Energy-Efficient IAQ Moves to the Head of the Class

Evidence continues to mount that Indoor Air Quality (IAQ) directly impacts student academic performance and health. Unfortunately, IAQ is reported to be unsatisfactory in about one in five public schools in the United States, while ventilation is reported as unsatisfactory in about one-quarter of public schools.

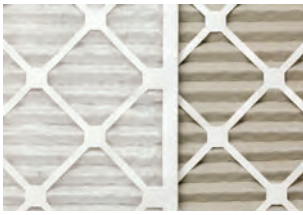
One of the biggest health problems linked to poor IAQ is asthma. Nearly 1 in 13 school-age children has asthma. There is evidence that indoor environmental exposure to allergens commonly found in schools – such as dust mites, pests, and molds – plays a role in triggering asthma symptoms.

Asthma is costly and a primary cause of school absenteeism, accounting for 10 million to nearly 13 million missed school days per year. Moreover, absenteeism directly affects school funding, which is often based on attendance.

Absenteeism linked to poor IAQ doesn't just affect students. It also affects the health, productivity and job satisfaction of teachers and staff. Nearly 80 percent of teachers responding to a survey in Chicago and the District of Columbia reported that school facility conditions were an important factor in teaching quality. Almost half who graded their facilities "C" or below would consider leaving. The most frequently cited problem was bad IAQ.

Selecting Air Filters for Good IAQ

Part of the job of a building's heating, ventilation and air-conditioning (HVAC) system should be to eliminate or significantly reduce respiratory illness triggers that occur within a building, such as microorganisms, dust and allergens. The key HVAC system component to reducing these triggers is effective air filtration, which provides the primary defense for building occupants and HVAC equipment against indoor air pollutants.



Air filters also play a significant role in the energy consumed to operate HVAC systems: Filters with a higher resistance to airflow can cause the HVAC system motor to work harder, thus consuming more energy.

The good news for schools looking to improve IAQ while actively managing energy consumption and costs (not to mention greenhouse gas emissions), is that selecting the proper air filter can achieve both goals.

When evaluating filtration efficiency, most people turn to MERV, a filter's Minimum Efficiency Reporting Value, which is assigned to filters based on the ASHRAE 52.2 Standard. A MERV 1 is considered least efficient, while a MERV 16 is most efficient.

The ASHRAE 52.2 test provides the efficiency of the filter over three particle size ranges: E1 (very fine particles in the 0.3 to 1.0 micrometer range), E2 (fine particles in the 1.0 to 3.0 micrometer range), and E3 (coarse particles in the 3.0 to 10.0

micrometer range). The E1, E2, and E3 efficiencies represent a more complete picture of a given filter's filtration efficiency.

When evaluating results of the ASHRAE 52.2 test, building engineers would be wise to review the Fractional Particle Size vs. Particle Diameter Curve that is included with the test report. The curve will provide the efficiency of the filter for the specific particle size of interest. Keep in mind, for example, that lung-damaging dust can be as small as 0.5 micrometers while some bacteria can be as small as 0.3 micrometers. This means that high E1 and E2 efficiencies are critical to providing for good IAQ.

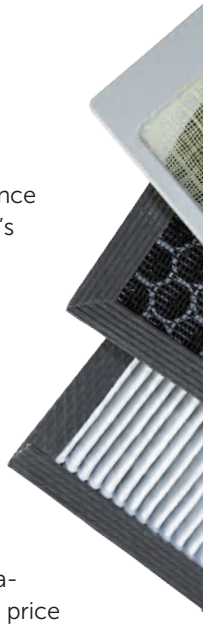
Did You Know?
32 million of the nation's 54 million school kids are at elevated risk of health and learning problems due solely to the conditions of their schools.

Selecting Air Filters for Energy Efficiency

As noted above, a filter's energy efficiency should also come into play during the selection process. That's because energy use is the largest operating cost involved in air filtration. In fact, during a filter's useful life, HVAC fan motor energy consumption accounts for 80 percent of its total lifecycle costs. Moreover, the cost of the energy used to operate the HVAC fan motors can be more than 8 times the initial purchase price of the filter itself.

The energy used to operate the HVAC fan motors is directly proportional to the airflow resistance of the filters. The more resistance, the more energy is needed to push/pull air through the filter. Resistance typically increases as filters remove more contaminants from the air. While this filtration is essential for healthier indoor air quality and protection of HVAC equipment, it can come at a cost in terms of energy consumption.

Choosing filters with a lower comparative resistance to airflow, yet having high E1 and E2 efficiencies, is one of the easiest steps to take in an effort to reduce energy costs. That is because, with a lower resistance filter, the HVAC system fan motor needs to overcome less resistance to deliver the required air flow, thus reducing the motor's energy consumption.



A Balanced Approach

When selecting air filters, be sure to consider the type of filtration media used to construct the finished filter. Those with a good balance of mechanical efficiency and electret efficiency (via an electrostatic charge) will almost always outperform a filter that relies solely on mechanical efficiency. Because energy costs are the largest component of an air filter's total lifecycle cost, it is imperative for educational institutions to look beyond the line item purchase price of filters when seeking to reduce their overall costs and instead consider the value that can be derived from healthier IAQ.

A well-designed charged filter media can be manufactured to provide high initial and high sustained filtration efficiency over its filter lifecycle. In addition, charge-enhanced mechanical filters almost always deliver lower airflow resistance in the same filter construction as mechanical-only filters, which translates into reduced energy costs and potentially reduced greenhouse gases.

Conclusion

With the right air filtration strategy and effective implementation, educational institutions may be able to positively impact the health, productivity, and attendance record of its students and faculty without incurring additional overall expenses. Whether it's a reduction in costs associated with substitute teacher, or if schools are compensated based on student attendance, this could be a huge win for all.

For additional guidance on IAQ in schools, visit the EPA web site.

Bottom Line for School Administrators and HVAC Professionals:

This school year is the perfect time to put indoor air quality on the curriculum and upgrade your school's air filtration system. Healthy IAQ should be an integral part of your strategy to improve student learning, improve funding by reducing student/teacher absenteeism, and reduce energy consumption.

Bottom Line for Filter Manufacturers and Distributors:

Educational facility budgets are often tight. Helping your customers understand the connection between healthy IAQ and student performance is one way to move away from a transactional relationship to one where you become a more trusted consultant solving real problems. One insight to share with your customers: Saving a few dollars on the initial filter purchase may end up costing schools more on energy expenses or lost student funding in the long run if the filter does not perform well.