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ADVANCING HEALTHCARE IAQ

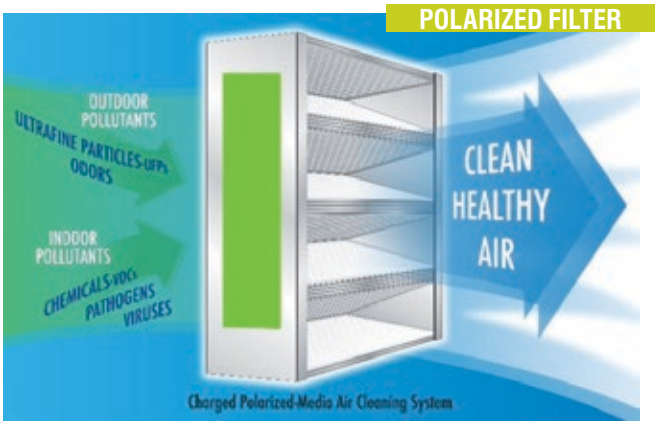
Technologies provide 'trifecta' of benefits

By David N. Schurk

The U.S. Environmental Protection Agency studies show indoor air quality is 2-5 times worse than outside air quality. And hospital patients may spend days and weeks isolated indoors, surrounded by a high concentration of contaminants.

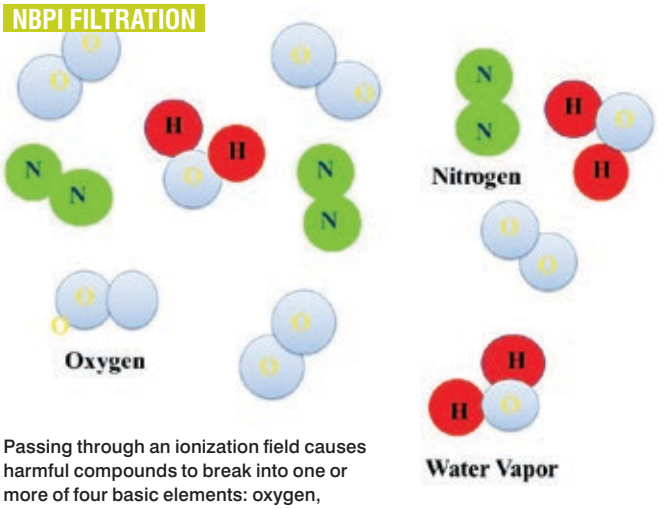
The U.S. Department of Health and Human Services has identified the reduction of healthcare-associated infections as an Agency Priority Goal and acknowledged a growing consensus that HAIs should be eliminated. The International Facility Management Association continuously encourages members to challenge standards and practices if facilities do not meet indoor air quality goals. In its "Operating Sustainable Facilities" manual, IMFA advises that facility managers "must look at their interiors from two perspectives: that of a facility manager interested in energy efficiency and lifecycle impact on the environment and that of a facility occupant who seeks and deserves healthful and comfortable surroundings," and that "to improve IAQ, a facility professional should understand potential and actual threats to IAQ in the facility and take steps to improve ventilation and air quality as needed."

POLARIZED FILTER



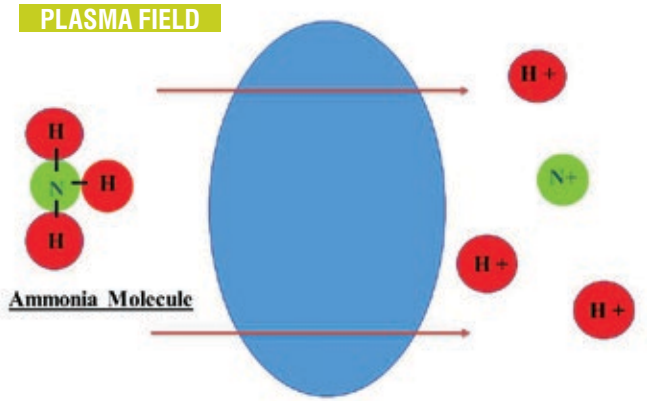
Polarized media filters combine elements of electrostatic air cleaners and passive mechanical filters. By polarizing the individual filter fibers, charged particles are efficiently attracted, captured and held in place, removing harmful elements from the airstream.

NBPI FILTRATION



Passing through an ionization field causes harmful compounds to break into one or more of four basic elements: oxygen, nitrogen, carbon dioxide or water vapor.

PLASMA FIELD



Upon entering the ionization field, positive and negative ions surround harmful ammonia particles, breaking them down into hydrogen and nitrogen naturally occurring in the atmosphere.

The industry must work together and be familiar with a wide range of cutting-edge indoor air quality technology to design facilities that meet air quality standards and provide a safe environment for patients and employees. This article focuses on polarized media filtration and needle-point bipolar ionization to expand solutions covered by *Medical Construction and Design* in previous issues.

