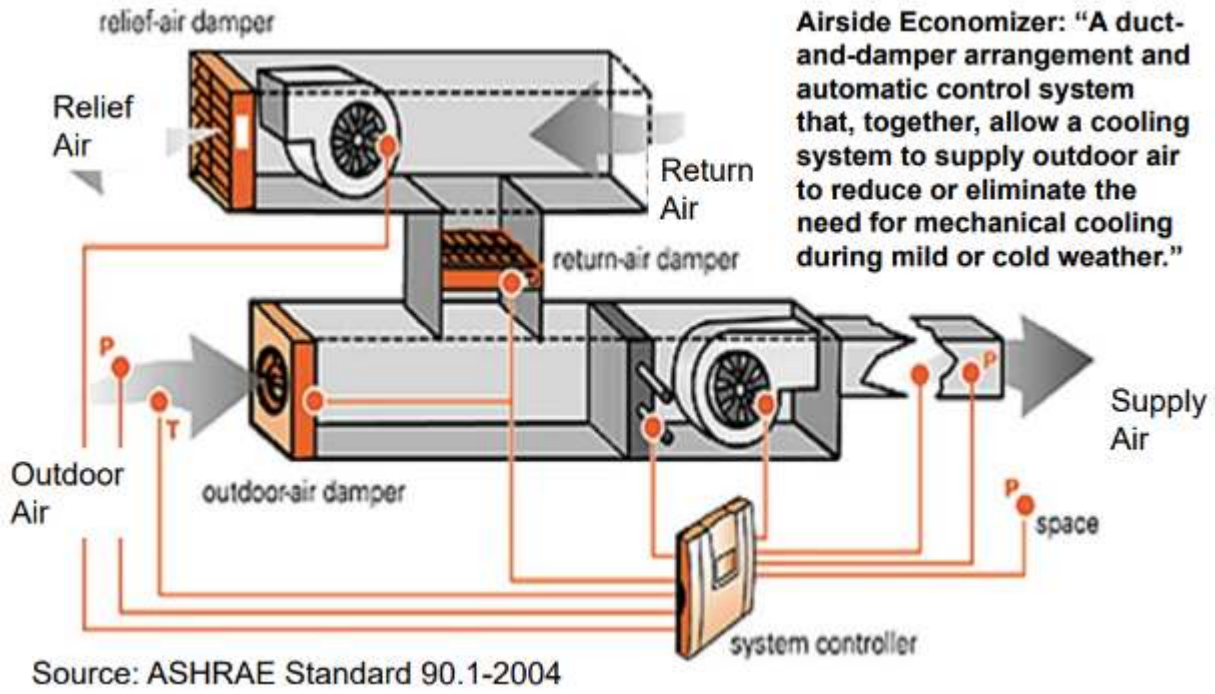
HOW TO AVOID PERFORMANCE ISSUES IN YOUR AIR-HANDLING UNITS

Take advantage of free cooling during the fall and winter months.

WEEKLY TIPS FROM INDUSTRY EXPERTS

FEATURED THIS WEEK: ANDREW MARSH, BAS EXPERT

We're getting to the time of year when free cooling is available, enabling you to cut back on your use of mechanical cooling; unfortunately estimates indicate that only 1 in 4 air side economizers function as designed. The collection of dampers, linkages, actuators, sensors and wiring seem complicated and yet can be simple to check and reset back to design.
Airside economizers typically save about 20 to 30 percent of overall cooling energy consumption. In their most basic form, economizers include the following components:



Source: ASHRAE Standard 90.1-2004

Economizers operate by pulling cooler outside air into buildings, reducing the load on the mechanical cooling system.

HERE'S HOW AN ECONOMIZER WORKS.

Using a collection of dampers, sensors, actuators, and logic devices, an economizer decides how much outside air can be brought into a building, allowing the load on the cooling system to be reduced.

Dampers regulate the amount of air introduced, recirculated, or exhausted from the building. Outdoor temperature sensors and logic controllers determine whether conditions are right for the economizer to operate, and govern the operation of the fresh/recirc/exhaust air dampers. Actuators open or close dampers based on signals from the logic controllers.
These systems are often out of sight and mind, issues related to their performance are often hidden due to either cooling or heating valves being used to automatically compensate, a good example of this follows.

REAL-WORLD EXAMPLE

During an interview of maintenance staff looking after a 12 story building they told me about an issue on the upper floors related to humidity and temperature. With that in mind we went to the roof to view the plant. Each of the four packaged Air Handlers were in full fresh air mode, despite the roof air temperature being in the mid 90's. After reviewing the BMS, we very quickly determined that the outdoor air humidity sensor used to calculate enthalpy had failed, causing the reading to be vastly inaccurate. To compensate for the 100% fresh air intake, all compressor stages had been operating on the air handlers and the conditioned air dumped out to the atmosphere. The fix, less than $500, generated ROI in less than a month - it's a no brainer and yet this issue had been going on for over 4 months.

AVOIDING PERFORMANCE PROBLEMS IN YOUR AIR-HANDLING UNITS

Here are some common maintenance-related issues and periodic tests that can be done to address and avoid performance problems with air-handling units before they become big issues.

- Stuck dampers or broken linkages. Economizer dampers, especially outside air dampers, can seize in place due to entrained debris and humid conditions. This is especially an issue for salty, corrosive marine environments. Also, the linkages, which connect the actuator to the damper, can fail. Cycle your dampers open and closed periodically, and verify that they operate as intended. This often requires one person at the control system's operator workstation, and another person observing damper operation. When the damper is commanded open, does it actually open? Don't just rely on the output signal from the operator workstation as the final word in how a system is actually working.

- Actuators not adjusted for full closure. A slight opening in the "closed" return air dampers during integrated economizer and mechanical cooling mode (100 percent outside air) can significantly reduce the efficiency of the system due to increased mechanical cooling load, because the system is operating at less than 100 percent outside air. The pressure characteristics are typically such that a slight opening in the return air damper translates to a significant amount of airflow. Command your return dampers closed, and verify that they close completely by feeling for leakage. If they're not closed completely, adjust the actuator/linkage connection. When closing the return dampers, be sure the outside air dampers are open, to prevent the plenum walls from collapsing inward.

- Worn blade and jamb seals. Blade and jamb seals help reduce damper leakage when the damper is closed. With no seals, leakage can be as much as 10 percent of rated damper airflow. Inspect your blade and jamb seals for leaks by feeling around the damper blades when they're closed, and if your dampers don't have seals, consider

installing them as a way to increase the efficiency of your system through reduced return damper leakage during 100 percent outside air mode.

- Sensors out of calibration. Temperature and enthalpy sensors are prone to drift out of calibration, especially enthalpy sensors and this is why we often see controls revert to temperature only (dry bulb). It's important to keep the outside air and return air sensors calibrated, as these are typically the sensors that make the determination for the economizer operating mode. Developing and implementing a sensor calibration program can help keep these sensors calibrated and maintain the overall performance of the system. This is good to do for other HVAC sensors too, especially those used as inputs to control sequences, such as measuring chilled water flow for a chiller staging sequence.

Do you agree? Have a question you'd like answered by an industry expert?
Email marketing@buildpulse.com.