# HYGIENIC AND ANTIBACTERIAL SOLUTIONS

## HIGH TECH SOLUTION FOR AIR PURIFICATION



expansion® electronic

BETTER AIR FOR A BETTER QUALITY OF LIFE

## PREVENTION AND CONTROL MEASURES IN PLANT SYSTEMS

The heating, ventilation and air conditioning systems and their components, as well as drinking water and sanitary equipment, can favor and amplify the diffusion of airborne substances: among these, Staphylococcus aureus and Legionella are particularly dangerous. The first cases of legionellosis were in fact mainly attributed to airborne substances containing bacteria from cooling towers, evaporative condensers or humidification sections of the air handling units. Infections were also caused by contamination of water supply networks, sanitary appliances, oxygen therapy equipment, fountains and ultrasonic humidifiers.
Procedures that combat the multiplication and spread of legionella must be carefully considered and implemented during the design, installation, operation and maintenance phases of the plant systems.
Although such measures do not guarantee that a system or component is legionella-free, they contribute to reducing the possibility of severe bacterial pollution.

Bacterial colonies growing on a plate exposed to the air.



Unfiltered air | Filtered air

## MAIN PREVENTION STRATEGIES FOR PLANT SYSTEMS

- To perform periodic cleaning of the systems;
- To limit the possibility of biological niches for micro-organisms through cleaning of plants; prevention and removal of sediments from hot water tanks, cooling basins and other sanitary measures;
- Check the efficiency of the filters and eliminate any drops of water on their surfaces.

## LONG-TERM PREVENTION MEASURES

- Scheduling of inspections on the air conditioning system in order to examine the status of the humidifiers, of the evaporative towers, the location of the external air intakes and the status of the channels;
- Control of the maintenance program: during system operation, it is important to perform periodic checks to detect the presence or absence of dirt;
- In the case, then, of a cleaning operation, it must be ensured later that the used substances are removed completely from the system.

## THERMAL EXCHANGE BATTERIES

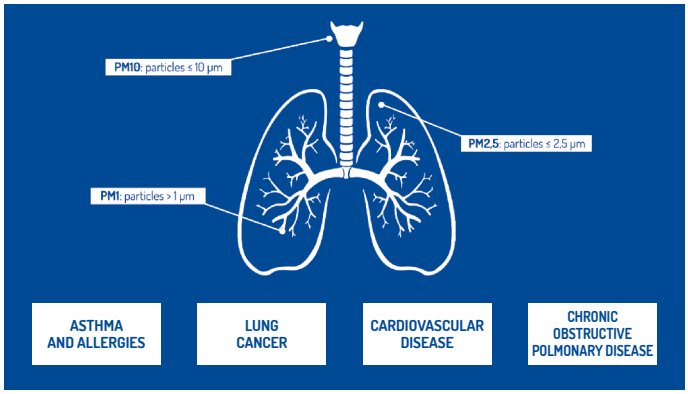
Heat exchange batteries can cause odors to be emitted due to the build-up that they form on internal surfaces, especially in the case of hot batteries. To minimize these problems, especially in the case of high temperatures, frequent cleaning must be carried out by brushing or vacuuming. In the case of cooling coils, the finned surfaces and in particular the condensation collection basins are the places where microorganisms and molds proliferate. Therefore, it is necessary to install inclined basins in order to avoid stagnation and to realize them with anticorrosive materials to facilitate cleaning.

## FILTERS

The cost of more effective filtration is much lower than that of cleaning the components of the distribution networks. It is therefore advisable to install F7 class ePM1 [60%] filters upstream of the air handling units and additional F8/F9 class ePM1 [90%] filters downstream of these units. On air return systems, at least F7 class ePM1 [60%] filters should be installed. Of course, regular cleaning and replacement of the filters are recommended.

## ANTIBACTERIAL EFFECT OF EXPANSION ELECTRONIC ELECTROSTATIC FILTER

Thanks to its high collection efficiency of submicronic particles and to its strong electric field, the Expansion Electronic filter has an elevated antibacterial power and is active on pollen, fine dust, toner, mold, smog, viruses, bacteria and tobacco smoke.
The electrostatic filter originates an inactivation of contaminants, unlike the mechanical filtration, which does not guarantee it and creates in the long run a collection of live contaminants that proliferate by creating germs colonies, exposing the environment and the maintenance man operator at a high risk of infection.

