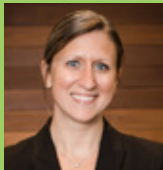




# Multiply Refrigeration Advantages With Multiplex System Design



By Julie Havenar  
Director of Integrated Marketing, Cold Chain  
Emerson





Over the past several years, the drivers impacting the choice of refrigeration systems used in supermarket and restaurant applications have evolved significantly. Increasing competitive pressures and changing consumer behaviors have caused food retailers to become hyper-aware of profit margins and more sustainably minded than ever before. And while the primary requirement for system reliability hasn't changed, contractors need to be prepared to give store operators new refrigeration options to help them meet their changing operational objectives.

Among the options emerging in this shifting paradigm is the concept of multiplex refrigeration system design — where one outdoor refrigeration unit services multiple walk-in coolers or refrigerated display cases. Not only can multiplex systems be used in new construction and retrofit applications, but they also provide a variety of operational advantages over traditional outdoor condensing unit (OCU) strategies.

### Digital compression and variable capacity modulation

One of the keys to multiplexing refrigeration systems is their use of digital compression technology to provide multitasking control over multiple evaporators (or connected refrigeration fixtures). Instead of installing one dedicated OCU for each refrigeration fixture, digital compression technology expands this one-to-one relationship to one-to-many.

In addition, digital compression technology enables multiplex systems to modulate their capacity to precisely match the individual load requirements of each refrigeration fixture. Unlike traditional fixed-capacity condensing units that run at 100 percent capacity regardless of refrigeration load requirements, variable-capacity

modulation allows a system to continuously regulate capacity from 20 to 100 percent as demand fluctuates.

Digital compression technology allows variable-capacity modulation to take place without having to cycle the compressor on and off — limiting the in-rush currents that increase energy consumption and reducing the wear and tear from compressor short cycling (stops/starts). It also delivers significant improvements to refrigeration performance, such as maintaining setpoint temperatures at a much tighter tolerance than fixed-capacity systems and delivering precise humidity control.

Overall, digital compression enables a much more precise mode of operation, allowing tighter control of suction pressures, eliminating large pressure swings, and improving case temperature control. This also provides an opportunity to raise suction pressure setpoints. In multiplex systems with a digital compressor running at higher suction pressures, the system inherently will run more efficiently. Theoretically, system efficiencies should increase approximately [2 percent per pound](#) of raised suction pressure.

The Copeland™ digital outdoor refrigeration unit, X-Line Series is built upon field-proven Copeland scroll compressors to support medium-temperature loads in multiplex refrigeration systems and deliver the associated benefits of variable-capacity modulation.



Copeland digital X-Line Series

## Multiplexing motivations

Today, multiplex refrigeration systems are being installed in a wide variety of supermarket and restaurant applications. Contractors are recommending a multiplex approach for any of the following retrofit and remodel scenarios:

- Multiple refrigeration fixtures and/or refrigeration loads
- Refrigeration units or loads are oversized for the application
- Excessive compressor cycling is negatively impacting system performance, requiring too much maintenance and consuming too much energy
- Operators seek to improve food quality and extend shelf life by maintaining tighter temperature control

- Installation constraints will not allow for multiple fixed-capacity OCUs

While these scenarios are all likely candidates for installing a multiplex refrigeration system, the most common reason is simply a desire to reduce the number of refrigeration units required. The ability to run two walk-in boxes — or a combination of fixtures such as a display case, food-preparation table and a walk-in box — with just one refrigeration unit is appealing to end users and contractors alike.

## Installation considerations

From an installation perspective, installing and commissioning a multiplex refrigeration system is very similar to the approach taken with traditional fixed-capacity units. With the exception that piping originates from one refrigeration unit rather than multiple individual units, the piping setup is essentially the same.

System sizing is also similar to a fixed-capacity system. Contractors will still need to size a system within a target capacity range that meets their customers' refrigeration requirements; only in this instance, the calculation will take multiple refrigeration loads into consideration.

Contractors also need to understand that with a digital compressor, they will no longer be setting low-pressure cut-in/ cut-out compressor controls during commissioning. Instead, they will simply need to set the desired suction pressure setpoint using the system's onboard controller. Once that setpoint is dialed in, the unit will continuously check the setpoint and try to maintain it as close as possible — swinging capacity from 20 to 100 percent based upon the demand.

To support maximum installation flexibility, Emerson's digital X-Line is built with a lightweight, slim profile that allows the unit to be installed in confined spaces such as those near other retail buildings. It's also designed to operate whisper-quietly at decibel (dBA) noise levels that are often up to 10 dBAs lower than traditional units. These features offer significant installation advantages for operators in high-density retail parks or those needing to comply with noise ordinances.

For contractors with more aggressive sustainability initiatives, another multiplex system advantage is that it greatly reduces a

system's overall refrigerant [charge by as much as 50 percent](#). In situations where operators may need to keep their system's refrigerant charge below 50 pounds, a multiplex refrigeration system design may be an ideal solution.

Emerson designed the digital X-Line to meet the Department of Energy's (DOE) Annual Walk-in Efficiency Factor (AWEF) rating and offer a variety of emerging lower-GWP refrigerant alternatives. The unit's onboard electronic control module also allows it to be set up and commissioned within a matter of minutes, while providing ongoing operation, protection and diagnostic features for a multiplex system.

## Connectivity, visibility and control

Today, most contractors are requesting that their customers install facility management or supervisory systems to improve system reliability and serviceability. Modern multiplex refrigeration units leverage built-in electronic controls that connect with facility management systems to enable real-time monitoring, remote diagnostics and supervisory functions.

For example, the digital X-Line features a smart, onboard controller that integrates with Emerson's Lumity™ supervisory control platform and its control devices to support remote visibility to system performance and access to a variety of diagnostic capabilities.

In addition to simplifying commissioning, this gives contractors the ability to make nearly any system change on a web-enabled device that they normally would make on the face of the controller — from changing a setpoint and updating a defrost schedule to reviewing alarms or accessing fault codes. This advanced knowledge allows contractors to better prepare for service calls or even pick up replacement parts prior to arriving at a retail outlet.

---

## Multiplex refrigeration system benefits

Compared to traditional, fixed-capacity OCUs, multiplex refrigeration systems offer a variety of benefits:

- Flexible and robust distributed architecture
- Fewer refrigeration units to install and maintain
- Simple and quick installation and commissioning
- Reduced refrigerant charge
- Tight temperature precision
- Energy efficiency gains
- Enhanced reliability and protection
- Reduced service calls

## Make the shift toward efficiency, sustainability and reliability

The emergence of multiplex refrigeration is the result of a shifting paradigm toward greater system efficiencies and improved sustainability in the commercial refrigeration industry. Built with digital compressors to support multiple fixtures and enable all the benefits of variable-capacity modulation, these units give end users and contractors the flexibility and power to support their refrigeration needs — all within much smaller physical system and environmental footprints. And with smart, onboard controllers for connectivity, diagnostics and protection, new multiplex refrigeration units also deliver the remote visibility and quality assurance that contractors need to succeed and adapt within a rapidly changing market sector.



---

*“Overall, digital compression enables a much more precise mode of operation, allowing tighter control of suction pressures, eliminating large pressure swings, and improving case temperature control.”*