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SPECIAL REPORT

Upgrading Your Temperature Management

Read on for the latest devices to measure, monitor and record holding-equipment and food temps, all designed to save you time, money and headaches while keeping you safely within HACCP guidelines.

>> In The Current Issue

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When you tell people you're in foodservice, what you really mean is you're in the temperature management business. And it's a tough business. If your stores don't keep on top of prepared-food and holding-equipment temps, you risk serving contaminated product or losing inventory.

So this month we bring you three stories on the types of equipment and devices available for the all-important job of managing temps. For example, in the story "On Duty: Equipment Monitoring Systems" we offer an in-depth look at systems that monitor your equipment and alert you when their temps have fallen out of spec. Here's where inventory protection gets a boost.

Next, we review monitoring systems that record food temps at critical control points in the story "Taking HACCP In Hand." These systems make use of handheld data terminals, often modeled on PDA devices, to monitor food temps so employees can take corrective action. Here's where the safety of prepared food gets the spotlight.

Finally, in "The New Old-Fashioned Way" we review the four types of thermometers used for basic temp measuring, as opposed to temp monitoring or recording. These include bimetallic stem probes, thermistors, thermocouples and infrared thermometers, some of which have been upgraded in recent years.

STORY 1
On Duty: Equipment Monitoring Systems
Say your walk-in goes down in the morning and it's not back online until the afternoon. You might lose a few hundred dollars or more of inventory. Not a fun experience, but you go on.

But what if an overnight power outage caused your food to spoil and your staff didn't know because everything in the box was back up to temp when employees came in to work? Even if you have a HACCP plan in place, how do you know your cold- or hot-holding equipment is doing its job when no one's there to check?

Enter equipment monitoring systems, which use stationary sensors to monitor your equipment and alert you when it hasn't held temps within a prescribed range. These systems are an easy and cost-effective way to accomplish a number of goals, including accurate record keeping. More importantly, they alert you to critical temp

changes so your staff can take action before you serve unsafe food.

How They Work

Equipment monitoring systems measure temperature, humidity, electric current and time. Sensors track the temp of your walk-ins and freezers over time, in one-minute increments if needed. You can also measure the temp of the final rinse on your dish machine or your hot-holding boxes, as well as the humidity of your dry storage room and even whether your walk-in or oven doors are open or closed.

Sensors can be hard-wired to a data collector or computer, or they can transmit data via Wi-Fi to a computer, base receiver, or an online server via wireless Internet modem.

The key here is making sure data gets from sensors to a computer or network so it can be logged or used to send an alert. A hard-wire link pretty much guarantees data transfer, but depending on the size of your kitchen and the number of sensors you want hooked up, installation can be expensive and potentially disruptive.

Wireless sensors are easy to install, and you can add more whenever you want. But wireless data transmission can be a challenge (think dropped cell calls or trouble getting on the Internet with your wireless laptop in hotels). In a large kitchen all those shiny stainless surfaces can interfere with signals transmitted from the sensors, especially if your computer is in an office located away from the kitchen.

System makers can help you get around these challenges in a couple of ways.

1. One way to configure the system is having wireless sensors transmit data to a base receiver. That in turn is hard-wired to your back-office computer.
2. Another alternative to ensure you receive data transmissions is using wireless repeaters to boost signals from sensors. The repeaters then send the data wirelessly to a PC. It's a fairly common solution many of you may already be using for your wireless networks at home.
3. Some manufacturers now use what's called "mesh network" technology. Two-way transmitters on the sensors allow signals to be rerouted, adjusting for changes in the environment like open doors or shifting stock that might otherwise block transmission. The sensors themselves, in other words, act like smart repeaters, finding the best route for the signal to the base receiver or PC. Still others use frequency hopping technology that minimizes radio interference.
4. If your stores are hooked directly into the Internet or a company intranet, yet another solution is to transmit signals from sensors to a wireless modem. Data streams directly to Internet or company servers, eliminating the need for an onsite PC. The advantage here is that anyone with access to the Internet can check the data or receive alerts, no matter where they are. The data, of course, can be password protected, so only certain people can access it.

