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Perform Economizer Maintenance

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

Description

Take advantage of “free cooling” and reduce the risk of economizer malfunction by regularly inspecting and maintaining dampers, actuators, sensors and linkages.

Project Talking Points

- Proper economizer operation enhances energy efficiency, reduces costs and extends equipment life.
- Maintenance is especially important because outdoor air (OA) dampers can be frozen or stuck open, resulting in increased energy consumption.
- Economizers can be “silent energy wasters” because open dampers can have little effect on overall occupant comfort.
- Utilize a proactive rather than reactive economizer maintenance strategy to avoid high energy costs and replacing equipment before the end of its useful life.

Triple Bottom Line Benefits

- **Cost benefits:** When operating as intended, economizers reduce costs by providing “free cooling,” enabling equipment to run less frequently. Preventive maintenance reduces the need for costly equipment repairs before the end of equipment life. Lower energy usage and fewer repairs save money.
- **Environmental benefits:** Reducing energy use reduces emissions and environmental impact.
- **Social benefits:** When equipment operates as intended, the indoor environmental quality is better for staff and patients.

Purchasing Considerations

Ensure that economizer maintenance is included in your controls vendor’s contract and your annual maintenance budget.



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How-To

1. Assemble a team of relevant stakeholders, including the commissioning agent, building engineer, heating, ventilation and air conditioning (HVAC) maintenance personnel and the building automation system (BAS) manager.
2. Review historic data from the BAS to identify economizers that may not be working properly. For example, if an outdoor air damper is stuck it may read as consistently open at a specific percentage rather than varying.
3. Perform a facility walkthrough every six months to inspect economizer equipment. Check for the following during the inspection:
 - Loose actuator or linkage connections.
 - Temperature or enthalpy sensor malfunction.
 - Operating mixed air temperature that is too high or too low.
 - Deviation from control settings for high-limit temperature, lockout temperature and building pressure.
 - Weak or warped economizer damper blade seals when the economizer is fully closed.
 - Corrosion, condensation or build-up that could cause the outside air damper and/or linkages to freeze in place.
 - A good way to check the performance of damper operation and calibration is to take CO₂ or dry-bulb temperature readings at various damper settings (including outside air damper closed position) and use the following formula to correlate actual outside airflows:

$$\% OA = \left(\frac{X_r - X_s}{X_o - X_s} \right) * 100$$

Given:

- X_r= return air CO₂ or dry-bulb temperature
 - X_s= supply air CO₂ or dry-bulb temperature
 - X_o= outside air CO₂ or dry-bulb temperature
4. Perform the following maintenance with each inspection, in addition to any needed repairs:





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- Clean linkages and verify they are properly connected to the damper.
- Verify the actuator is connected to a power supply and functioning properly.
- Calibrate the enthalpy sensor and check that it is functioning properly.
- Program the BAS to cycle the economizer regularly by opening and closing the dampers to reduce the risk of freezing up in between maintenance inspections.
- Continue to track economizer performance using BAS trending data.
- Integrate the economizer maintenance program into Energy Conservation measures: [Retro-Commission HVAC controls](#) and [Practice preventive maintenance of major HVAC equipment](#).
- Consider fault detection diagnostics (FDD) to observe and maintain the performance of all mechanical equipment.

Resources

- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE): [Procedures for Commercial Building Energy Audits](#)
 - Level 1, Walk-Through Analysis
 - Level 2, Energy Audit, Energy Survey and Analysis (Because many building codes require economizers in certain scenarios, understanding how to identify if they are functioning properly is key.)
- Building Owners and Managers Association International (BOMA International): [Preventive Maintenance Guidebook: Best Practices to Maintain Efficient and Sustainable Buildings](#)
- Lawrence Berkeley National Laboratory: [What is an Economizer?](#)
- [LEED for Existing Buildings: Operations + Maintenance](#)
- LEED for Healthcare: New Construction and Major Renovations
 - Energy and Atmosphere Prerequisite: Fundamental Commissioning and Verification
 - Energy and Atmosphere Prerequisite: Minimum Energy Performance
 - Energy and Atmosphere Prerequisite: Building-Level Energy Metering
 - Energy and Atmosphere Credit: Optimize Energy Performance
 - Energy and Atmosphere Credit: Enhanced Commissioning
 - Energy and Atmosphere Credit: Advanced Energy Metering
- Liescheidt, Steven: [Economizers in Air Handling Systems](#)
- U.S. Department of Energy:
 - [Hospitals Realize Fast Paybacks from Retrofits and O&M Solutions](#)





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- [Hospitals Save Energy and Money by Optimizing HVAC Performance](#)
- U.S. Department of State: [HVAC Controls Guide for Plans Examiners and Building Inspectors \(2011\)](#)
- U.S. Environmental Protection Agency (EPA):
 - [Energy Efficient Products, Air-Side Economizer](#)
 - [ENERGY STAR® Building Upgrade Manual](#)

Regulations, Codes and Standards, Policies

- [American National Standards Institute \(ANSI\)/ASHRAE Standard 62.1-2019: Ventilation for Acceptable Indoor Air Quality](#)
- [ANSI/ASHRAE/Illuminating Engineering Society \(IES\) Standard 90.1-2019: Energy Standard for Buildings Except Low-Rise Residential Buildings](#)

- [ANSI/ASHRAE/ASHE Standard 170-2017: Ventilation of Healthcare Facilities](#)

Commissioning Connections

The ASHE *Health Facility Commissioning Guidelines* and accompanying *Health Facility Commissioning Handbook* offer helpful information for economizer maintenance.

- 6.1 The Retro-Commissioning Process (*in both books*)
 - (24) Develop revised air-handling unit sequences of operation and set points for optimum energy efficiency (supply air temperature control, humidity control, economizer cycles, damper sequencing, supply air temperature set-point reset, and supply air static pressure set point reset).
- ASHE (www.ashe.org)
 - Health Facility Commissioning Guidelines
 - Health Facility Commissioning Handbook

ECM Synergies

- [Establish baseline for current energy consumption.](#)
- [Practice preventive maintenance of major HVAC equipment.](#)



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- [Evaluate setback of temperature and airflow settings at night.](#)
- [Replace air handling unit \(AHU\) filters regularly.](#)
- [Reevaluate HVAC equipment scheduling.](#)

ECM Descriptors

Category List:

- Building and Maintenance
- Commissioning
- Contracted Services
- HVAC

ECM Attributes:

- Optimize operations
- Repair or optimize existing systems

Improvement Type:

- Commission/Retro-Commission
- Retrofit/Renovations
- New Buildings
- Operations and Maintenance

Department:

- Engineering/facilities management
- External controls vendors