SANOSIL

DISINFECTANTS FOR LIFE

MADE IN SWITZERLAND

Sanosil disinfectant for

controlling biofilms

www.sanosil.com

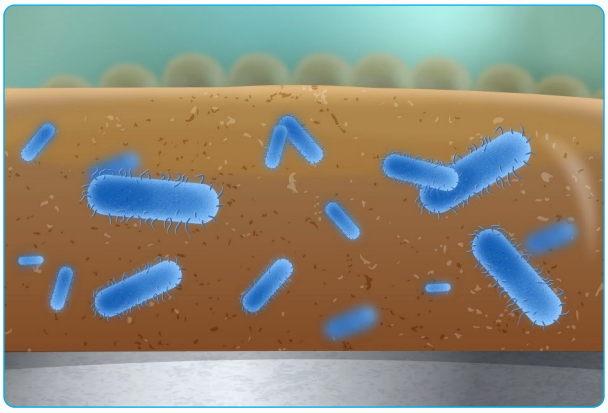
What are biofilms?

Biofilms consist of a mixture of bacteria, fungi, protozoa and/or algae, which live in symbiosis with and off each other.

They can be observed as a slime layer or coating of varying thickness, colour and consistency, and tend to form at transitions between liquid and air, such as in pipes, cooling towers, drains and other water-bearing systems. Biofilms typically consist of mucus substances secreted by the microorganisms, which produce stable gels.

These layers of slime adhere very well to surfaces and allow microorganisms to colonise. As a result, they are not "washed away". Since biofilms have proven themselves over the course of evolution as a foundation of life for microorganisms, they are ubiquitous and colonise water systems after just a short time.

Biofilms: Difficult to control



Microorganisms, contained in a protective mucus matrix.

Biofilms exhibit another special property: they act as a type of protective layer, effectively protecting the microorganisms living inside them from many conventional disinfection methods.

In particular, their **resistance to chlorine, ozone and UV radiation** dramatically increases in proportion to the thickness of the biofilms.

This means that it is exceedingly difficult to remove germs from a water system that is covered with thick biofilms using most common methods.

The longer a system is covered with biofilms, the more resistant it is to biocides.

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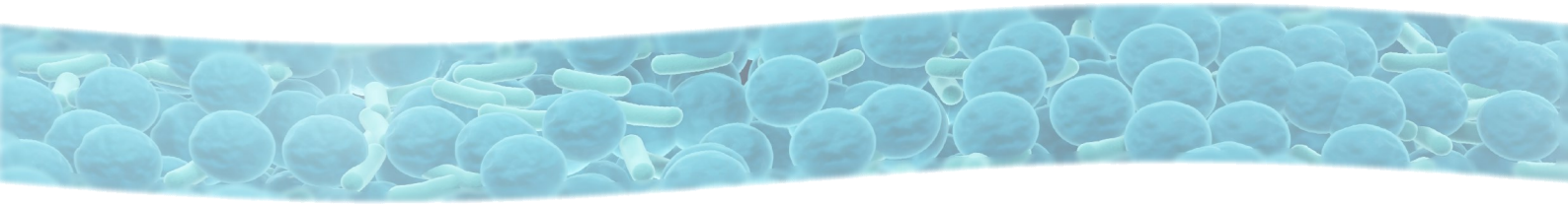
Microbiological problems caused by biofilms

Biofilms can quickly create microbiological problems caused by the overgrowth of a number of different surfaces.

- Typical scenarios where it is necessary to eradicate biofilms include the following:
- Biofilm growth in drinking water installations, pipes, fittings, test benches
- Contamination of cooling systems, in particular evaporative coolers and heat exchangers
- Germ growth in both air conditioning and ventilation systems
- Contamination of industrial washing facilities, e.g. for cars, empty containers and cleaning baths for workpieces, etc.
- Irrigation systems in agriculture



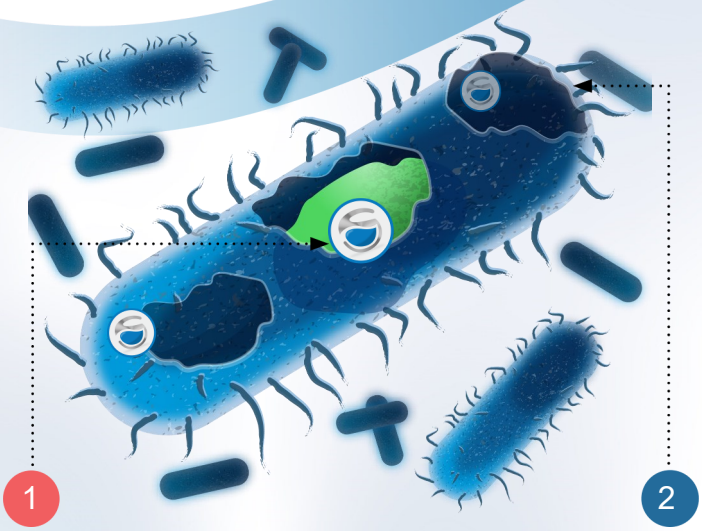
Sanosil disinfectants: A brief introduction

Sanosil disinfectants S015 and Super 25 are disinfectant concentrates for disinfecting water, pipes and tanks. Sanosil C is used to treat cooling towers. Hydrogen peroxide is used as the active ingredient. It is also stabilised and its disinfecting effect is catalytically enhanced several times over by adding a minimal amount of silver ions. This process can increase the disinfection effect by up to 800%.

