



OZONE TECHNOLOGIES & SYSTEMS INDIA PVT. LTD

- POWER PLANTS • PAPER & PULP • COOLING TOWERS • STP
- SWIMMING POOLS • FOOD PROCESSING • POTABLE/PACKAGED WATER

PIONEERS IN OZONE APPLICATIONS IN INDIA

Dreaded Pseudomonas – The Ozone Solution

Pseudomonas is a gram Negative strain, dreaded by both Pharmaceutical companies as well as Hospitals. Gram-negative bacillus of late presents a major clinical significance; Many instances of infections with these organisms have been noted regularly now . Infections include bacteraemia/septicaemia caused by contaminated solutions .Environmental studies have revealed that the organism can survive in chlorine-treated municipal water supplies, often colonizing sink basins and taps, intubation tubes, humidifiers, incubators for new-borns, ice chests and syringes, contaminated medical devices such as blood gas analysers, nebuliser equipment and has become a potential reservoir for infections in the hospital environment

Role of Bio films

The sources of water in most Pharmaceutical Industry /hospitals are from sources outside and unknown to them. Water supplies are under contract to these water suppliers. This water is treated and used for all purposes including advanced treatment process for Pharmaceutical compounding, Water for Injections in Pharmaceutical companies and for all purposes in Hospitals. Pseudomonas can pass through even advanced treatment process and emerge in the final product water. As these ordinary treatment processes continue, there is a formation of bio film in all the water pipes. Conventional Bio films removal process such as CIP with Hydrogen peroxide, per-acetic acid or even steam have not found to be too effective against Bio film removal .These biofilms provide safe haven to most of these opportunistic bacteria and they proliferate when opportunity arises. The locations that has been identified are areas especially where there are increased storage facilities, and in areas where chlorine residuals are removed with SMBS .

Inferences that can be drawn are:

- 1) All of them are Gram Negative
- 2) All of them find their way into water through soil contamination/sewage contamination
- 3) Most of them hide behind bio fouling material to escape disinfectant action
- 4) All pseudomonas and many of the other species are chlorine resistant

Likely ozone actions on these bacteria: Construction of Bacteria

Bacteria are microscopically small single-cell creatures and take up foodstuffs and release metabolic products, and multiply by division. The bacteria body is sealed by a relatively solid cell membrane. Their vital processes are controlled by a complex enzymatic system.

Action of ozone on Bacteria

Ozone interferes with the metabolism of bacterium cells, most likely through inhibiting and blocking the operation of the enzymatic control system. A sufficient amount of ozone breaks through the cell membrane, and this leads to the destruction of the bacteria

Gram Negative Bacteria (pseudomonas) are more susceptible to ozone

Gram negative bacteria are more susceptible to ozone than gram positive organism's. Gram negative organisms, fatty acid alkyl chains and helical lipoproteins are present. In acid-fast bacteria, such as Mycobacterium tuberculosis, one third to one half of the capsule is formed of complex lipids and glycolipids. The high lipid content of the cell walls of these bacteria may explain their sensitivity, and eventual demise, subsequent to ozone exposure. Ozone may also penetrate the cellular envelope, directly affecting cytoplasmic integrity, disrupting any one of numerous levels of its metabolic complexities.

Ozone solutions to Obtain pathogen free water

- 1) Ozone is very effective against gram negative bacteria because of its mode of action
- 2) Ozone is very effective against pseudomonas strain unlike chlorine
- 3) Ozone destroys bio-fouling material on the inner surfaces of the pipes and tanks, hence prevents subsequent proliferation of these bacteria and exposes them to ozone action

Ozone on Bio films:

Biofilms can be classified as 1) Primary films 2) Secondary films

Primary films are the biofilms that have been formed and exist in layers on the surfaces of the tanks and pipes. Secondary films are Bio films that are relatively new and appear in clusters on the surfaces or in the pipes. Ozone can remove exo-polysaccharides in the biofilm matrices and is very effective against biofilms against secondary bio films and can remove them totally with small amounts of residual ozone and lower contact time. Residual ozone of below 0.3 ppm ozone has found to be effective. Regular use of ozonated water will prevent formation of such Bio films

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