Sanosil disinfectant for air washers / air humidifiers





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Be moderate, exercise, breath clean air and cure your illness by fasting instead of taking medicine if you want to be strong, healthy and young.

Hippocrates





Air washers or air humidifiers are widely used in many workshops in the paper, printing and textile industries, among others. They are used either to ensure a consistent level of relative humidity in the rooms – a requirement of some manufacturing processes – or to reduce the amount of dust in the air in production halls. Air-conditioning systems that are rarely or insufficiently cleaned may cause acute respiratory diseases and, under circumstances, permanent health damage because of the explosive spreading of pathogenic microorganisms into a room. Since 1960, symptoms of diseases have been described that occurred in "sick buildings." The appearance of diseases associated with the "sick building syndrome" is steadily increasing, and their common symptoms include headache, nausea, respiratory infections, dizziness, irritation of the conjunctiva as well as fatigue.

How do air humidifiers or air washers contaminated by microbes harm your health?

Water in air-humidification or air-washing systems may get colonized by a wide variety of microorganisms (bacteria, fungi, amoebae) that originate in the compartment or come from external air. For microorganisms, the conditions in such equipment are optimum with respect to temperature, humidity and nutrients (e.g. paper dust in printing facilities). Therefore, the microorganisms can multiply very quickly (mainly in standing water) and



Bacteria in biofilm

contaminate further parts of the system within a short time. By mechanical vaporization of the contaminated water, an aerosol is formed that contains a large quantity of pathogens, which, in this form, gain access to the lungs. Following this process, the aerosol spreads out very quickly into all rooms. The microorganisms themselves or their bacterial toxins (endotoxins) set free during the decomposition of gramnegative bacteria can cause various diseases through inhalation. Here are some examples:

• Humidifier fever

Main symptoms of humidifier fever include a high temperature, shivering, irritation in the throat, dyspnoea but also very often common complaints such as a headache, fatigue and muscle pain. Typically, these complaints occur at the beginning of the week (Monday fever), 4 - 8 hours after starting to work. Outside the contaminated rooms, an improvement can be experienced within 12 - 24 hours. Long-term effects of a single case of humidifier fever develop only rarely.

• Humidifier lung (exogenic allergic alveolitis),

This grave illness can be described as an allergic reaction in the area of the pulmonary alveoli to microbial antigens (mainly aspergillis, thermophilic actinomycetin, micropolyspora faeni, or pullularia). It manifests itself partly in the same way as humidifier fever; distinctive symptoms are shortness of breath, coughing, depression and sputum. Medical diagnosis can show a restriction of the lung functions and an increasing number of white blood cells as well as opacity over the lung in a thorax X-ray. Because of the slow course of the illness, it cannot be easily recognized at first. A complete recovery, i.e. normalization of lung functions, cannot be expected even after medical treatment or cessation from exposure to contaminated air. Alternatively, such allergic reactions manifest themselves as asthmatic attacks.



Pneumonia Pulmonary lobe on the right side

• Legionella infection

The primary route of Legionella infection in humans is inhalation of aerosolized bacteria. Therefore, showers, faucets, taps, evaporative condensers, air conditioners, whirlpools, and other aerosolizing devices are of paramount concern. Once in the lung, the Legionella are attacked by macrophages (the body's own leukocyte protection cells). However, protecting themselves with a mucous film, the Legionella avoid being digested by the macrophages and even reproduce within them. Reproduction continues until the macrophages burst, releasing hundreds of new Legionella bacteria. This leads to a heavy, maybe deathly infection



Types of air humidifiers: Principles of operation

(Source SUVA Pro)



Evaporator (small risk)

Evaporators

A rotating wheel or a mat is constantly humidified in a water bath, and air passing through the wheel or mat is humidified. Microorganisms can develop on the surfaces and in the water, but the aerosol formed is barely contaminated. This is why only very few microorganisms* can get into the air. However, a displeasing odor can result.

* (Exception: In case of stationary evaporator mats, as shown in the picture, mold fungi very often develop and the air can be contaminated by allergenic mold spores.)



Vaporizers

Water is heated by means of a heating coil and then enters the room in the form of water vapor. The high temperature of the heated water inhibits the growth of microorganisms; however, the energy consumption needed for evaporation and decalcification of the water on a continuous basis is high. A further disadvantage of this system is that mold can develop on all surfaces and steam condenses on it.



6°.0';

Atomizer (high degree of risk)

Atomizers

A rotor generates water droplets that are atomized into room air by making use of the available waste heat. A part of the atomized water combines with dust and dirt particles and falls back into the storage tank. Optimum conditions for the survival of microorganisms exist there, so they can possibly multiply explosively. If this contaminated water is atomized again, a large quantity of the microorganisms is blown into the air. This type of equipment is used preferably in combination with other ventilation systems in order to rehumidify the air that was previously cooled (and thereby had become relatively dry) to a comfortable water content. The memorable/infamous Legionella infection (with over 20 victims) at the American Legion Convention in Philadelphia, where its name comes from, was caused by an airconditioning system contaminated in just this way.



Air washer (very high degree of risk)

Air washers

Circulating water is sprayed into an air duct by means of fine nozzles. Then the larger water droplets are trapped by means of a separator and carried into a storage tank. This kind of equipment is installed not only in airconditioning systems but mainly also where the air is highly contaminated by dust. The main purpose is not only to humidify the air but also to clean the air from dust and dirt pollution. The washing water is highly contaminated with organic matter and, therefore, the risk of renewed contamination is much higher than in the above-mentioned atomizer type.



Solutions

The goal -the prevention of disease- can be achieved by keeping the growth of germs in the waterbearing parts of the equipment very low.

