Fogging for the disinfection of food and Dairy processing areas to increase shelf-life and avoid cross contamination to the products.......

BY applying pressurized air, the disinfecting solution is released as small particles 10-20μm, forming a fog-like air suspension which behaves as a gas and reaches all areas within the room.

Airborne count in food production areas can vary widely. A survey of 39 factories showed a range of mean airborne counts of 1500±10000 cfu/m3. Organism count ranging from 100 to 53,000/m3 in three meat-processing factories at different stages of production. Similar values (1 to 15000 cfu/m3) were measured in a rice mill. Generally, airborne count of a few hundred per m3 is found in high-care food production environments, although count must be continually reducing as manufacturers aim to further improve hygiene and extend the shelf-life of the food. Essentially, Aerial disinfection is the process of disinfecting the air for a period of time. It has been found that the air quality degraded after cleaning activity at the process hall due to water, detergent & soil aerosol generated during cleaning. Aerial disinfection of process food, packaging rooms, and surfaces is must to do for critical contamination areas in industries, allowing potentially harmful (pathogenic) microorganism control in non-accessible areas.

Following are the prerequisite of the aerial disinfectant-

1. Disinfectants-leaving no residue & rinse-free- and

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2. Spray/fogging equipment.

Most of the industries are not aware of the correct process of aerial disinfectant and they have been still continuing with formaldehyde OR KMnO4. Food industries have large process halls, so they need special equipment, non-toxic and food-grade, highly effective disinfectant which can cover maximum volume of the hall in minimum time.

**Four directional nozzles** & portable fogging equipment is the right option for disseminating disinfectants. Aerial disinfection is complementary or alternative to traditional disinfecting methods and is based on application of a disinfectant solution using spray or fogging equipment. After proper cleaning of process equipment, walls, floor, drains and chopping tables, etc, aerial disinfectant solution is released by applying pressurized air, microdroplets of 10-20µm form a fog-like air suspension and reaches all areas within the room. Height of the room is very critical before choosing the right fogger equipment. The mist projectile should reach to the height point of the room to achieve maximum efficacy of the process. While these fine droplets in the form of mist travel from the equipment nozzles and falling down due to gravity, come in contact with the microbes present in the air. Hence, the efficacy of aerial disinfectant process will depend on

- Strength of The disinfectant solution
- Aerial contamination before fogging/fumigation of disinfectant.
- How much time the disinfectant was fogged and fumigated in the area.
- Settling time post fumigation.
- Height achieved by the mist.
- Mist size
- Ventilation of the area during and settling fogging.
- Cleaning process before fumigation and detergent used to clean the room.
- Quality of Water used in the fumigation process

**How long should we fog a room for the best result-** 10min / 20min / 30min / 60min?

![Graph showing time of fogging with PAA](Image)

Higher the volume of the room, more is the time required to get better results. If you do fogging more frequently, lesser time will be required. However, it all depends on the level of contamination and volume of the room.

**Size of mist/droplet size**-

The smallest droplets (5 µm) disperse well and produce a uniform coverage in the room. However, many of them remain airborne for several hours and require more settling time. The 15µm droplets produce a fairly uniform coverage and remain airborne for around 45 min, although this depends on the airflow in the room (such as ventilation systems, although these would normally be inoperative during fogging). The large 35 µm droplets do not disperse
well, tending to deposit on to the floor close to the nozzle. It has been noticed that a particle diameter of **15 µm** is ideal for fogging as it leads to good dispersion, provided sufficient nozzles (at least four nozzles) are used and application and settling times of **45 min could be used**

**Sanitizer- Strong sanitizer is needed to get the best results to post fogging.**

We recommend PAA based sanitizer. Since the early 1900s, chlorine has been used as a water disinfector. It was favored by water and wastewater industries for disinfection until several harmful disinfection by-products were discovered in chlorinated water. Studies were done to find and eliminate disinfection by-product precursors and look for an alternative disinfectant, which turned out to be peracetic acid or PAA. Peracetic acid is a chemical product belonging to peroxide compounds such as hydrogen peroxide.

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**Reduction of spores of B. cereus strain DSM-4312 (presented as – log10 [(N0/N1)] treated by different concentrations of PES 15/23 at three temperatures, with or without protein load and up to 60 min exposure time**

<table>
<thead>
<tr>
<th>T (°C)</th>
<th>P (µm)</th>
<th>0.25</th>
<th>0.5</th>
<th>1.0</th>
<th>1.5</th>
<th>2.0</th>
</tr>
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<tbody>
<tr>
<td>10</td>
<td>5</td>
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<td>0.16</td>
<td>0.16</td>
<td>0.87</td>
<td>0.64</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>0.20</td>
<td>0.18</td>
<td>0.18</td>
<td>0.89</td>
<td>0.66</td>
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<tr>
<td>30</td>
<td>5</td>
<td>0.22</td>
<td>0.19</td>
<td>0.19</td>
<td>0.92</td>
<td>0.69</td>
</tr>
</tbody>
</table>

**Cost of Aerial disinfectant-**

Cost of aerial disinfectant is almost nil compare to the benefits can be achieved. Some of the benefits are-

1. Enhancement of the Shelf life of the product
2. Reduced rejection
3. Odor control.

However, **actual cost of fumigation** is as follows-

1. Fumigation machine- around INR 65,000-75,000 ($100), One time investment.
2. Chemical cost per 3000 m³ volume is around INR 120 ($1.5) only

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Source: Elsevier Food control: Effectiveness of PAA against Spores of Bacillus cereus.

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Ecocare offers an innovative Fogging/Aerial disinfection and complete hygiene program for preventing environmental contamination and cross-contamination in Beverage industries. EcoCare’s sanitization program has been tested and validated by various industries. It has proved successful in reducing room and surface contamination in the presence of edibles, minimizing logistic inconvenience contrary to traditional disinfection methods.

**Recommended sanitizer- CALGONIT STERISID FORTE 15 (NSF approved)** is a very powerful, non foaming disinfectant based on a stabilized equilibrium mixture of peracetic acid, acetic acid, hydrogen peroxide and water. It is suitable for use in CIP, soak or fogging applications in the brewery, dairy, food and allied industries. It has a rapid and powerful killing effect, even when cold, on bacteria, (Including spores), moulds, yeast, fungi and viruses. It breaks down, after it has acted, to harmless end products. Although it is more tolerant of organic matter than most other disinfectants, surfaces to be disinfected should be previously cleaned and rinsed to avoid any loss in efficacy.