New filtration technologies can improve indoor air quality, mitigate risks, and lower building operating costs

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The healthcare industry has made great progress in implementing strategies that lower risks, improve building efficiency, and reduce carbon footprints. Many measures are geared to reduce heating and cooling system energy consumption. Today, advances in air cleaning technologies are helping to take these strategies to the next level. MERV15+ systems such as the Dynamic V8 Air Cleaning System can clean the air of biologicals, ultra-fine particles, nuisance odors and volatile organic compounds (VOCs) while substantially reducing energy consumption and operational costs.

Improved Indoor Air Quality

High efficiency air cleaning systems can improve indoor air quality (IAQ) by improving filtration of:

Ultrafine Particles. High efficiency air cleaners can remove dangerous, ultra-fine airborne particles such as particulates from combustion engine exhaust pulled into buildings from heliports, ambulance bays and covered loading/unloading zones.

Odors and VOCs. Issues with odors and/or VOCs will also impact the type of filtration. Medical facilities and assisted living facilities are common examples of applications where odor and VOC issues can be expected. Today, the most popular technologies that address these gas phase contaminants include polarized-media air cleaners, carbon filters, and photo-catalytic oxidation (PCO).

Biological Contaminants. High efficiency air cleaners can provide effective control of airborne organisms including viruses, bacteria, molds and mold spores. Systems that collect mold spores reduce the risk of potential mold problems by removing mold spores from the air stream, as well as sub-micron particles, which can provide a food source for mold and pathogen growth. Technologies that address biologicals (living airborne organisms) include polarized-media air cleaners, HEPA filters, and ultraviolet germicidal lamps. Some produce Ozone, and some do not.

Operating Costs Savings

Healthcare facilities can find significant operational savings in new air cleaning technologies through:

- Reduced fan horsepower from lower static pressure
- Reduced maintenance costs from longer service intervals
- Reduced disposal costs

Fan Horsepower. Historically, increasing filter efficiency meant increasing energy and operating costs because it takes more fan horsepower to push air through denser filter media. Lower static pressure also corresponds directly to lower brake horsepower. Since brake horsepower drives fan energy, lower static pressure corresponds directly to energy savings.

In an amendment within ASHRAE Standard 90.1-2007, a standard has been set for allowable brake horse power for each type of system and space use. Section 6.5 of the 2007 version of ASHRAE 90.1 (HVAC Air System Design and Control) sets allowances for brake horsepower based upon system type and application. While these allowances can often be difficult to meet with traditional high-efficiency passive filtration, newer advanced air cleaners like the Dynamic V8 Air Cleaning System can help to meet them.

The third largest energy cost item in a healthcare setting is the energy needed to move air through the heating and cooling systems. Lowering static pressure is one of the most effective and measurable ways to immediately reduce the total energy used by the HVAC system. Newer active field electronic air cleaners offer relatively low resistance. In some cases, there can be mid-life pressure drop savings of up to 1.5" versus passive, mechanical filters. This allows fans to be designed and selected with lower break horse power requirements and potentially far less operational energy consumption. For example, in a hospital with 300 filters operating on an average of 0.5" lower in pressure drop during use equates to $26,669 in annual energy savings (based on $0.10 per kWh).

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Maintenance. Polarized-media filters like the Dynamic V8 last longer than conventional passive filtration due to very high dust-holding capacity, often extending change-out intervals from several months to several years and lowering labor, ordering, handling, storage and disposal costs.

For instance, a 2" deep MERV 13, 24"x24" filter holds approximately 40 grams of dust before it reaches its dirty design static pressure of 1.4" w.g. Therefore, if the average building produces 130 grams of dust per cubic meter each month or 48 grams per 24"x24" filter, a 2" deep MERV 13 filter would have to be replaced every two weeks, a 4" deep MERV 13 filter every month, etc. to keep the static below 1.4" and maintain a mid-life static pressure of around 0.9", not including the impact from a pre-filter. By comparison, the Dynamic V8 Air Cleaning System can hold up to 2,600 grams of dust at the recommended change state of 0.6", or twice its initial static pressure. An air cleaner that holds 10 times the dust of cartridge and bag filters and up to 100 times the dust of shallow-bed passive filters will greatly impact maintenance intervals and other ongoing costs of filtration.

Additionally, regulations in effect in many areas of the country require air filters used in medical facilities to be bagged. Disposal costs alone for bagged waste can top $480 per ton or more – 19 times the cost of ordinary solid waste.

Other Key Factors

HEPA Protection. When HEPA filters are required as point-of-use filtration, using the Dynamic V8 as a secondary filter can extend the life of the HEPA filter substantially (5-8 times). With HEPA filters costing between $400-500 this can contribute to substantial savings.

Sustainability. Many healthcare organizations with CSOs and/or sustainability directors are actively looking for new sustainable solutions. Air cleaning systems can help reduce carbon footprints and lower CO2 emissions by reducing fan horsepower. And air cleaning systems like the Dynamic V8 can help earn up to three LEED® points. For example, LEED certification requires a minimum of MERV 13 for its IEQ Credit 3.0. Reducing HVAC Energy qualifies for a point under EA Credit 1.0.