Water analysis

The water quality in all water-bearing parts of air-conditioning systems should be checked regularly. The results may be a cue for possible further action or may confirm the effectiveness of a measure taken previously.



Sanosil Minilab

Testkit vs Legionella

Number of pathogens/ml of water or m ³ of air	0-500	500-1000	1000-5000	5000-10,000	10,000+
Recommended measures	No action		Research into ca air analysis, first countermea	auses, asures	Immediate reconstruction of the air- conditioning system

Important: Limit concerning Legionella – 1 CFU/ml water

Disinfectants and ultraviolet lamps in the process water of air-conditioning systems

It seems obvious that it would be desirable to protect all water-bearing parts of an air-conditioning system against microbial contamination simply by using disinfectants and/or ultraviolet lamps. As a matter of fact, these are extremely suitable measures, although with some restrictions:

Many commercial disinfectants (e.g. chlorine bleach) are suitable only for shock-type disinfection and are not designed for continuous/maintenance disinfection. Otherwise they would get into the compartment air and then cause irritation of the mucous membrane and eyes. Furthermore, very few disinfection methods have a long-lasting effect and therefore it is impossible to carry out a precise dosage for the continuous treatment of water.







Ultraviolet irradiation of process water in air-conditioning systems effectively inhibits the growth of microorganisms but only if clean water is available (turbidity < 30 NTU).

Even slightly turbid water caused by suspended particles can remarkably decrease the effectiveness of ultraviolet lamps.



Sanosil disinfectants: Product description

Sanosil disinfectants are highly effective, universally applicable, have a wide spectrum of action and are based on hydrogen peroxide and silver. By combining the effects of these components, they are ideally suited to water disinfection because, in contrast to most other biocides, they: first, have the power to penetrate biofilm; second, have a long-lasting effect; and third, practically 100% of the disinfectant decomposes into water and oxygen.

Sanosil Disinfectants – Working Principle

The active substance used is hydrogen peroxide, an environment friendly substance. In a complex manufacturing procedure, the active substance is stabilized and

boosted with silver, thus achieving a greatly improved effectiveness against microorganisms. The traces of silver efficiently inhibit a renewed contamination.

The elemental oxygen (O2) separated by the hydrogen peroxide attacks the cell walls of the micro-organisms directly. 1. The chemical reaction between the oxygen and the cell wall molecules will cause these to be denatured and destroyed. This effect is intensified by the silver ions which form a bond with the disulfide bridge of certain proteins of micro-organisms, thereby inactivating or precipitating these proteins. **2**.





Product varieties

Sanosil disinfectants for water treatment are available in different concentrations and, depending on the particular application concentration, their effectiveness is practically identical.

Product	- Concentration - Product type	Handling requirements	 H₂O₂ content Transport classification Warning symbols
Sanosil Super 25 Highly concentrated disinfectant	100% solution	To be handled by profes- sional staff only	Contains 50% H ₂ O ₂ Hazardous good, UN2014 C, O
Sanosil S015 Concentrated disinfectant	15% solution	May be handled by inexperi- enced staff after adequate training	Contains 7.5% H ₂ O ₂ Not a hazardous good Xi
Sanosil S006 W Disinfectant	6% solution	May be handled by inexperi- enced staff after adequate training	Contains 3% H2O2 Not a hazardous good

Application of Sanosil disinfectants:

1: Cleaning & shock disinfection

As soon as the water analysis indicates a critical hygiene level, the whole system should be cleaned mechanically (high-pressure cleaner [be sure to wear P3 respirator] and then disinfected. First, discharge the contaminated water. Then, spray the clean surfaces (empty basin, condensate separator, etc.) with a 3% Sanosil Super 25 solution or a 20% Sanosil S015 solution. Disinfect the pumps, pipes and nozzles by filling the storage tank with clean water. Then mix approx. 1000 ml Sanosil Super 25 or 6600 ml S015 per m³ water and turn on the atomiser and circulating pump (do not switch on the ventilator fan). All watercarrying parts should come into contact with the disinfectant solution. After an application time of 8-12 hours (ideally overnight) the disinfection solution can be drained (the solution can simply be disposed of via normal drainage systems; neutralisation and rinsing are not necessary). The cleaned and disinfected system is then ready for operation.



Ventilation and air-conditioning filter/screen shortly after adding Sanosil The detached biofilm is clearly visible



Strong occurrence of biofilm

Here all surfaces were sprayed with a 20% S015 solution prior to mechanical cleaning to reduce the biological risk for cleaning staff. After cleaning, the water was disinfected for a second time and subject to shock disinfection.





2: Continuous disinfection / Subsequent treatment

This involves continuously mixing a small amount of Sanosil into the fresh water in a clean system. The dosage depends on several factors, including water temperature, organic load, quantity of fresh water, etc. Continuous disinfection can greatly improve the ventilation and airconditioning cleaning cycle and keep it within hygienic levels.

Typical dosages are as follows:

Super $25 = 10-30 \text{ ml/m}^3$;

 $S015 = 60-200 \text{ ml/m}^3;$

 $S006W = 120-450 \text{ ml/m}^3$.



While the exact dosage for Super 25 and S015 can only be applied with a dosage pump, S006 W can be used with a Dosatron D3 RE 3000 proportional dosage device.

Manufacturer



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Use biocides safely. Always read the label and product information before use. Our operating instructions, both oral and written, are based on extensive tests. Our advice is given to the best of our existing knowledge but is not binding insofar as the application and the storage conditions lie beyond our direct control. The description of the products and details of the properties of the compounds do not subsume any liability for damage.