After application, hydrogen peroxide also completely decomposes into water and oxygen. The minimal amount of silver remaining after the peroxide has broken down inhibits the multiplication of germs and has additional conservation effects in water systems.

The special properties of Sanosil disinfectants make them extraordinarily effective against biofilms and clearly superior to many other products used for this purpose.

Sanosil Super 25



How it works:

1. The oxygen ($^1O_2$/$^{\cdot}O_2$) released by the hydrogen peroxide attacks the cell walls of the microorganisms. The process of oxidation (cold combustion) denatures and destroys them.

2. The effect is supported by silver ions, which enhance the effect of the peroxide in a catalytic process. They also block the germs' metabolism (where applicable) and ability to multiply.

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Sanosil
Disinfectant

for disinfecting water and controlling biofilm

.... Ideal for process water treatment, legionella control, irrigation systems, drinking water installations, water tanks and pipes.

- Effective water disinfection with a long-lasting effect
- Highly effective against biofilms and VBNC bacteria
- Odourless and tasteless in treated water
- Easy and safe application (no hazardous substance)
- No chlorine/chlorine compounds or QAV, bromine or isothiazolinone
- Does not develop AOX / trihalomethanes
- With catalytically enhanced hydrogen peroxide
- The hydrogen peroxide completely (100%) decomposes into water and oxygen
- Shelf life of over 2 years
- High-quality product made in Switzerland

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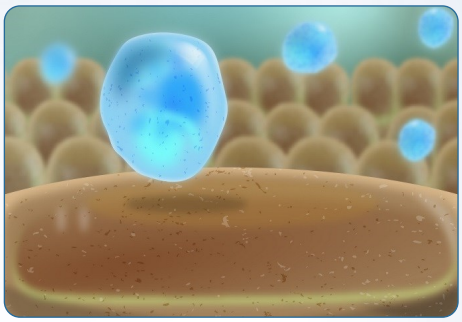
Sanosil disinfectants are effective against biofilms

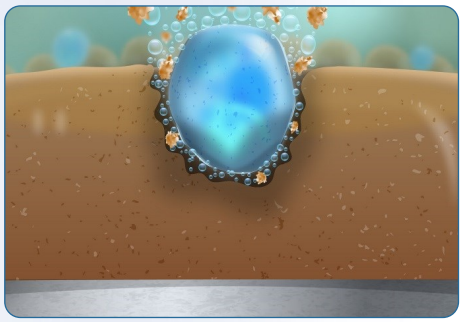
Biofilms have a relatively dense surface. As a result, a number of conventionally used products only have an effect on the surfaces of the biofilm. A large part of their potential "dissipates" with virtually no effect.

Sanosil disinfectants include a special stabilising feature. This delays the breakdown of the hydrogen peroxide, while allowing the active ingredient to penetrate deep into the mucus structures. The bubbles of active oxygen which subsequently form inside the biofilm not only efficiently control the germs they contain, but also increase the volume inside the mucus structures.

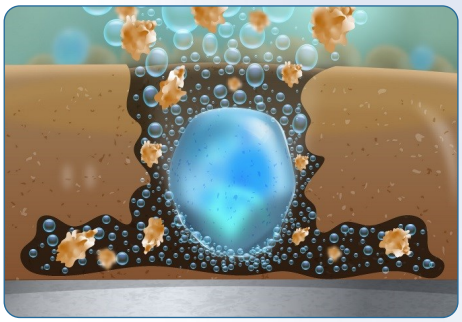
This causes the biofilm layers to burst open and subsequently peel off, which ensures sustainable results.



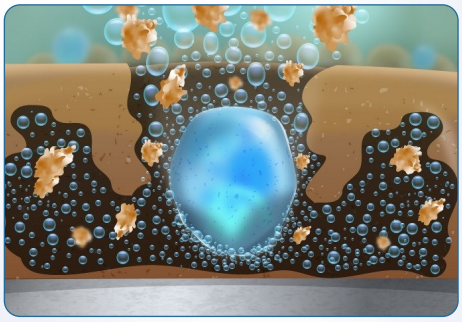
1. Biofilm surface: slime structure protects microorganisms against environmental influences.



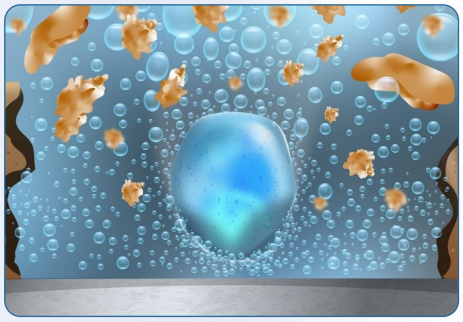
2. Sanosil penetrates the biofilm matrix. Stabilisation prevents premature breakdown.