Life Cylcle. Comparing initial price to trade-offs in life cycle costs and operating costs becomes increasingly important as the need for high efficiency filtration increases. Fan horsepower and system static pressure greatly impact energy consumption. Filter replacement costs and length of maintenance intervals influence ongoing operational costs. All these costs should be reviewed to determine a system's return on investment (ROI). In some cases, high efficiency filtration systems can pay for themselves in less than two years.

Dynamic V8s in a custom air handler

The Dynamic V8 Air Cleaning System

The Dynamic V8 provides MERV 13-15+ performance without ionizing or Ozone generation– plus VOC reduction and superior capture of dangerous ultra-fine particles. It is constructed to eliminate bypass, a critical issue for maximum performance. The Dynamic V8 holds up to ten times the dust of standard cartridge and bag filters and up to 100 times the dust of shallow-bed passive filters. Loading is critical to the ongoing costs of filtration. Unlike passive filters (which load primarily on the face of the media), the Dynamic V8 loads throughout the full 1" depth of each of the eight media pads and 360° around each fiber. This three-dimensional loading accounts for the V8's dramatic ability to collect contaminants. And the active-field technology tightly holds what has been collected so it is not shed back into the airstream. This means maintenance intervals measured in years instead of months.

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Case Studies

Firelands Regional Medical Center – Sandusky, Ohio

Challenge: Replacing three obsolete critical AHUs, owners also wanted to **1)** exceed the U.S. Department of Health & Human Services minimum MERV rating for final filtration in patient areas, **2)** minimize noticeable odors and harmful particulate typically introduced as ventilation from ambient sources including helicopter fumes and idling ambulances, **3)** create a highly effective level of indoor air quality and healing environment, **4)** extend media life and minimize the burdens from having to replace media, and **5)** reduce energy and operating costs.

Solution: Dynamic V8 Air Cleaning Systems.

Results: The system exceeded MERV 15, rivaling the efficacy of HEPA filters. Filter replacement intervals have exceeded three years. The system also delivered on fan energy savings. To illustrate, the system static pressure of standard 95% passive filters and pre-filter media typically runs at 1-1/4" w.g. static after six months. At Firelands, the total static from final filtration was 0.38" w.g. after one year and 0.5" w.g. after 2½ years on the original set of media.

Ohio Veterans Home – Sandusky, Ohio

Challenge: Controlling and removing difficult odors including tobacco smoke and residual smoke odors from interior smoking rooms and a stubborn urine odor in a special care ward.

Solution: Dynamic 1" and 2" V-Banks, Dynamic 2" Air Cleaners, and Dynamic G-375 Germicidal Systems.

Results: Results were almost immediate. Smoke was reduced and residual smoke odors disappeared. Dynamic V-Banks were added as part of a subsequent HVAC system upgrade serving a large resident facility. Shortly thereafter it was noticed that a stubborn urine odor was gone. In open wound patient rooms, several Dynamic G-375 Germicidal Systems have been installed.

Royal Victoria Hospital – Montreal, Quebec

Challenge: Odor control. Odors were migrating within the main building and outdoor odors were coming into the building through the ventilation system. A designated smoking area once located in the hospital lobby was later moved outdoors but within proximity to the fresh air intakes.

Solution: Dynamic 2" V-Banks.

Results: Hospital personnel conducted their own test to measure system effectiveness with odor control. Three months after the air cleaners were installed, maintenance personnel placed a tray with foul-smelling caulk upstream of the air cleaner. Personnel were surprised that there was no indication of caulk odor downstream of the air cleaner.

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Case Studies

Cancer Care Center of York County – Sanford, Maine

Challenge: When the facility opened in 2006, its proximity to a nearby rubber plant resulted in odors frequently being brought into the building with the ventilation air. The odors exacerbated nausea problems with oncology patients.

Solution: Dynamic 2" Air Cleaners

Results: The complaints and problems associated with the rubber plant disappeared and there was a marked improvement in interior air quality.

Ellis Hospital – Schenectady, New York

Challenge: Vehicle exhaust emissions entering through fresh air intakes located under a covered area which served as a primary pick-up and drop-off point for patients entering and leaving the facility. The intake supplied fresh air to air handling equipment serving several areas within the hospital.

Solution: Dynamic V8 Air Cleaning Systems.

Results: The Dynamic V8 Air Cleaners eliminated the odors. The hospital was pleased not only with the elimination of the odor complaints, but they were also elated with the longer filter service life. Previously, hospital personnel were replacing 2" passive pleated filters every few months. The Dynamic V8 replacement media will not require replacing for several years.

Hospital Viamed – Seville, Spain

Challenge: Energy savings in a state-of-the art medical facility.

Solution: Dynamic V8 Air Cleaning Systems.

Results: Owners compared two identical AHUs serving two operating rooms with similar characteristics and usage for one full month. Energy metering devices were installed on both AHUs for continuous energy monitoring. During the 30-day test period, energy consumption in the AHU with the Dynamic V8 was 55% lower during normal operating room hours and 12% lower during non-use times.

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