

Hannaford Ahead of the Curve with Case Controllers & EEVs

Since the mid-1990s, Hannaford has used case controllers along with electronic expansion valves (EEVs) to realize substantial energy savings and other benefits. More than three-quarters of Hannaford's 181 stores utilize case controllers. Case controllers are distributed control systems that enable independent control of refrigerated cases and the use of EEVs in groceries and food retailers. While case controllers have been available since the early 1990s, with an estimated 90 percent market penetration in European supermarkets, estimated penetration in the U.S. is only about 20 percent.¹ Hannaford Supermarkets (a subsidiary of Ahold Delhaize) has been an exception. These technologies helped Hannaford lower its greenhouse gas emission intensity.

Why Case Controllers & EEVs?

Hannaford recognized early that case controllers paired with EEVs could offer energy savings and cost benefits. Hannaford conducted its own research in the mid-1990s in order to confirm its hypothesis and has used its case controller and EEV strategy ever since. When paired with EEVs, Hannaford sees the following benefits when utilizing case controllers:

- ▶ **Reduces costs** of mechanical maintenance for expansion valves.
- ▶ **Increases refrigerant flexibility for future refrigerant conversions**, such as CO₂.
- ▶ **Achieves energy savings through reduced compressor use.** With independent case controllers to control EEVs, Hannaford uses a floating head-pressure strategy that reduces pressure drop and mitigates flash gas at expansion valves. This allows discharge pressure to float lower than typical levels (e.g., down to 50°F condensing temperature), reducing compressor energy use. The case controllers and EEVs also enable a floating suction-pressure strategy, allowing suction pressure to float higher than typical levels (as long as all evaporators achieve setpoint), further reducing compressor energy use.



Refrigerated display cases in a Hannaford supermarket (Photo Courtesy of Hannaford)

Highlights

Hannaford's Start with Case Controllers	Mid-1990s
Hannaford Stores Using Case Controllers	138 U.S. Stores
Case Controllers in a Typical Hannaford Store	40-100
EEVs in a Typical Hannaford Store	100-120
Energy & Cost Savings	15-30 percent.* Reduced compressor use compared to systems with conventional thermostatic expansion valves. Reduced labor cost through simplified design & installation.

*Compared to transparent door, medium- to low-temperature cases that meet current standards.¹

“Case controls and EEVs will likely become even more compelling as supermarket chains transition to alternative refrigerants, and as we experience the evolution of smart appliances in general.”

—Harrison Horning, Director of Equipment Purchasing, Maintenance and Energy, Hannaford
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Case controllers alone can provide benefits and energy savings:

- ▶ Case controllers can **control anti-sweat heaters** based on store air humidity, which minimizes condensation on glass doors and mullions.
- ▶ Case controllers can adjust the schedule of case lighting, which **minimizes unnecessary energy used for lighting**.
- ▶ Case controllers can **skip defrost cycles** if sensors indicate little or no frost build-up on the evaporator.
- ▶ Case controllers provide **simpler power wiring** compared to traditional control schemes and layout.

Further Cost Savings and Next Steps

In the early days of these devices, the incremental costs of case controllers and EEVs were driven primarily by hardware costs, but that has shifted in the last ten years or so, and labor costs now dominate.

Case controls simplify electric power wiring on new installations (only one power circuit to each display case or walk-in cooler/freezer), which helps to offset labor cost impacts. Hannaford is currently working on further reducing costs by:

- ▶ **Installing control hardware at the factory**, where practical. EEVs would typically be installed at the factory, and Hannaford is working with its vendors to have control boards and relay boards installed at the factory in order to reduce field labor (and associated time and expense). This requires detailed specifications and careful communication and coordination with case manufacturers and control system/component suppliers.
- ▶ **Simplifying system designs**. Given the variety of design options for refrigerated display cases, simplifying system designs may seem challenging. Hannaford acknowledges the need to accommodate new and different merchandising needs,

balanced with the need for simple and maintainable control systems. The increased use of self-contained cases may present an opportunity here.

- ▶ **Streamlining the design and installation process**. An example is having the electrical contractor run conduits for the low-voltage communication wiring, to improve coordination on installation projects.

Tips and Best Practices

Based on Hannaford's experience, case controllers and EEVs are reliable, as long as the following areas are carefully managed:

- ▶ **Protect the communication bus from damage**. Hannaford installs the communication wiring in conduit.
- ▶ **Keep replacement parts and controllers available**, including sensors.
- ▶ **Be prepared to replace or install software into new hardware**. Establish a program to manage versions and version upgrades for software and firmware.
- ▶ **Training is also important to maintaining performance of case controllers and EEVs**. Installation and maintenance technicians need to be trained on the control systems, with particular attention to case controls and EEVs. Typically the control system manufacturers can provide appropriate training. Hannaford has sent in-house personnel and outside service providers to control system training programs so they are properly prepared to keep the refrigeration systems working properly.

References

- 1) 2016 Better Buildings Summit presentation; *How Smart is your Refrigeration System?*. Available at: <https://betterbuildingssolutioncenter.energy.gov/sites/default/files/2016-Refrigeration-Systems-How-Smart-Is-Yours-Commercial-TUES.pdf>
- 2) 2016 FMI Energy & Store Development Conference presentation; *Total Cost of Ownership: Mechanical vs. Electronic Expansion Valves/Case Controls*. Available at: http://www.fmi.org/uploadFiles/43F360000001A1.filename.Mechanical_vs_Electronic_Expansion_Valves-Case_Controllers.pdf