Making Sense Of Sensors

Sensors have battery backup and low-battery indicators to let you know when they need to be replaced. Some operate on a couple of common AA batteries that last up to a year. Others use rechargeable batteries with a typical replacement life of three to five years.

Sensors generally can be programmed to sample data in about one-minute increments, or from 30 seconds to 15 minutes in as little as one-second increments. Data transmission also can be programmed in intervals of your choice, such as every five, 10 or 15 minutes.

Make sure the supplier you work with can provide the software necessary to do the job for your operation. Some reports might be difficult to extrapolate depending on the system's software. Be sure to talk with suppliers about what kinds of reports you want before you decide on a vendor. For example, if you want to know how many sensors showed out-of-range temperatures in your kitchen in the past three months, make sure the system allows you to combine and look at the data of all sensors at once, not just

one sensor at a time.

Sound The Alarm

Most equipment monitoring systems allow you to program parameters for each sensor, as well as the criteria under which an alert or alarm will be created and sent. Systems also offer several types of alerts. A sensor on a walk-in, for example, can be programmed to send an e-mail alert when its temp is outside an acceptable range of 38°F to 42°F for 15 minutes and sound an audible alarm after 30 minutes.

Systems also can send e-mail or pager alerts when equipment is out of range. At night if the kitchen walk-ins fall out of range, you can program the system to sound an audible alarm at a security guard station or the front desk of a hotel, for example. The system can provide a list of people to call. During the day, you can program it to send out-of-range alerts to an e-mail list first, then to cell phone or pager numbers after 30 minutes if the problem hasn't been corrected.

Some operators who've installed monitoring systems have noted that alarms go off more frequently during busy times when walk-in doors are open more often. One fix here is to set walk-in alerts for 43°F or even 45°F to account for higher air temps when doors are open during deliveries. Some operators turn the alarms off on the walk-ins and have the system send out pager alerts instead.

At least one company makes temperature probes in bottles of glycol that don't react as quickly to temperature changes, which more accurately reflects the internal temps of products stored in a walk-in. In the summer, for example, air temperatures inside the walk-in might go up to 60°F temporarily, but product temperatures will still remain within proper range. Glycol probes will reflect that, so alarms won't sound.

Systems even can be programmed to call a security company or, better still, service reps when certain parameters are exceeded. The data also can help you monitor performance of your equipment, potentially alerting you to the need for maintenance or even replacement. If your data show a walk-in going into an unnecessary or abnormally long defrost cycle, it may be time to replace a compressor, or have the walk-in serviced.

Monitoring In Transit

Finally, a word about monitoring product before it gets to your receiving door. A number of manufacturers offer small temperature logging devices that collect temps while product is in transit. When product arrives you're able to check the log to ensure proper temps were maintained during the trip.

STORY 2

Taking HACCP In Hand

On the prepared food side, you can choose monitoring systems that help you track food temps at critical control points in your operation.

In many facilities, employees still use probe thermometers to take internal food temperatures and manually write them down on a chart. In contrast, most of the new electronic tracking systems use handheld data terminals similar to PDAs to record data. Employees use the appropriate probe to take food temps, and the device records the temperature, the time it was taken, and the employee who recorded it.

As portable as the digital thermometers employees currently carry with them, these units can automatically log temperatures of food from the receiving dock to cooling before it goes into the walk-in for the night.

Most of these devices can accommodate a wide range of K- or T-type temperature probes designed for everything from griddles to frypots, but the devices themselves are intended to record temps in a range of about -70° F to 300° F. One unit offers an optional Bluetooth wireless probe so there's no chance of dangling wires in food or near a hot range.

Why Automatic Recording Makes Sense

When employees and supervisors get busy they sometimes end up logging temps at the end of a rush or even a shift. Known as "pencil whipping," the practice is easy to spot—logs show the same temperature written in all the way down the page. To get around this practice, handheld monitors will time- and date-stamp each recorded temperature, making it nearly impossible to fudge data.

A couple of models go even further, allowing you to track locations with either bar codes or electronic data tags. This provides even more assurance that employees are recording temperatures of the right foods.

