Maintenance of HVACR equipment is necessary for all operations, but it is critical for a data center since these units operate 24 hours a day, seven days a week. As mentioned in part one of this series, if the CRAC was an automobile it would travel more than 435,000 miles a year. Understandably, regular maintenance is required for all CRAC units. Manufacturers generally specify required monthly and quarterly inspections. This article will cover only the basic maintenance requirements; the manufacturer's IOM for specific information should be referenced for the unit being serviced.

**Monthly/quarterly maintenance**

During the monthly maintenance, there are more items that need to be inspected than in a comfort air-conditioning unit. Blowers, belts, pulleys and filters need to be inspected and replaced if necessary. Compressors need a minimum of a visual inspection for oil spotting, which may indicate a refrigerant leak. Air-cooled condensers, condensing units and fluid coolers need to have the coils cleaned and inspected. Condensate drains and pumps need to be checked and cleaned if necessary. Humidifiers and reheat elements need to be inspected and cleaned. There may also be other items in the units that need to be inspected depending on the options and configuration.

In general, quarterly inspections require checking the same components as the monthly inspection but with more detail. If the unit has compressors, the operation pressures, temperatures, and amp draws need to be checked and recorded. Checking and tightening of all electrical connections needs to be done, and the contactor points need to be inspected and replaced if pitted. Check the sequence of operation. Tightening of all the refrigeration fittings should be done quarterly. Air-cooled condenser/fluid-cooler coils need to be cleaned, leak-checked and the motor mounts should be tightened.
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Quarterly inspections require checking the same components as the monthly inspection but with more detail. Air-cooled condenser/Fluid-cooler coils need to be cleaned, leak-checked and the motor mounts should be tightened.

This also provides the customer with accurate records, including overall condition, of their property. Customers can use this information to plan for the future, such as upgrading the equipment before there is a major problem or avoiding running out of capacity due to expansion.

Troubleshooting

Troubleshooting a CRAC unit can be intimidating to those new to this side of the industry. Remembering the basics—refrigeration is refrigeration, blowers move air, etc.—helps. Service technicians should not be intimidated by all of the electronics and controls.

As is the case with all maintenance calls, proper documentation is the key to good customer relationships. The customer is looking to the service technicians for expertise on the equipment. Part of good service is providing timely and accurate information. Good record keeping will also allow the technician's company to plan repairs before the units fail.
Most controllers will have a manual override switch to bypass the controller for troubleshooting. This can help speed up the test process and help determine if there is a wiring issue, a component problem or microprocessor failure.

CRAC-unit compressors need at least a visual inspection for oil spotting during monthly maintenance. Oil could indicate a refrigerant leak, requiring more in-depth troubleshooting and repair to keep these units properly functioning.

First, the problem needs to be determined. Many times the microprocessor will display the problem on the screen. This can make finding the problem easier and faster. After the problem is found, and perhaps fixed, the root cause of it needs to be discovered in order to prevent it from happening again. In the customer’s eyes the service technician last to touch the unit is the one who owns any problems associated with it.

On a service call for a troubled CRAC unit, the problem may be very obvious, such as a broken belt or a compressor is off due to high discharge pressure. Problems like these are easier to find. There are other problems that will take more investigation. These will be broken down into three areas (the first two of which are common issues technicians diagnose/repair): cooling issues; air-side problems; and control-side issues.

The call for cooling comes from the microprocessor, which will close a contactor for the compressor or send a signal to the chilled-water valve to open. These are both easy to test. If there is a call for cooling, it will be displayed on the microprocessor and the compressor should be operating or the chilled-water valve will be open. If the controlled space is below the temperature setpoint, the unit most likely is in dehumidification. When the system is calling for dehumidification, the cooling mode is activated, lowering the temperature of the space while removing the moisture from the air. If there is more cooling available than heat load in the space, the temperature in the space will fall.
With most CRAC units the blowers will run continuously when the unit is turned on. Diagnosing the air side of the system—is the air circulating or not—is pretty straightforward. If there is no air flow, the contactors, belts and blower shaft should be checked. If there is a problem with the amount of air flow, the specifications for the designed air flow will need to be checked. Whether there is excessive air or lack of air flow, the air flow needs to be addressed. The system should be checked by a certified TAB technician to balance the system.

The controls on the CRAC can be the most troublesome for the inexperienced technician. The sequence of operation needs to be understood before the system troubleshooting begins. Although several manufacturers use similar looking controls, the internal logic and sequencing can be completely different. Many times a perceived problem is only a misunderstanding of the logic. Once the control logic is grasped, changing the setpoints so the unit operates in the cooling and the reheat modes allows the technician to check its operation via the controller and make sure it is operational. Most controllers will also have manual override switches to bypass the controller for troubleshooting. These bypass switches can speed up the test process and help determine if there is a wiring issue in the unit, a component problem or microprocessor failure.

There are many specialized subfields in the HVACR industry. This three-part series was published to help service technicians learn some of the key facts about CRAC units. Technicians should always remember the basics; the rest are options that make the system seem confusing. The controls are more than a standard thermostat, but the functionality, cycling of the compressors and cycling reheat are the same as with a normal thermostat. If the functions are broken down into segments, the analysis should not be as overwhelming.

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