Thermal opportunities in the grocery store market

Application Note

Field Applications
Case Study

Tool: Fluke Ti40 Thermal Imager

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Inspection points: Compressors, roof, refrigerant tubes, freezer doors, light ballasts, and electrical circuits.

Thermal imaging may be the ticket you need to win new or larger contracts with clients who previously delayed repairs until catastrophe struck. With a thermal imager, the evidence is right there, in color, on screen. Doing the math is easy: Compare the expense of a catastrophic repair to the cost of quick, regular scans by your thermal imager and preventive electro-mechanical repairs, and you should have a convincing argument.

Groceries stores are an excellent example of a client with a tight budget and many practical applications for thermography. Sometimes, your entry point can be as easy as finding one failing compressor.

Sample opportunities

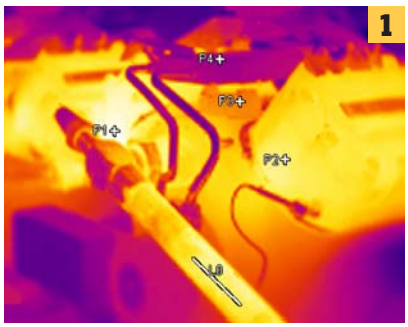
One store saved an estimated $20,000 after an infrared scan identified a compressor that was 70° F hotter than similar units in the room. This compressor would have failed if the hot spot hadn't been identified.

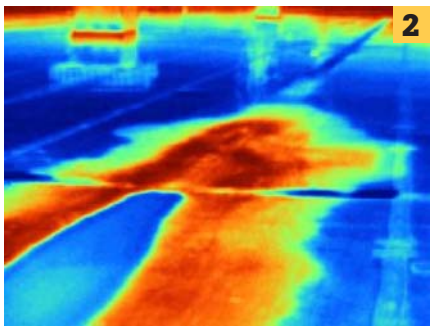
The opportunity for a grocery store to lose money is substantially high if they experience a failure in either electrical supply or the compressors used for refrigeration or freezer support. For example, in the case of a compressor failure supporting produce, the store will have an accelerated end of life loss of fruits and vegetables. Normally, produce has a seven-day life expectancy. If a compressor failure upsets the regular warming/cooling cycle, the store will lose a percentage of the affected produce over the next five days or so. An infrared predictive maintenance program would help avoid this costly downtime. These costs go straight to the bottom line.

Grocery store chains also have the same roof issues as everyone else. They can't afford a problem and usually fix it after they have a pail or two in the isle. Failure of the roofing structure can cause product loss throughout the store. Image 2 shows moisture buildup underneath roofing materials. Having easy-access to infrared scans that identify the problem will empower the building owner to pay for only the areas that need fixing, rather than completely re-roofing the entire building. This can save many thousands of dollars.

Thermal opportunities at a grocery store:

Area of the store	Value of thermal scans
Compressors	High
Roof	High
Refrigerant tubes	High
Freezer doors Seals Heat elements	Medium Medium Medium
Light ballasts	Medium
Electrical	Medium





Compressor details

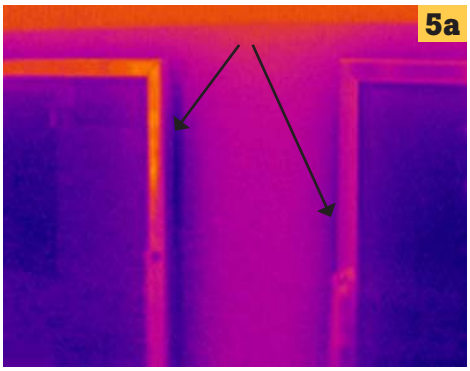
Compressors are often ganged together to support the high cooling demand. When one compressor fails, it puts more strain on the others in the series. That strain can cause additional, even catastrophic, failures that disrupt cooling to freezers and coolers. The loss in food product can dwarf the cost of compressor repair or replacement.

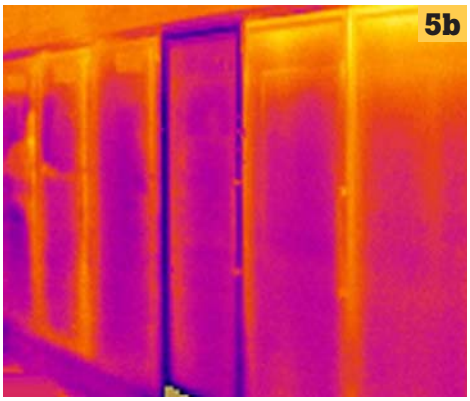
If you have access when new equipment is installed, take baseline thermal images then. If you start a thermal program with existing equipment, take baseline images, note average temperatures, and compare future measurements to these figures. Images 3 and 4 show the first three compressors in a bank. No issues are apparent in these images. The heads are within 4° F of each other. Compressors cycle on and off at different times, so if you note a temperature difference, observe for a few minutes to see if the unit just started or cycled off.

