FocusOnFACILITIES

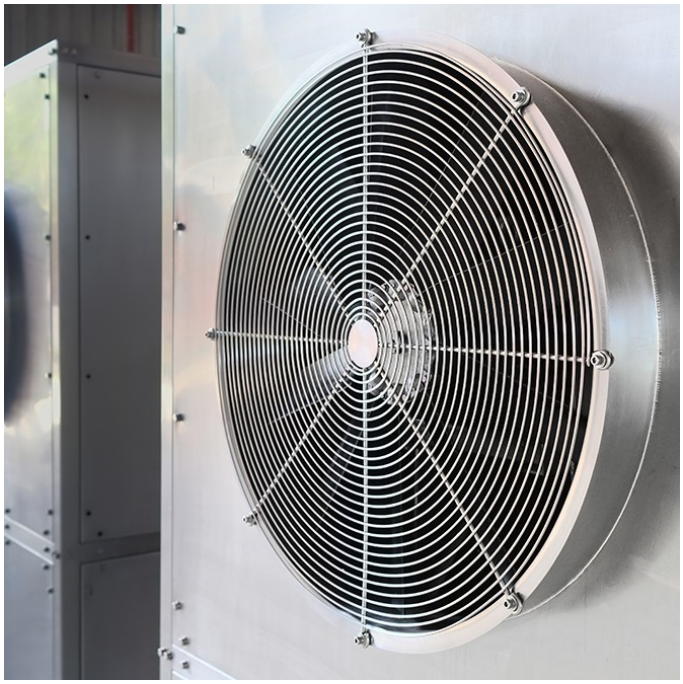
Air-Handling Unit Maintenance

By Howard McKew, P.E., C.P.E.

There is a wide range of air-handling unit types: fans that simply circulate air (e.g., propeller fans), exhaust air fans (e.g., kitchen exhaust fans), heating and ventilating (H&V) system fans, and heating, ventilating, and air-conditioning (HVAC) system fans. This month we want to share with our readers the topic of air-handling unit (AHU) maintenance which requires routine, "walk-around" observations at least once a week, if not daily, along with regularly scheduled planned, preventive maintenance (PM) work order tasks.

Weekly "walk-around" tasks should take note of the following:

- Air leaks from the AHU enclosure. This is especially important if the unit is a heating or a heating and air-conditioning unit resulting in conditioned air being discharged into the fan room, resulting in loss of this supply air quantity meant for the occupied rooms it serves.
- Water leaks from the AHU enclosure. These leaks may result from condensation forming on the discharge air ductwork where the sheet metal insulation has been damaged, requiring insulation repair. Condensate water leaking in the vicinity of the heating, ventilating, and air-conditioning (HVAC) unit's cooling coil drain pan may mean the condensate drainpipe is clogged, resulting in the drain pan water overflowing, resulting in this water leaking onto a floor or the ceiling directly below the unit.
- Excessive noise from the fan motor or the fan shaft bearings requiring further investigation into the cause of the noise.
- Excessive vibration from the unit requiring further investigation into the cause of this vibration.
- AHU is not delivering supply air or exhaust air, but the fan motor is continuing to operate. This could be a result of a broken fan belt motor.
- AHU is off when it should be operating. This could be due to a safety device, e.g., freeze-stat, shutting down the AHU resulting in further investigation.



Depending on the AHU application, this unit may have an after-filter and/or final filter in addition to the standard pre-filter. For these central AHU's, it is recommended that the PM work order frequency be completed at least every six months to check and service the unit's filter(s) going into both the heating and air-conditioning seasons. Air filters will most likely require a PM work order be performed quarterly to maintain relatively clean filters to protect the components downstream of the filter(s) and to contribute to better indoor air quality (IAQ).

Circulating fans and exhaust air fans (e.g., wall exhaust fan), may only need "walk-around" attention with one PM work order a year to take closer inspection of the fan and, when applicable, an associated automatic or gravity damper.

Dissecting an H&V or HVAC unit for preventive maintenance, here are some suggestions with each initiative, but important to note, it is imperative to follow the Log-Out/Tag-Out requirement at the AHU starter:

OVERALL UNIT ENCLOSURE: Perform with regular "walk-around" inspection.

