



Many well-known companies and institutes already use dry fog disinfection to minimize production downtimes while achieving maximum efficiency in reducing germs.

Speed and efficiency for pharmaceutical cleanrooms

Reliable disinfection with dry fog



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Various methods are used today for surface disinfection, with varying degrees of success and associated costs. These methods include wiping disinfection, spray disinfection, thermal processes and UV light. Cold sterilization systems use either wet mist or dry fog. The DryFog system manufactured by Minntech, in combination with a biocide on the basis of hydrogen peroxide and acetic acid, is an effective alternative.

What is dry fog?

Dry fog is an aerosol made up of particles smaller than $10\ \mu\text{m}$ (also known as ultra-fine atomization). Aerosol particles generated with the

dry fog machine have a size of ca. $7.5\ \mu\text{m}$. What are the advantages of this? Due to the low weight, dry fog is distributed more effectively than wet mist, resulting in improved surface contact. Even hard-to-reach surfaces are decontaminated. The small droplet size minimizes condensation, so that equipment does not have to be covered or moved. Due to the physical properties of the aerosol particles, they do not collapse upon collision with an obstacle or bond with other aerosol particles, which virtually eliminates condensation.

One system – many possibilities

A compressed air or nitrogen connection that delivers approx. 5 bar is the only technical prerequisite for operating the DryFog system. The ventilation has to be switched off during the fogging phase. If the air supply cannot be regulated from outside, a remote control option is available. Depending on how airtight the room is, it may be necessary to seal the doors with tape. The large Dry Fog system can disinfect spaces up to 1,000 m³. It is also possible to disinfect several inter-connected rooms. A further component is the water used in the process: either WFI or deionized water, depending on local requirements. An important benefit of the system is its economy. Only 1.5 ml of Minncare concentrate is needed per cubic meter of space to be disinfected. The water quantity to be added depends on the relative humidity and the temperature. As compared with conventional methods, such as wiping disinfection, the DryFog system achieves substantial savings through low material costs. It is also possible to disinfect the ceiling plenum, by simply calculating the additional space and removing a few ceiling panels. A further option is disinfection of the cleanroom ventilation system, which requires a special procedure. Switching the ventilation off and on at intervals ensures distribution of the fog throughout the entire system. Special software included with the

DryFog system calculates the ideal ratio of water and Minncare solution. Entering only a few parameters, such as the room volume, initial relative humidity and temperature, produces optimum results.

Under ideal conditions, fogging can reduce germs by six orders of magnitude ("log⁶"). Virus, bacteria and spores do not have a chance.

Factors affecting efficiency include the size of the droplets, the relative humidity in the room, the size of the room and the position of the machine in the room. The initial relative humidity should be below 60% and should not exceed 80% during the fogging process. Ideal sporicidal activity takes place between 70% and 80%.

An alternative to the DryFog system is Mini DryFog, which is suitable for small rooms, disinfection chambers, insulators, material locks, etc. The Mini DryFog system operates best in rooms with a volume of 1 m³ to 20 m³.

An alternative to formaldehyde

A direct comparison with the commonly used method of formaldehyde fogging demonstrates the many advantages of the DryFog system. Formaldehyde fogging can result in production downtimes of one to two days; with the use of DryFog, the downtime is only two to five hours, depending on the size of the room and the air recirculation. Also, a comparison study has

shown that the corrosive effect of the Minncare system is much lower than that of formaldehyde. In fact, the DryFog system itself is not prone to corrosion, since it is made primarily of stainless steel. To prevent corrosion, cleaners and disinfectants containing chlorine should not be used, since chlorine can react with the peracetic acid in the Minncare solution.

The Minncare system features further advantages over formaldehyde, since it presents no health risk to people and it already complies with future bans on formaldehyde.

Residue? What residue?

What residue can remain after fogging? Let us consider the individual components of Minncare: hydrogen peroxide and peracetic acid, in addition to water. Minncare is biodegradable; after fogging, all that remains is water, oxygen and acetic acid. Under unfavorable conditions, a maximum of <0.00002 ml of acetic acid per m² could remain, but this would be very difficult to detect. Under normal conditions, the residue is considerably lower. A pump, e.g. from Dräger, equipped with capillary tubes for hydrogen peroxide and acetic acid, is suitable for measuring the residue after fogging. It is also worthy of mention that no toxic or aldehyde-containing vapours remain in the room. The DryFog system features very simple and solid

construction to ensure maximum flexibility while eliminating malfunctions. Comparable systems with extended technical features are accordingly more prone to breakdowns and therefore also entail higher maintenance costs. Not to mention the substantially higher purchase price.

Brief description of the process

The DryFog system is very easy to operate. Simply place the machine in the room and connect it to the compressed air supply. Switch off the ventilation. Then start a test run with water to make sure the machine is functioning properly. You can calculate the required quantity of water and Minncare concentration with the included software. Now the fogging process can begin; it lasts 15 to 20 minutes

depending on the size of the room. This is followed by the contact time or exposure time, which is one hour. Then you switch on the ventilation. The ventilation time is generally 30 to 120 minutes, depending on how long it takes to replace the air. Therefore, the total process time including ventilation is 2 to 5 hours. The estimated process time is a clear argument for use of the system; the personnel requirements are also much lower as compared with formaldehyde fogging. Also, the non-toxic properties of the system eliminate the need for special training of personnel.

