ENERGY to care

Greater efficiency supports patient care.

Replace Air Handling Unit (AHU) Filters Regularly

All ECM content was independently developed and reviewed to be vendor, product and service provider-neutral.

Description

Replace air handling unit (AHU) filters regularly to ensure proper function and maximize system efficiency. Keeping filters and coils clean can dramatically improve the efficiency of the entire heating, ventilation and air conditioning (HVAC) system.

Project Talking Points

- Overloaded filters will:
  - Increase the energy demand on fans.
  - Reduce the volume of supply air, resulting in improper system operation.
  - Negatively affect air quality and occupant health.
  - Increasing the filter cross-sectional area (angled filter bags, pleated filters) provides more energy-efficient filtration.
- Ensure that filter replacement is part of your facility's preventive maintenance plan.
  - Monitor static pressure across the filters to identify any issues. This can also indicate when it is time to change the filter, rather than a time-based approach to changing.

Benefits

- **Cost benefits:** Regular filter replacement prevents pollutant overloading and improves energy performance. Using less energy means spending less overall.

- **Environmental benefits:** Regular filter replacement results in more efficient HVAC system function and improved indoor air quality (IAQ). A system that functions more efficiently is going to use less energy and produce fewer emissions.

- **Social benefits:** Regular filter replacement improves IAQ by removing particulates from the air, enhancing patient and staff experiences.

ENERGY to care

Greater efficiency supports patient care.

Purchasing Considerations

- The height, width and depth of the filter.
- Whether or not there is a humidifier in the AHU.
- The Minimum Efficiency Rating Value (MERV) of the system. Please note that a higher MERV blocks smaller particles but also has an impact on static pressure. Compliance with ANSI/ASHRAE/ASHE 170-Ventilation for Healthcare Facilities should account for the tradeoffs between filtration and static pressure.
- Space designation and number of required filter banks.

How-To

1. Assemble a team of relevant stakeholders, including the commissioning agent, building engineer, HVAC maintenance personnel, purchasing department and BAS manager.

2. Establish purchasing strategy for all filters (e.g. will they be purchased, as needed or will stock be kept?)

3. For ventilation systems serving patient care areas, consult the infection prevention and safety officer regarding potential temporary shutdowns during filter changes.

4. Develop an AHU Log and include the following information about each AHU:
   - Space designation.
   - Zone.
   - Location.
   - Floor area serviced.
   - Filter size.
   - Number of filters.
   - MERV rating of the current filter.
   - Manufacturer's recommended differential pressure for change out.
   - Which filters have differential pressure gauges, and which are monitored by the BAS.

5. Inspect filters and filter banks for damage and moisture issues.
   - Check for damage and/or moisture on existing filters and filter fasteners.

- Damaged filters should be changed immediately to reduce the risk of microbial growth and (in the case of tears or punctures) dirt being introduced into the ductwork.
- Maintenance personnel should identify and correct the source of moisture, whether a leak or condensation from HVAC equipment.
- Check filter mounting racks and seals for proper sealing/mating. Check for evidence of leakage around the sealing surfaces.

6. Verify that current filters meet ventilation requirements and are optimized to the existing HVAC system:
   - Review filtration requirements per space designation as outlined in Table 6.4 (Minimum Filter Efficiencies) in the American National Standards Institute (ANSI)/ American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)/American Society for Health Care Engineering(ASHE) 170: Ventilation of Health Care Facilities
   - If filters do not meet current MERV minimums, consider changing to filters with updated MERV ratings.

7. When filters are to be replaced, notify occupants that the AHUs will be shut down for approximately 15 minutes during replacement. If possible, perform the replacement during unoccupied hours to minimize disruption in operations.

8. Shut down equipment prior to replacing the filters.

9. When placing the filters in the filter rack, ensure the airflow arrow is pointing away from the cooling coil and the filter media is sealed in the frame to keep bypass air from entering the duct.

10. Seal cracks between filter frames and between the filter bank and the duct wall.

11. Perform air balancing to maximize energy efficiency.

12. Schedule regular filter replacements as recommended by the manufacturer. Replace filters more often under extreme conditions.

13. Install a differential pressure measurement device for every filter bank with efficiency greater than MERV 12 to monitor pressure drops. This process can be repeated for all filter banks if desired, but it must be done for MERV 12 or above.
    - Monitoring the pressure drop across filter banks and adjusting replacement schedules according to actual conditions instead of using time-based replacement schedules can reduce maintenance labor and filter material expenses.

14. Log all filter replacement activities in the AHU log.

Resources

- ASHRAE:
    - Guideline 14: Measurement of Energy and Demand Savings
    - Service Life and Maintenance Cost Database
    - ANSI/ ASHRAE/ASHE 170 - Ventilation for Healthcare Facilities
    - ASHRAE 62.1-Ventilation for Acceptable Indoor Air Quality (for those spaces not covered in ANSI/ ASHRAE/ ASHE 170)
- LEED for Existing Buildings: Operations + Maintenance
    - Energy and Atmosphere Prerequisite 1: Energy Efficiency Best Management Practices, Planning, Documentation and Opportunity Assessment
    - Energy and Atmosphere Prerequisite 2: Minimum Energy Performance
    - Energy and Atmosphere Credit 1: Optimize Energy Efficiency Performance
    - Energy and Atmosphere Credit 2.1: Existing Building Commissioning, Investigation and Analysis
    - Energy and Atmosphere Credit 2.1: Existing Building Commissioning, Implementation
    - Energy and Atmosphere Credit 3.1: Performance Measurement, Building Automation System (BAS)
    - Energy and Atmosphere Credit 5: Measurement and Verification
    - Indoor Environmental Quality Credit 1.4: IAQ Best Management Practices, Reduce Particulates in Air Distribution
- LEED for Healthcare: New Construction and Major Renovations
    - Energy and Atmosphere Prerequisite 1: Fundamental Commissioning of Building Energy Systems

  - Energy and Atmosphere Prerequisite 2: Minimum Energy Efficiency Performance
  - Energy and Atmosphere Credit 1: Optimize Energy Efficiency Performance
  - Energy and Atmosphere Credit 3: Enhanced Commissioning
  - Energy and Atmosphere Credit 5: Measurement and Verification
  - Indoor Environmental Quality Credit 5: Indoor Chemical and Pollutant Source Control
- U.S. Department of Energy
  - Energy Smart Hospitals: Retrofitting Existing Facilities
  - Hospitals Realize Fast Paybacks from Retrofits and O&M Solutions
  - Hospitals Save Energy and Money by Optimizing HVAC Performance
- U.S. Environmental Protection Agency (EPA)
  - ENERGY STAR Building Upgrade Manual

Regulations, Codes and Standards, Policies

- ASHRAE: Standard 52.2: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
- ASHRAE: Standard 170: Ventilation of Health Care Facilities. Reference Table 6.4, Minimum Filter Efficiencies.

ECM Synergies

- Practice preventive maintenance of major HVAC equipment.
- Establish baseline for current energy consumption.
- Retrocommission HVAC controls.
- Install variable frequency drives on pumps and motors.

ECM Descriptors

Energy

Level: Beginner

Category List:
- Building and maintenance
- Commissioning
- HVAC

ENERGY to care

Greater efficiency supports patient care.

ECM Attributes:

- Environmental health and safety
- Optimize operations
- Repair or optimize existing systems

Improvement Type:

- Commission/retro-commission
- Retrofit/renovations
- New buildings
- Operations and maintenance (O&M)

Department:

- Engineering/facilities management