



SpeciFlow™: A Fresh Approach to Measuring Outdoor Airflow

The Problem

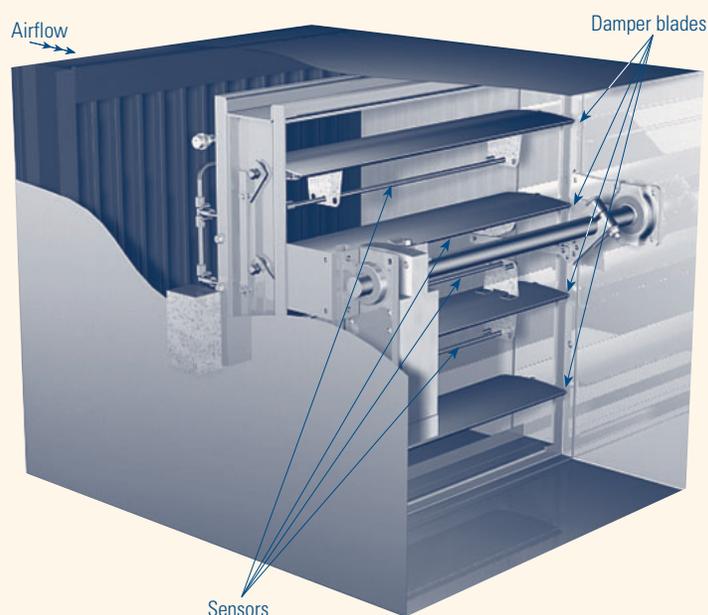
A building's performance is sensitive to the amount of outside air that is brought inside—too little results in poor indoor air quality, and too much results in wasted energy used to condition the excess air. However, it is difficult and costly to measure ventilation airflows, especially at outdoor-air intake locations where space is limited and non-uniform flow conditions exist. As a result, many commercial and industrial buildings do not have the equipment needed to monitor and control the intake of outside air.

The Solution

A new airflow control technology, called SpeciFlow™, integrates sensors, software, and electronics into a system that accurately measures airflow in non-uniform conditions and that costs less than conventional airflow measurement techniques. Federspiel Controls, a developer of building systems control technologies, created SpeciFlow technology and patented it in 2003. In early 2005, ventilation equipment manufacturer Greenheck Fan Corp. introduced a control damper, the IAQ-42, that uses the SpeciFlow airflow control technology to ensure that buildings take in just the right amount of outside air. Although this product

Figure 1: IAQ-42

The IAQ-42 incorporates the SpeciFlow™ technology to help buildings take in just the right amount of outside air.



Capabilities of SpeciFlow Airflow Control Technology

Compared to conventional airflow-measuring techniques, SpeciFlow offers a number of benefits:

- Low cost
- Accuracy at low velocities
- Insensitivity to non-uniform flow
- Low pressure drop
- Easy to repair
- Temperature compensated
- Insensitive to condensation
- Integral controller

integrates new airflow measurement hardware and techniques, some of these concepts are also available from the separately developed Ruskin IAQ50 Integral Outside Air Monitor/Damper.

Features and Benefits

The IAQ-42 control damper features pressure sensors placed right on the damper blades (see **Figure 1**). A programmable controller measures the pressure difference across the damper blades, the position of the damper blades, and the temperature of the air flowing through the damper. The controller uses that data to compute the airflow rate, and then it adjusts the damper blades so that the airflow rate through the damper stays close to the set-point. The IAQ-42 can compensate for the effects of temperature and altitude on air density, which may vary from standard conditions by as much as 15 percent.

SpeciFlow technology brings a number of benefits to the IAQ-42:

- *Low cost.* Standard airflow measurements are typically taken with a separate airflow measuring station. The SpeciFlow approach integrates airflow monitoring and measuring instrumentation with the mechanical component that modulates flow. That step cuts costs because some of the components do double-duty—they already exist as part of the damper. In addition, the damper does not have to be custom-made—the IAQ-42 uses a stock damper that Greenheck already manufactures.
- *Compact.* Integrating the instrumentation and damper also makes the equipment smaller and more compact than most conventional airflow measurement technologies. Conventional units require a separate airflow measuring station in a straight length of duct to ensure that uniform flow conditions exist.
- *Capable of accurately measuring non-uniform airflow.* The most common methods for measuring airflow require uniform flow conditions, but the SpeciFlow airflow control technology works well in outdoor-air intakes because the configuration of the pressure pickups on the damper makes the system insensitive to the non-uniform flow conditions that exist there. The accuracy of the IAQ-42 is 5 percent of the reading for face velocities of 1.5 to 10 meters per second—only complex, expensive technologies such as hot wire anemometers offer comparable accuracies for measurements in non-uniform flows.

Applications

SpeciFlow technology is applicable to any size of commercial, institutional, or industrial building. The IAQ-42 product is designed primarily for commercial applications that use direct outdoor-air control or relief-air control. It is applicable to both central HVAC systems and packaged air-handling units.

California Codes and Standards

SpeciFlow technology, as embodied in the IAQ-42, enables buildings to meet the minimum outdoor air requirements of ASHRAE Standard 62 and California Title 24 in a cost-effective manner by providing accurate monitoring and control of outside air. The direct monitoring capability of

the IAQ-42 may enable a building to qualify for one LEED (Leadership in Energy and Environmental Design) credit, and its ability to provide additional ventilation (if desired) may enable a second LEED credit.

What's Next

The final research goal, now under way, is to cut manufacturing costs further by developing a generic calibration curve that correlates pressure with damper blade orientation. This will mean that each unit produced won't have to be individually calibrated. The Public Interest Energy Research program is also funding field testing of the technology. Architectural Energy Corp., a provider of energy-efficiency services and products for buildings, is carrying out the testing, set to begin in late 2005, to determine the effect of SpeciFlow technology on energy consumption and indoor air quality in buildings on two California college campuses.

Collaborators

The organizations involved in this project include Federspiel Controls, Greenheck Fan Corp., and Architectural Energy Corp.

For More Information

Reports documenting this project and providing more details may be downloaded from the web at www.energy.ca.gov/research/innovations/eisg_final_reports/500-01-029/500-01-029.PDF and www.greenheck.com/pdf/dampers/IAQ42October2004.pdf.

To view Technical Briefs on other topics, visit www.esource.com/public/products/cec_from.asp.

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About PIER

This project was conducted by the California Energy Commission's Public Interest Energy Research (PIER) program. PIER supports public-interest energy research and development that helps improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

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