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Refrigeration Preventative Maintenance

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Prepare to Prevent
The Case for a Refrigeration Preventive Maintenance Program

It's Saturday night in the middle of the dinner rush
when your chef comes to tell you some bad news. The walk-in cooler has been operating well above 41 degrees for more than an hour. This could be a disaster, with loss of product and food safety liability.

You place an overtime service call to the company that worked on this system recently. The technician arrives at your facility within a few hours to find the problem is a dirty condenser coil, which is causing the compressor to cycle on and off every few minutes through its internal safety temperature control.

After the condenser coil has been cleaned and the compressor has cooled off, the system begins to operate again. The temperature within the walk-in box pulls down below 41 degrees in a little over an hour. A couple hundred dollars later, it looks like you "dodged a bullet." Or have you?

What about the condition of the compressor; has it been damaged from the repeated on and off cycle?

Have any of the other electrical or mechanical parts of the refrigeration system been damaged?

What about the condition of food? Has the core temperature of any of the products inside the walk-in cooler risen above 41 degrees? If it has, should you throw it away or is it still safe?

What a costly headache this turned out to be. This problem would have been avoided with a regularly scheduled preventative maintenance program.

Increasing Awareness
As an experienced refrigeration service technician and a mechanical contractor, I have seen my fair share of neglected and abused refrigeration systems. As a matter of fact, most refrigeration compressors do not fail from poor manufacturing quality: they are literally murdered.

My goal is to help raise the level of awareness for the need of a comprehensive refrigeration maintenance program. First, we need to review the terms and overview of a basic vapor compression refrigeration cycle.

There are four major system components within any refrigerant compression cycle:
1. The compressor is the heart of the system. Think of it as a pump that circulates coolant (refrigerant) through two heat exchangers (the condenser and evaporator). The compressor draws in a low-pressure vapor (20-70 psig) from the evaporator and compresses the refrigerant to a high pressure (150-300 psig) vapor.
2. The condenser is a heat exchanger similar to the radiator in your car. It removes the heat in the refrigerant vapor absorbed in the evaporator and condenses it from a vapor to a liquid.
3. The metering device regulates the flow of refrigerant into the evaporator. It also creates a large drop in pressure, causing the refrigerant to change from a liquid to a saturated liquid-vapor mixture.
4. The evaporator absorbs the heat from the air and the products within the refrigerated enclosure. As the refrigerant turns to 100-percent vapor, it returns to the compressor, starting the whole process over again.

Medium-temperature systems are designed to maintain a 20-degree evaporator temperature at 120 degrees condensing temperature. These systems will typically maintain storage and holding environment of 35 to 38

degrees.

Low-temperature systems are designed to maintain a -25 degree evaporator temperature at 105 degrees condensing temperature. These systems will typically maintain storage and holding environment of -10 to 10 degrees.

Types of Refrigeration Systems
There are two types of refrigeration systems: self-contained units and remote systems.

Self-contained units are the typical refrigerators and freezers that are moved into position and have a wall plug. As the name implies, the complete refrigeration system is “contained” within the unit.

Self-contained equipment is more prone to problems from dirt and grease affecting the condenser coil due to the working environment. Self-contained refrigeration equipment adds heat to the kitchen as the hot air is recycled around the condenser coil throughout its lifecycle.

Remote systems typically have the condensing unit located on a roof or equipment room connected to the evaporator coil via the two (copper) liquid and suction refrigerant lines. It is very important that refrigeration condensing units located on the roofs of restaurants are protected from the forces of nature. The typical refrigeration condensing unit will spend 15 to 20 years on the roof.

The Importance of Regular Maintenance
The purpose of a PM program is to prevent or greatly reduce the risk of failure to the covered equipment. This objective can only be accomplished by cleaning, checking and inspecting the equipment on a regular basis. When necessary, worn or suspect parts must be replaced as soon as possible to catch small problems before they cause a complete system failure.

When deciding how often to perform regular maintenance, remember that the local climate outside and the environment inside the kitchen have a strong influence on the recommended service intervals. For example, bakeries require the condenser coils to be cleaned more often than kitchens preparing soups and salads.

A small walk-in cooler refrigerator in a church kitchen that is only used two or three days a week for six hours a day may require an inspection twice a year. But a busy casual- dining establishment with self-contained refrigeration equipment will require service every 30 to 60 days. A production kitchen in a large hotel or college that serves breakfast, lunch and dinner may require monthly inspections.

A trained service professional who knows your local environment and types of equipment will be the best source of information on tailoring a plan for your specific requirements.

Benefits of a PM Program

The benefits of a robust PM program are innumerable. For example:
• The refrigeration equipment will operate more efficiently and for fewer hours per day. This will translate into reduced electrical consumption, which saves money.
• It will extend the operating life of your equipment, therefore delaying the substantial cost of equipment replacement.
• Proper preventive maintenance will reduce your emergency service repair costs by resolving many potential problems prior to failure.
• Properly maintained equipment has a lower failure rate. Frequent equipment failure can hinder the success of your business.
• The savings in electrical consumption, along with reduced repair cost, should more than offset the cost of implementing a refrigeration PM program. (See example on page 43.)

The contractor or individual performing the PM should have the proper state contractor’s license or certification to work on commercial refrigeration systems. In California, it is the C-38 license, for example.

It is critical that he or she is an EPA Rule 608 certified technician. The individual should have Environmental Protection Agency-mandated refrigerant recovery machines and storage cylinders inside his or her work vehicle for any repairs needed to the refrigeration systems.

The technician or company should have experience working on commercial refrigeration equipment. There is a difference in many of the skills between technicians who work on commercial air conditioning and refrigeration. It is rare to find technicians competent in both.

In these times of economic uncertainty, maintenance programs are usually one of the first causalities of budget cutbacks. Before a maintenance program is cut for any piece of equipment, do a comparison of your energy

costs versus your maintenance program costs. It is not a zero-sum game. The decrease or elimination of a maintenance program will only lead to increased electrical costs and reduced equipment performance.

A robust maintenance program will more than pay for itself with stable refrigeration storage temperature, energy savings, increased equipment life and reduced total lifecycle costs.

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