importance of system reliability. We'll also highlight a range of products available from Danfoss, which are designed specifically to help manufacturers build systems that are both more reliable and more efficient.

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The relationship between food safety and refrigeration

Keeping food at its correct storage temperature – even when on display – is vitally important to ensure food safety.

Most countries have legislation in place which makes it a criminal offense in cases of non-compliance. After all, customers becoming ill from poorly-refrigerated food can have serious consequences.

It's also important to ensure the maximum shelf life for perishable goods. Any products that are wasted create irrecoverable financial loss both in terms of products, and customers who may not return if what they want isn't available.

This doesn't just apply to perishable products. Even some non-perishable products are designed to be consumed at lower temperatures – such as carbonated beverages. So, storing and displaying these products at the correct temperatures is critical to consumers' experiences, brand reputation and, ultimately, sales.

And while temperatures can vary significantly depending on the product – including whether it's chilled or frozen – even a difference of one degree in temperature could have an impact on the product, so there's very little room for variance. Simply, to keep food products safe and maximize shelf-life, your coolers need to operate consistently, all day, every day.

By law in some countries, commercial refrigeration systems must be monitored around the clock.

System reliability goes beyond safety

By law in North America and the European Union (EU), among many other countries, commercial refrigeration systems that store perishable foodstuffs must be monitored around the clock, to ensure they're functioning correctly and that they're maintaining the correct temperature.

Not only that, but temperatures need to be recorded manually or electronically and kept on file for a period of time after.

So, if a customer became sick from something they had consumed, a country's food standards agency could request refrigeration records (among other records), to check whether correct refrigeration values were properly maintained.

Commercial refrigeration operators are regulated by the Hazard Analysis and Critical Control Points (HACCP*) standard – used to control production, storage, and regulation of foodstuffs in North America and the EU.

It establishes critical limits for cold chain storage (among other factors), provides a framework for corrective action, and establishes standard documentation for all procedures and records.

But stable temperatures can only be achieved and maintained with reliable equipment and components.

Is your system operating as it should?
Food safety and system reliability go hand-in-hand. If your cooler is performing as it should – and assuming adequate product management is in place – there should be no safety or longevity issues with the foodstuffs you're storing and displaying.

So, the question is, how can you deliver the efficiency with lower GWP refrigerants and charges needed by today's commercial refrigeration landscape, while still managing pressure, moisture, and particle build-up in your system, to ensure reliability?

Choose the right components for safety and reliability

At Danfoss, we work with countless refrigeration manufacturers, wholesalers and contractors across the globe in an effort to drive greater levels of safety and reliability. And we've developed a range of products to help manufacturers build equipment that's reliable, efficient and easy to maintain.

To ensure systems run reliably and efficiently, and therefore, comply with food safety standards, we've identified three major system components that are critical to maintaining safe operations as refrigerants change:

1. ACB and KP/KPU switches

In the event of a system malfunction, a pressure switch is the last line of defense. Which is why you need a KP/KPU or ACB switch to fulfil your legal requirements as a commercial refrigeration operator.

One of the big steps we've taken as a manufacturer is to ensure all our ACB switches are certified by UL for use with flammable refrigerants such as propane, isobutane, and butane which is especially important for the North American market.

It not only makes our components compliant with evolving regulations but also provides peace of mind for manufacturers and operators by knowing their components are recognized by an international safety body.

Compared to KP/KPU switches, ACBs are small, simple and factory-set – reducing the potential for user error – while KPs can be user-set and managed.
Other distinctions include:

- ACB switches are smaller, and installation is easier
- A broad range of variants gives multiple standard choices
- Reset capabilities can be both manual and automatic

Whereas KP/KPU switches:

- Are available in single packs and in multi-packs
- Are generally most appropriate for smaller manufacturers doing customized builds

Figure 1. Danfoss KP/KPU switches are designed to protect systems from excessively high discharge and low suction pressures.

- Enable appropriately skilled engineers and installers to have more control over one-off builds

If your emphasis is on food safety, a factory-set component like an ACB switch helps to ensure consistency and reliability, as it eliminates the possibility that the setting hasn't been altered inadvertently, or by accident.

Figure 2. ACB pressure switches are leak free, compact and light for direct mounting on refrigeration systems.

2. Filter Drier

Liquid line filter driers perform a critical role in system integrity and reliability.

Without a filter drier, minute particles would be able to flow through the system, and damage key components – such as expansion valves or capillary tubes – which can severely restrict performance.

In addition, filter driers lower the moisture level in the refrigeration system to a safe design level, which stops corrosive acid from accumulating, and prevents icing.

Reducing particle build-up and moisture has a significant impact on system safety; not only does it keep the system chemically stable, but it also prevents compressor burn-out (a direct result of water in the system).

But your choice of filter drier also has a key role in reducing the refrigerant charge. If you use a smaller filter drier, you can also lower the volume of refrigerant in the system to meet regulatory requirements.

Simply, an efficient liquid line filter drier will ensure the risk of breakdowns is reduced which leads to food safety.

Figure 3. DCL/DML hermetic filter driers are 100% factory leak tested for high system reliability.

Keep the coil clean

Dirt build-up on the heat exchanger coil can reduce efficiency and lead to breakdowns over time. And while pressure switches will intervene to protect the system if the heat exchangers are not maintained, preventative measures are always advised. That's why it's vitally important to keep heat exchanger coils clean.

3. Sight glass and ball valve

Regular inspection and maintenance are vital parts of commercial cooler operations, and to ensure food safety standards are not compromised by an unexpected breakdown.

But without the right components in place to facilitate efficient inspection and maintenance routines, service engineer visits can take significantly longer than desired.

Sight glasses help understand the condition of the refrigerant – for example, if there are bubbles in the refrigerant, it could indicate a shortage of refrigerant in the system.

Meanwhile, ball valves are used to isolate refrigerant in the event of system maintenance. This eliminates the need to remove the refrigerant from the system – which saves both time and money.

And because they're laser-welded, the potential for leaks or drops in pressure are significantly minimized.

Figure 4: Sight glasses help determine quality of refrigerant and often include a moisture indicator. Ball valves are used to isolate refrigerant before servicing.

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System reliability: the key to safer commercial refrigeration

It's clear that when supplying food products to the public, safety is paramount. And even in the case of glass door merchandisers (GDMs) and bottle coolers, temperature stability and system reliability are important to the quality of the end product.

But maintaining reliability hinges on the performance and longevity of your refrigeration system components.

Danfoss produces a wide range of system-critical components, specifically designed to help you create systems with safety and reliability at the fore – while still delivering on today's new environmental standards.

To learn more about how system reliability can help you maintain food safety standards and guarantee compliance, contact our team of experts to talk through your options or visit cr.danfoss.com

For more information about HACCP, visit: https://www.fda.gov/Food/GuidanceRegulation/HACCP/default.htm

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