FAN SECTION

- Inspect enclosure for damaged insulation
- Inspect enclosure for rust
- Inspect enclosure for air leakage around access doors and enclosure panels
- Lubricate and grease motor and blower bearing
- Check that the motor belt and pulley are working properly
- Inspect wiring for damage or loose connections

HEATING COIL SECTION

- Electric coil:
  - Inspect wiring for damage or loose connections
  - Inspect coil/element for deterioration debris
  - Vacuum control panel
  - Exercise the automatic controls, e.g., demonstrate "coil is off" when AHU is "off"
- Hot water coil:
  - Inspect for damaged pipe insulation
  - Inspect for water leaks
  - Blow-off strainer (annually)
  - Inspect the upstream coil surface for debris
  - Exercise the automatic control valve, e.g., demonstrate "normally open" when AHU is "off"
- Steam coil:
  - Inspect for damaged pipe insulation
  - Inspect for water leaks
  - Inspect condensate steam trap
  - Blow-off strainer (annually)
  - Inspect the upstream coil surface for debris
  - Exercise the automatic control valve, e.g., demonstrate "normally open" when AHU is "off"
- Gas heat exchanger:
  - Inspect for gas leaks
  - Record temperatures, e.g., flue gas
  - Clean burner manifold
  - Inspect the upstream coil surface for debris
  - Exercise the automatic control valve, e.g., demonstrate "gas valve closed" when AHU is "off"
- Oil heat exchanger and burner:
  - Inspect for oil leaks
  - Record temperatures, e.g., flue gas
  - Clean burner oil nozzle
  - Clean oil filter
  - Inspect the upstream coil surface for debris
  - Exercise the automatic control valve, e.g., demonstrate "burner is off" when AHU is "off"

COOLING COIL SECTION

- Chilled water coil:
  - Inspect for damaged pipe insulation
  - Inspect for water leaks
  - Blow-off strainer (annually)
  - Clean condensate drain pan and associated drain pipe
  - Inspect the upstream coil surface for debris
  - Exercise the automatic control valve, e.g., demonstrate "normally open" when AHU is "off"
- Direct expansion coil:
  - Inspect for damaged pipe insulation
  - Check for correct amount of refrigerant
  - Inspect for refrigerant leaks
  - Capture any refrigerant that must be evacuated from the system
  - Inspect refrigerant strainer (annually)
  - Clean condensate drain pan and associated drain pipe
  - Inspect the upstream coil surface for debris
  - Exercise the automatic control valve, e.g., demonstrate "normally closed" when AHU is "off"

FILTER SECTION (pre-filter, after-filter, and final filter)

- Check for any air by-pass around individual filters within filter section
- Verify accuracy of magnehelic gage
- Change filters if magnehelic gage "dirty filter" limit has been reached or exceeded
- Inspect the upstream surface for debris

AUTOMATIC DAMPER SECTION

- Inspect damper linkage

- Lubricate damper linkage
- Exercise damper operation, e.g., outdoor air damper in sync and operating opposite to return air damper and/or exhaust damper
- Inspect the upstream coil surface for debris
- Exercise the damper control, e.g., demonstrate "normally closed" when AHU is "off"

SMOKE DAMPER SECTION

- Inspect damper linkage
- Lubricate damper linkage
- Exercise damper operation, e.g., using smoke container observe damper close on signal of smoke sensed
- Inspect the upstream coil surface for debris and/or obstruction to close
- Exercise the damper control, e.g., demonstrate "normally closed" when AHU is "off"

AUTOMATIC CONTROLS

- Exercise automatic control operation sequence by sequence (annually)
- Exercise automatic controls when under emergency power generation

With each of the above tasks, facility managers should have made the determination which PM work order tasks will be performed by in-house staff. There may be equipment and systems the in-house staff are not skilled and/or certified to provide PM service on. This will require contracting an outside HVAC service contractor to perform the PM work order tasks, as well as be on-call for seasonal startup systems and shutdown systems. This service company may also be under contract to provide 24-hour emergency response.

Service companies will assign skilled HVAC technicians and certified technicians when required. They bring the necessary materials, tools, and equipment to complete the maintenance. This includes calibrate devices, special filters, etc. that an in-house operation and maintenance staff may not have available nor be trained on the use of this equipment.

In closing, it is important to note that the phrase, "preventive maintenance" doesn't prevent anything from failing. It can be better defined as "planned maintenance" because no equipment lasts forever but, proactive maintenance can maximize the useful service life of the equipment, as well as keep it operating efficiently.

For more on AHU maintenance, please refer back to past Focus on Facilities, Facility Management Columns:

Air-Handling Units With Freeze-Stat Protection Problems
What a Preventive Maintenance Work Order Includes
Air-Handling Unit Visual Inspections
Maintaining Air Filters and Other Priorities

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