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Erio air purifiers and sanitizers

Air purifiers and sanitizers equipped with active electrostatic filtration and negative ionization like the Erio DEPUR20, are able to guarantee air purification and at the same time hygienic, antibacterial and antiviral effects.

Electrostatic filtration is a well-known technology that uses high voltage and ionization fields to capture particles and microorganisms from the airflow, aka electrostatic precipitators (ESP).

ESPs bases its functioning on electric fields and electrostatic forces applied directly on particles and on microorganisms present in the air.

The filtration operation in the device develops in two phases:
- the conferring of an electric charge to particles and microorganisms carried by the air
- the electrostatic precipitation of charged particles/microorganisms.

The electrostatic filter is therefore built with two separate sections:
- a ionizing section
- a collection/precipitation section.

In the first phase particles' and microorganisms' (i.e. bacteria, spores, yeasts) charging takes place in the ionization section through electrodes generating a positive or negative corona discharge. In the second phase, the electrostatic precipitation of the previously charged particles and microbes, occurs in the collection section, on a set of parallel electrically charged collecting plates. The electric field generated between these plates captures the particles and traps them on the collection plate's surface.

The contact with the plates causes the immediate destruction of any micro-organism and avoids the release of endotoxins when bacteria are lysed as happens with mechanical filters.

The main advantages of the Electrostatic Precipitators (ESPs) are the followings:
- collect particles > 0.3 µm to 100 µm up to 99% efficiency
- operate at high flow rates
- operate at high particle loadings, 500 grams/m3
- have low energy consumption and low running costs
- there are no replacement and disposal costs

The electrostatic filtration technologies also show specific advantages when applied to the air decontamination of critical areas in nosocomial environments where airborne diseases are often spread. The efficiency of air filtration is high enough to collect particles of any size, including ultrafine particles. The destruction of microbes is thus managed effectively, and the system is also able to remove Volatile Organic Compounds (VOCs).

The usefulness of ESP technology in mitigating biological aerosols has been demonstrated using both bacterial endospores and various bacterial species. This technology destroys the microorganisms transported by air flows before they risk becoming contaminants for human being. ESP are considered for this reason as an "**active kill filtration**". As it does not allow microbes, fungi or spores to vegetate and flourish on the filter's surface while also preventing the emission of substances in the environment arising from metabolism and destruction of the captured microbiological flora.

Filtration with mechanical fibers filters is a technology which presents many gaps: the quality and quantity of clean air decrease over time, the filters get clogged causing an increase in pressure drops, noise and energy consumption, together with a laborious change of filters, becoming a non-economic

solution in the long run. Furthermore, HEPA filters which are usually used in traditional air purifiers are effective only up to 0.3 µm, excluding thus viruses and micro-toxins.

Literature and laboratory tests confirm the effect of electronic filters against viruses which move in airborne particles. Atmospheric particulate acts as a carrier for many chemical and biological contaminants, including viruses. Regarding their spread in the population, there is a solid scientific literature which correlates the cases of viral infection with atmospheric particulate concentrations such as PM10 and PM2.5. Since even the ultra-fine PM1 particulate (with dimensions between 0.3 and 1 micron, according to the EN ISO 16890 standard) falls within the abatement field of "Expansion Electronic" electronic filters, they are effective against airborne viruses.

The failure to release the particulate and the particles captured and deposited on the electrostatic filter, when the switching off of the air purifier or of the filter itself occurs, is tested and certified by the University of Lucerne. This guarantee also makes the maintenance phase safer, which consists in washing the filter with water and detergent.

Moreover, since the filter is completely regenerable through washing, further replacement and disposal costs are avoided, ensuring a great economic saving over the time.

The capture and inactivation of airborne viruses by electrostatic precipitators have been studied on several occasions. Here below some interesting articles:

(Department of Energy, n.d.)

https://www.ncbi.nlm.nih.gov/pubmed/19731701

(Ayse Fidan Altun, n.d.)

https://www.e3s-conferences.org/articles/e3sconf/pdf/2019/37/e3sconf_clima2019_02020.pdf

(Journal of applied microbiology, n.d.)

https://sfamjournals.onlinelibrary.wiley.com/doi/full/10.1111/jam.14278

(Park, n.d.) http://large.stanford.edu/courses/2017/ph240/park2/

The elimination and inactivation of airborne viruses and bacteria also prevents the generation of dangerous outbreaks.

Mechanical filters in fact act as a breeding ground for microbes. Toxic microbial metabolites can pass through the filter, consequently the air which comes out is contaminated and the result can be lethal.

High efficiency air filtration (HEPA) can be used to remove airborne particles of biological origin (e.g. bioaerosols) in many indoor environments, including hospitals, office buildings and aircraft cabins.

However, even if it is always installed after pre filtration systems, this type of filter can also become an ideal habitat for viruses and bacteria.

The DEPUR20 powered with Expansion Electronic electrostatic cell, is an air purifier that have different fields of application: is in fact installed in homes, offices, shops, bars, restaurants, hairdressers and beauticians' salons, gyms, hotels, conference rooms, shopping centres, hospitals, rest homes, dental laboratories, dental clinic.

They are not ozone generators. Ozone generators can be very harmful for human health. Ozone can cause health effects after inhalation.

Symptoms such as mucous membrane irritations and headaches often occurs. These symptoms can also occur during photochemical smog episodes.

Higher concentrations (> 50 ppm) and long-term exposure (> 30 min) can be fatal.

However, remaining in a room with these kinds of concentrations is nearly impossible.

Long-term effects of ozone exposure are not fully known, but we are warned to consider a decrease in lung capacity and lung diseases. To prevent the above-mentioned health risks, a maximum amount of ozone has been established for areas where one uses ozone.

This is the so-called Maximum Admitted Concentration, or MAC-value. This value describes the maximum concentration of a substance that a human can be exposed to for a given period of time.

For a normal working week of five days, eight hours per day, ozone has a MAC-value of 0,06 ppm (parts per million, or mg/L). For 15 minutes, the MAC-value is 0,3 ppm.

Ozone can be measured in ppm or ppb (parts per billion, or µg/L), according to various principles. With these measurements, the desired ozone concentration in a system can be monitored. When MAC-values are crossed near the ozone generator, an alarm will sound.

Ozone has a very distinctive smell, causing MAC-value violation to be noticed quickly.

Humans can stand a limited exposure of ozone, symptoms like dryness in the mouth and throat, coughing, headache and chest restriction can occur and nearby the lethal limits, more acute problems will follow in a higher concentration.

Limits:

* 0,06 PPM for 8 hours a day, 5 days a week (PPM = Parts Per Million)

* 0,3 PPM for maximum 15 minutes

Source: Expansion Electronics