POLARIZED MEDIA FILTRATION

Hospitals must maintain specific levels of filtration for air-delivery systems. Filter combinations may include both "pre" and "final" filter assemblies with an aggregate Minimum Efficiency Reporting Value deemed acceptable for each environment. Hospitals often use passive (mechanical) throw-away filters that offer moderate to high efficiency but have a high air-flow pressure drop and limited capacity to capture and hold particulate matter. These filters consume more energy because of the extra fan motor horsepower required to overcome airflow resistance and necessitate regular replacement and disposal to maintain cleanliness. Passive filters are front loading, so the particulate in the air passing through accumulates mostly on the face of the filter instead of penetrating into the filter, limiting dust-loading capacity.

Polarized media filtration combines the best elements of passive filters and electrostatic precipitators. It meets or exceeds ASHRAE standards and can achieve uniform loading throughout the filter depth using safe low voltage/amperage. By polarizing the individual filter fibers, charged particles are efficiently attracted, captured and held in place, removing harmful elements from the airstream before being inhaled. Particulate holding capacity is greatly increased and some media can hold up to 10 pounds of dust while reducing air-flow resistance. A mechanical filter may be fully loaded with less than 1 pound of particulate, reaching up to 1.5 inches in water pressure drop (in wc), while polarized media can remain in service from five to seven times longer before requiring replacement at a final resistance of only 0.57 in wc. Utility cost savings from this reduced pressure drop in a single 20,000-cubic-feet-per-minute air-handling unit could exceed $3,500 per year. Combine the savings from replacement materials and maintenance with the same AHU equipped with polarized technology and total lifecycle costs could be reduced by more than $60,000 over a period of 15 years.

NEEDLEPOINT BI-POLAR IONIZATION

The EPA reports emissions from industrial facilities, motor vehicle exhaust, gasoline vapors and chemical solvents are major sources of harmful mono-nitrogen oxides and VOCs. Hospitals also must address emissions from helipad operations, emergency generators and co-generation plants that enter buildings through the outdoor air supply and are distributed through air-handling systems. In many U.S. cities the outdoor air is so polluted that ventilating a space to comply with code requirements can be detrimental to the occupant, triggering asthma, bronchitis or emphysema.

Needlepoint bi-polar ionization allows for safe and efficient removal of harmful substances from the air. When

energized, stainless steel needles within the generation device create cold plasma that splits water molecules in the air, producing positive and negative ions without generating ozone. Ions surround harmful particles such as airborne mold, virus, bacteria and allergens. Then a chemical reaction occurs at the molecular level, depriving pathogens of life-sustaining hydrogen and severing proteins on the cell membrane, preventing reproduction. When in contact with VOCs, ions cause the compound to break into one or more of four basic elements of the atmosphere: oxygen, nitrogen, carbon dioxide or water vapor. Because ions are naturally present in the air, the process of generating ions simply "super-charges" it, boosting its defenses against pollutants.

Traditionally, hospital HVAC systems use various forms of gas-phase filtration to clean the air supply. Activated carbon is widely used with varying levels of success. Some carbon filters load quickly with pollutants, rendering them ineffective, and in humid climates they can absorb water vapor, limiting their efficacy. Additional fan motor power is necessary to overcome internal resistance and carbon materials need regular replacement. NBPI can replace gas-phase filtration, eliminate associated air-flow resistance and greatly reduce time and expense resulting from carbon materials replacement.

NBPI effectively keeps wet cooling coils free of bacteria, mold and fungal growth. When installed on the upstream side of the coils, an NBPI system is unobtrusive to the airflow and can deliver ions through the ductwork into the occupied space to effectively decrease surface microbial counts and subsequently reduce hospital-acquired infections. Additionally, ions interact with oppositely charged particles causing them to agglomerate, creating larger and heavier particles that can be more effectively trapped on any downstream filtration.

NBPI is a safe, energy-efficient technology that combats VOC pollutants, molds and pathogens. By eliminating air-flow pressure drop and with savings from reduced maintenance and materials, NBPI offers a return on investment in months rather than years, making it a viable filtration option for hospitals to consider.

A TRIFECTA OF BENEFITS

Actively polarized media filtration and needlepoint bi-polar ionization can contribute substantial energy savings when installed in systems that comply with outdoor ventilation rate reductions based on IAQ procedures that allow the use of gas-phase cleaning and high-efficiency particulate filters. An owner may save on average more than $35,000 a year on utility bills by reducing the outdoor air quantity by 10 CFM/person through a single 20,000 CFM, 100 percent outdoor air unit operating 24/7.

Recent technological innovations have resulted in an impressive array of IAQ solutions for healthcare. Ultimately, needlepoint bi-polar ionization and polarized media filtration improve the patient experience, reduce energy and maintenance costs and extend HVAC equipment life, creating a "trifecta" of benefits producing dramatic results and impressive returns on investment.

David N. Schurk, DES, CEM, LEED-AP, CDSM, SFP, is director of healthcare accounts for HTS Texas.