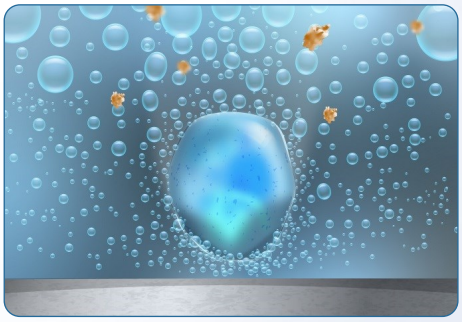
3. The hydrogen peroxide, which is catalytically enhanced by silver ions, produces large amounts of oxidising oxygen (ROS).



4. The oxygen bubbles formed increase the volume.



5. The mucus structures break apart and peel off.



6. Germs that were previously protected now float without any protection in the water and are eliminated through oxidation.

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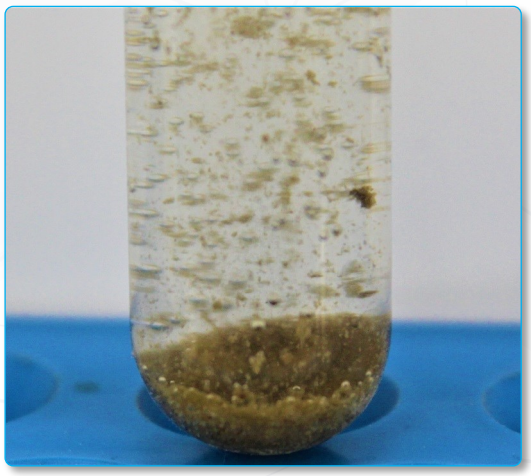
VBNC - effect in biofilms

VBNC = viable but not culturable is the term used to describe the phenomenon whereby microorganisms, such as Pseudomonas, fall into a kind of "shock rigidity" or hibernation on contact with some disinfectants (especially chlorine). They reduce/stop their metabolic activities and cell division for a specific period of time, but are still viable.

If a water sample is taken during this period and incubated on a nutrient medium in the traditional manner, no growth is observed. This produces incorrect results, as it incorrectly assumes that disinfection has been successful.

Sanosil disinfectants have been proven to completely eliminate germs by disintegrating the microbial genome – without VBNC residues.



Biofilm in a test tube after adding Sanosil disinfectant. Clearly visible: oxygen bubbles break down the mucus layer.

Controlling biofilm with Sanosil: **Case study 1**

Problem: Irrigation system (sprinkler) Switzerland. Regular blockage of sprinkler nozzles due to biofilms. Unsuccessful intervention with chlorine shock treatment.

Treatment: Shock disinfection with 1–2 ml of Sanosil Super 25/l of water, exposure time 4 hours. Flush out the coatings.

Result: Large amounts of dislodged deposits can be flushed out. System is free of growth.

Conclusion: The customer repeats the procedure 2 or 3 times per season as necessary. No more problems due to blockages.

Nozzle clogged with biofilm

Flushing out the dislodged biofilm after using Sanosil Super 25

Dislodged bio-films

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Case study 2

Problem: Recirculating cooler at a refinery in Mexico with heavy biofilm growth leading to blockages and reduced cooling capacity.

Treatment: Bromine product is replaced by Sanosil C, 3 months of continuous testing. A non-oxidising biocide is also used from time to time to control heavy algae growth. It is fully compatible with Sanosil.

Result: The heat exchangers no longer exhibit biofilm growth. Cost savings compared to bromine: over 50%. The corrosion rate has significantly decreased with Sanosil. No more toxic AOX were released.

Conclusion: Sanosil C is not only effective and more cost-effective in large-scale plants, it is also much less harmful to materials and the environment than the bromine product that was previously used.

Aéroréfrigérant au démarrage du test

Aéroréfrigérant à la fin du test

Case study 3

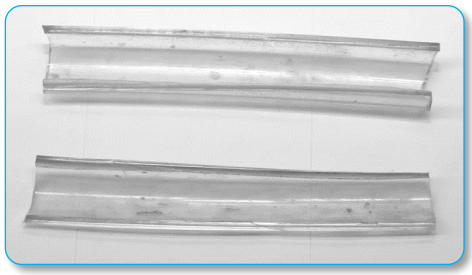
Problem: Biofilm growth in the domestic water system of a houseboat in France. The water has an unpleasant smell. Use of chlorine tablets still proves unsuccessful.

Treatment: Shock disinfection with 6–10 ml of Sanosil S015/l of water. Exposure time: overnight. Thorough flushing of the tanks/pipes.

Result: Slime deposits in the tanks and hoses are significantly reduced, the unpleasant odour has disappeared.

Water tank with biofilm

PVC pipes with biofilm



PVC pipes after the application of Sanosil S015

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E-mail: service@sanosil.com

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