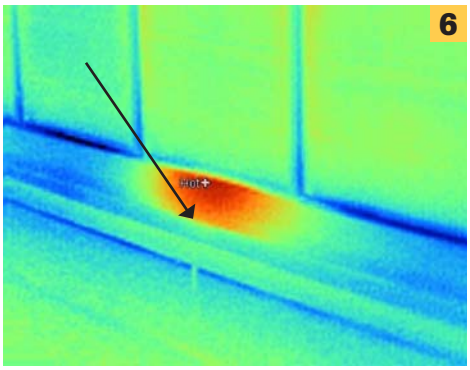
Freezers

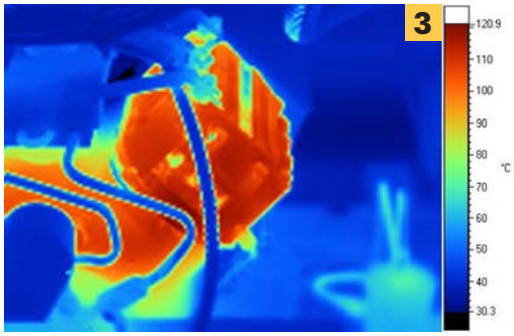
The frozen food isle has two general categories of units: The upright closet "glass door" style and the open chest type, often referred to as the "bunker" freezer. The glass door freezers often have highly reflective aluminum door frames with glass inserts. The door frames contain heating elements to help prevent frost build up and rubber seals to help prevent cold air loss while the door is closed. Finding cold air loss is a bit difficult, but can be done. Image 5a shows a problem with the rubber seal. Notice the blue color extending further out from the left door. Image 5b is a freezer isle shot showing a failed heating element on door three.

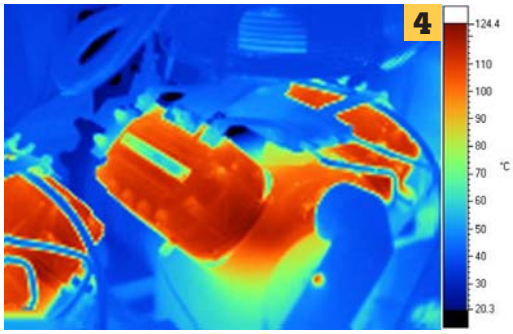
Lighting ballasts are another issue on the freezer isle. Just like other ballasts, freezer lighting failure can often be predicted based on temperature fail points. Image 6 shows a warm ballast; Not yet to a point of failure, but warmer than others in the same isle. At the beginning of a customer's thermography program, it would be nearly impossible to predict a failure without baseline and historical data.











The open chest freezer poses different challenges for thermography. Open coolers operate on the principle of air curtains. They cool from below with cooling tubes using Freon or similar "earth friendly" products and also blow cold air across the top portion of the chest, generally from the back to front. This forms an invisible barrier between the cool or frozen items and the room temperature air above.

There aren't many points to effectively study the open chests with thermography, unless you want to test temperatures above and below the air curtain. You may be able to detect blockage or interference of the air flow, which could lead to product failure near the surface.

Image 7 is shows an open, prepackaged meat chest with a sloped lower level and a second shelf. The air curtain goes from top back to lower front. Image 8 is a traditional floor freezer. Notice the reflectivity of the various product packaging.

Image 9 is an attempt to view the air curtain in an open cooler, to determine the temperature of food products at or above the curtain (cold) level. Infrared scans can identify if products are stacked above the cold air current level. When products sit above the air curtain, they begin to thaw and will fail ahead of schedule.

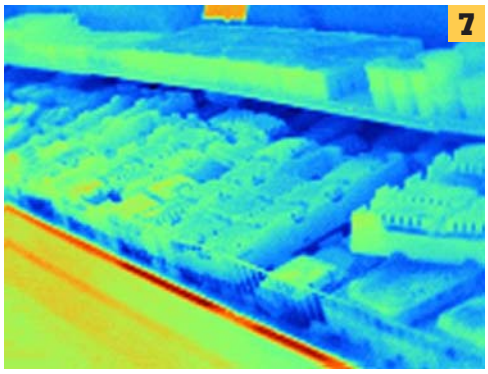
The lemons pictured in this image also have high emissivity, which helps point out the level and flow of the air curtain. The air curtain is marked by the contrast-line between the red and light green colors.

Larger walk-in freezers use a heat tape around the door edges and rubber seals, both of which can be scanned. Inside the freezers you will often find fan motors.