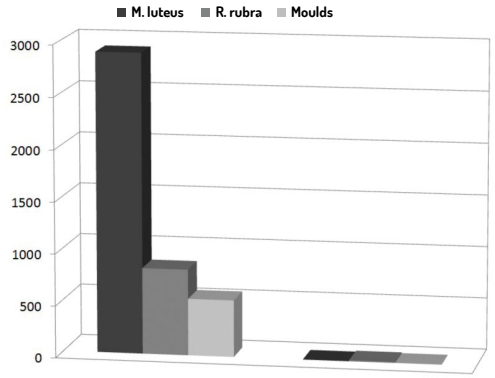



The contaminants, according to their size, can enter inside our body and wear out certain organs. With electrostatic filters this problem is eliminated as pollen, dust mites, fungus and other contaminants are captured and inactivated.
As we can see from the diagrams below, in the Test A, the concentration of the bacteria commonly present in a given environmental air have been measured before and after the installation of electrostatic filters.

The efficiency of bacteria removal is 98-99% on:
- Airborne bacteria, such as Micrococcus luteus;
- Yeast, such as Rhodotorula rubra;
- Bacillus Anthracis;
- Molds and germs present in the natual spectrum of air.

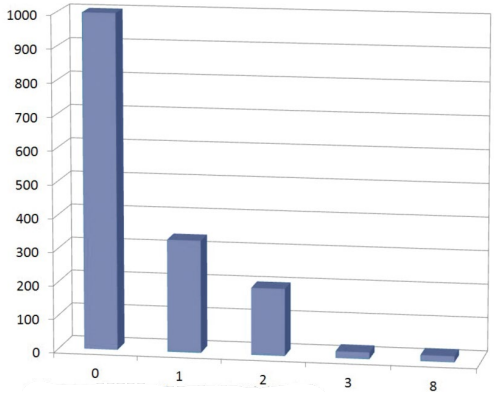
Test B shows how the concentration of molds in the air is reduced when the system is equipped with electrostatic filters.

**Measurement of the bacterian load in the air before and after the electrostatic filter**




| | CFU before the filter | CFU after the filter |
|---|---|---|
| M. luteus | 2896 | 0 |
| R. rubra | 830 | 9 |
| Moulds | 548 | 2 |

**Reduction of moulds inside an electrostatically filtered environment**




**Operating hours of an electrostatic filter**

| | 0 | 1 | 2 | 3 | 8 |
|---|---|---|---|---|---|
| CFU Moulds | 1000 | 335 | 200 | 20 | 18 |

## CERTIFICATED EFFICIENCY

ILH BERLIN
INSTITUT FÜR LUFTHYGIENE

Expansion Electronic has developed and lodged several patents and received a certain number of certifications thanks to which it has obtained great success and a large number of international awards. We want to recognize our commitment and value through the certifications and compliance of our products to provide our customers with absolute quality and efficiency.

INSTITUT FÜR LUFTHYGIENE

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ILH BERLIN

**Expertise on Hygiene**

(reduction)

Of efficiency of the HI-TECH NATURE SYSTEM (HTNS) of the Company EXPANSION ELECTRONIC Srl, Via delle Industrie 18, 36050 Cartigliano (VI), Vicenza, Italy for the abatement of living particles (microorganisms) and nonliving ones (dust) from air.

Content of the report

On behalf of the Company EXPANSION ELECTRONIC Srl it was made a survey to test the efficiency of the HTNS of the Company EXPANSION ELECTRONIC Srl, on abatement of living particles (microorganisms) and nonliving ones (dust) from the air. For the realization of tests it was made available by the principal, a sample of the machine type HI-TECH NATURE SYSTEM (HTNS), model 115 / 3D Oil.

The determination of efficiency of abatement of HTNS was simultaneously performed by determining the concentration of microorganisms (*Micrococcus luteus, Rhodotorula Rubra*, mold, natural spectrum of outdoor air) and particles in the air before and after the electrostatic filtration unit, after each single emitter and the exit of the inlet jets (after neutralizers and revitalizer). As air to be tested, it was used outside air. Tests were led with different air speeds and with different relative air humidity.

Conclusion of test results

The HTNS is capable of eliminating from the air to be filtered airborne bacteria (M. luteus), yeasts (R. rubra) and molds with an efficiency that ranges from 98.53% to> 99.96% which depends on the type of germs and the relative humidity. Against airborne particles was determined with an efficiency between 98.24% and 99.48%. The HTNS produces hygienic, energetic and economic benefits and is recommended in a large number of applications, particularly as the second level of filtration in the following sectors: agri-food, pharmaceutical, clean room, hospital, textile production, printing and paper, tobacco production and ventilation and air conditioning systems in places with high air pollution (compares extended expertise).

## CERTIFICATED EFFICIENCY

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The **Hygiene Institute of Berlin**, which has been operating since a long time on the research, ventilation, environmental technology, medicine and hygiene fields, has certified that Expansion Electronic electrostatic filters are able to remove from the air the airborne bacteria, yeasts and molds with a level of efficiency that goes from 98% to 99%.