Most of these handheld units also can be programmed to prompt employees to take corrective action if temps are out of range. An employee checking lasagna on a cafeteria serving line, for example, would key that menu item or a corresponding log number into the device, then record the temperature. If it's below 140°F, a message on the device screen might give the employee the option of checking the temperature again, heating the lasagna to 165°F for 15 seconds, or discarding the product.

At the end of the day or shift, the devices can be hooked up to a PC with a USB cord to download all the data for HACCP records. Some even download data wirelessly.

The units themselves can hold 3,000 or more readings. A couple of the models on the market use modified off-the-shelf PDAs, with at least one using Microsoft's Pocket PC operating system so it can even be used to take inventory.

Manufacturers are making software as easy and intuitive to use as possible. Several suppliers allow log data to be imported into Excel, which most people are familiar with, so you can create your own reports. Some also make it easy to upload HACCP checklists or forms into the PDA or handheld unit, which simplifies programming.

One of the greatest benefits of monitoring systems, though, is their accuracy. The hard data they sample and record is almost impossible to tamper with, provides excellent HACCP documentation and can augment your equipment maintenance program.

STORY 3

The New Old-Fashioned Way

Of course, the traditional methods of tracking food temps—probe thermometers and pen-and-paper charts—are the least expensive. But even without electronic or wireless data capture, these "old-fashioned" methods still work very well, and some products have even been upgraded lately.

There are four types of thermometers for temperature measuring, as opposed to the temperature recording or monitoring we've talked about so far. They include bimetallic stem probes, thermistors, thermocouples and infrared thermometers. And there are, of course, many variations for specific applications in your kitchens.

Bimetals Gets The Job Done

Many operations still use bimetallic stem probe thermometers, and for good reason: They're accurate and among the least expensive temp measuring options. Bimetallic thermometers, as the name implies, are made with two metal alloys that expand at different rates when heated. Attached together at one end but not at the other and wound in a coil inside the probe, the free end rotates as the metals expand, showing the temperature on a gauge.

One thing to consider: The sensor, or bimetal coil, is about 2" to 3" long, so you measure an average temperature along that sensor. The probe might measure the internal temp of a whole turkey at 165°F, for example, while the actual temperature in the center might be several degrees cooler. These thermometers can take up to a minute to register an accurate temperature, and they should be recalibrated on a regular basis—daily, usually—to ensure accuracy.

Less than 10 years ago, food safety experts encouraged operators to use bimetallic probes and spent countless hours training employees how to properly use and

calibrate them. Now there are a number of digital, electronic options that are easily affordable.

Thermocouples Take It Further
Thermocouples also use bimetallic probes, but measure the difference in voltage between them as they heat and/or cool, then translate that into a temperature reading. Highly accurate, these units rarely need recalibrating.

One plus is that different types of probes can be attached to a thermocouple device: an air probe to measure walk-in temp, a flat-surface sensor to check a griddle temperature, or a stem probe to take internal food temps. While more expensive than bimetals, thermocouples' versatility and quick responsiveness make them well worth their cost.

Then There Are Thermistors....
Thermistors use semiconductors—materials like ceramics—to measure electrical resistance as they heat or cool, and translate that into a temperature reading. Most pocket digital stem thermometers now use thermistors. As the fastest and most accurate of the sensors available, thermistors also have the advantage of being very small.

The sensing portion of a thermistor probe is about ¼" of the tip, so you get a true reading of product temps wherever you place the probe tip. One note, though: Semiconductors are fragile and should not be treated roughly. And if they need recalibration, they must be sent back to the factory.

...And Infrareds...
Infrared thermometers are still the latest innovation on the market. Simply aim and "shoot" and these devices provide a reading of surface temperatures. Designed primarily to read equipment temps, infrareds can also be used in some food-temp applications. Several models are available with a probe attachment option that lets you do both.
Another feature that several models now incorporate is antimicrobial materials. Some units are encased in plastic impregnated with an antimicrobial. Others come with antimicrobial probe sheaths to inhibit the growth of pathogens between readings and stem cleanings.