Other check points

Refrigerant can be a costly maintenance item. Although infrared cannot see the gas itself, it can see the changes of temperature in the areas around leaks. Image 10 shows Freon escaping from a leaky valve on a storage tank. Notice the cold top half of the valve and the gas pattern drifting up and away from the valve tip.

It's also important to regularly scan a store's standard electrical components (see image 11). Grocery store power consumption is generally less than an industrial plant. You'll find more 240 V circuits, fewer 480 V and even fewer with voltages above that.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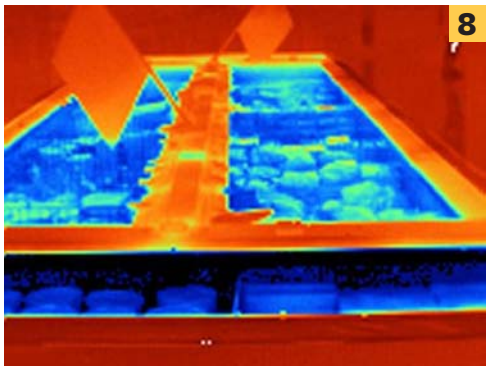
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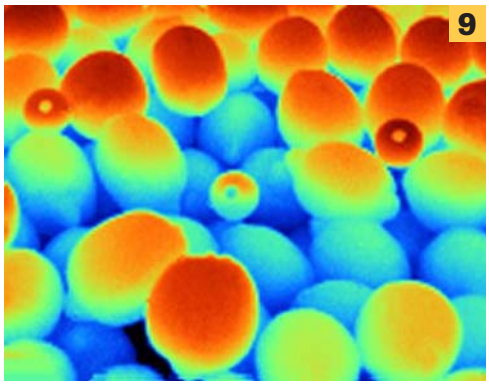
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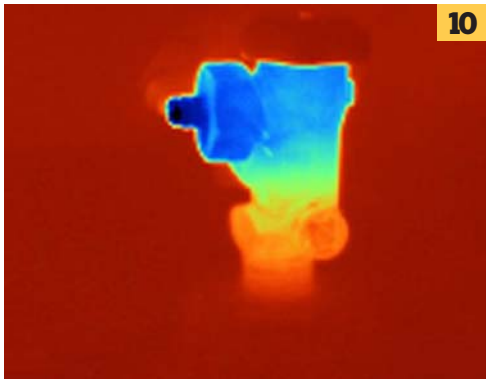
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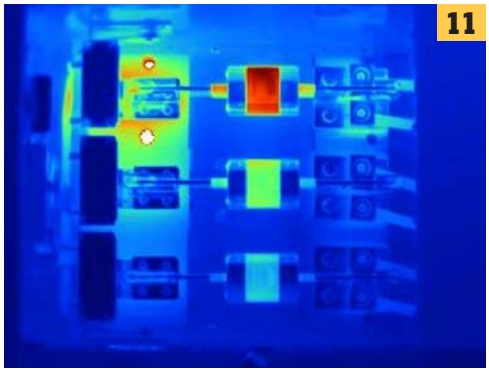
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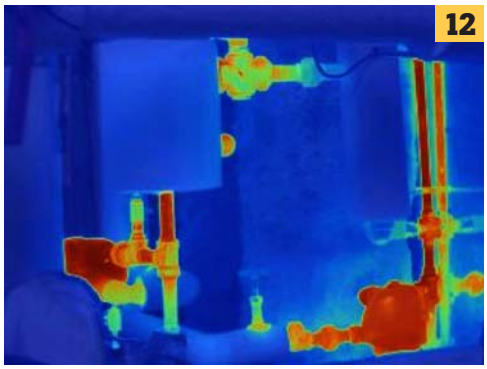
To clarify, voltages make no difference for thermography. The amount of heat generated is a function of current (amps) on a circuit, regardless of voltage. Ironically, lower voltage, (120 V ac) single phase circuits are more susceptible to thermal breakdown because of the small circuit impedance and resistance values. Example: A large industrial circuit can handle a lot more heat than a small household circuit. Suffice it to say that all electrical distribution should be scanned, and in most cases the insurance underwriter or carrier will require this to be done. Electrical fires are the number one cause of fires in building structures*.

If a store uses steam as its primary heat source, infrared offers a quick way to tell whether steam traps are working or failed. See image 12.

* Factory Mutual Insurance



Summary

Compressors and their operation are the top concern for store managers and maintenance. Some stores have alarms tied to compressors. If one fails, phones start to ring (24 hours a day). Offering a predictive maintenance program as a tool to help predict compressor failure can be of great value to the store and the people responsible.

The roof also offers great thermal opportunities. Managing a roof through infrared inspections and planned maintenance will extend its life by two times. All of the other services that an infrared camera offers to the store are bonuses.

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