From the results obtained in tests with the application of HTNS it's possible to signal the following advantages compared to traditional filters in extended surface (pockets, cells or boxes of glass fibers, synthetic or celluloses):

1. Higher efficiency of electrostatic filtration unit (comparable to H11 -H13 according to DIN EN 1882);

2. As a result of (1): the cleaning of the air ducts (the respect of the norm VDI 6022 is sure, Sheet 1 (7/98) which considers 10 g / m² of dust thickness);

3. Using pocket filters and bag ones there is a possible formation and release of toxic microbial products from decomposition such as endotoxins, while through the use of HTNS in electrostatic filters this is not to be expected, but in a negligible amount; this according to the results of the tests performed;

4. The reduction of electrostatic cell depends substantially on the diameter of the particles and by their ability to receive the electric charge. Since the size of the particles of *Legionella* and the *M. luteus* are in the same order of dimension, it is concluded that the removal of Legionella by the filter cell of HTNS as high as the Micrococcus luteus;

5. Minimum and almost constant pressure drops;

6. It musts be expected for lower maintenance costs due to the multiple regenerability of electrostatic cells.

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ILH Berlin
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Institut für Lufthygiene

(Dr.-Ing. M. Möritz)

(Dr.-Ing. H. Peters)

## REPORT MEDICAL CENTER OF PADUA

Here below is shown a real case study made in the **Medical Center of Padua**, with an evaluation of the classification of the air renewal system of the premises.

Report Medical Center Padova

Ref.: **RPT-MC-PD-**

OBJECT: Evaluation report of the classification of the air renewal system of the premises.

The measurements were carried out in the premises of the Medical Center of Padua in order to verify the classification according to ISO 14644-1 standards.

The data of the measurements of the particles in the air are obtained by means of a particle counter with laser sensor that allows detection for DOE (Equivalent Optical Diameter) with a range of 0.3µm to 20µm.

The average values measured for the 2 rooms examined were the following:

| Room | Description | Average values measured Particles/m3 Ø0.5µm |
|---|---|---|
| 1 | Operating room | 1'980 |
| 2 | S n°7 | 1'626'699 |

**TABLE 1- Air Classifications(a)** (Ref.: Food and Drug Administration)

| Clean Area Classification (0.5 µm particles/ft³) | ISO Designation (b) | > 0.5 µm particles/m³ | Microbiological Active Air Action Levels(c) (cfu/m³) | Microbiological Settling Plates Action Levels(c,d) (diam. 90mm; cfu/4 hours) |
|---|---|---|---|---|
| 100 | 5 | 3,520 | 1e | 1e |
| 1000 | 6 | 35,200 | 7 | 3 |
| 10,000 | 7 | 352,000 | 10 | 5 |
| 100,000 | 8 | 3,520,000 | 100 | 50 |

**a-** All classifications based on data measured in the vicinity of exposed materials/articles during periods of activity.
**b-** ISO 14644-1 designations provide uniform particle concentration values for cleanrooms in multiple industries. An ISO 5 particle concentration is equal to Class 100 and approximately equals EU Grade A.
**c-** Values represent recommended levels of environmental quality. You may find it appropriate to establish alternate microbiological action levels due to the nature of the operation or method of analysis.
**d-** The additional use of settling plates is optional.

The characteristics of the premises served by the systems and the project data are indicated in the tables below:

| Room | Description | Classification* AT REST | Relative pressure | Temperature [°C] | UR [%] | Recirculation | Ventilation scheme |
|---|---|---|---|---|---|---|---|
| 1 | Operating room | ISO 5 | + | nd | nd | nd | 100% external air |
| 2 | Room n°7 | ISO 8 | + | nd | nd | nd | 100% external air |

* Table 1 shows the classification of the air according to the FDAs that were used in the evaluation of the plant performance in the AT REST state.
**nd** indicates the data as unavailable

As you can see, by combining Electrostatic filters and absolute filters, the result is ISO 8 classification of the system AT REST.

## SOME DATA

**90%** of all city dwellers breathe in polluted air every day.
*Source: WHO*

**7 mill.** deaths are caused by air pollution each year.
*Source: WHO*

**1.48 trill.**
Euro is lost annually in Europe due to polluted air.
*Source: WHO*

**4 mill.** cases of infection during hospitalization due to an incorrect sanitization of the aeraulic channels in EU.
*Source: WHO*

**+150 bill.**
dollars world costs of medical malpractice.
*Source: Forbes*

## MAIN CERTIFICATIONS

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INSTITUT FÜR LUFTHYGIENE

BSRIA

CETIAT
ensemble, innover et valider

Consiglio Nazionale delle Ricerche

CTI ENERGIA AMBIENTE

SP Science Partner

POLITECNICO DI TORINO

IRAM
Instituto Argentino de Normalización y Certificación

CE

ISO 16890

gf gratiche-fantinato.it

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