ACTIW WATER Shock Disinfectant for Hot tub, Pool Technology, Filters, Technology

DISINFECTION OF HOT TUBS

Agent: Actiw Water 2000 ppm HOCl
Objective: To remove bacteria, biofilm and disinfect the water system and the surface of the hot tub.

STEP 1: Preparing the hot tub

Switch **off** the filtration and heating system. **Empty** the tub of water if it has already been used. **Clean** the internal surfaces mechanically (sponge, no detergent). **Fill the hot tub with water** to the operating level - so that the jets are covered.

STEP 2: Addition of ACTIW WATER

Dosage for shock disinfection: 2% solution of Actiw Water 2000 ppm = 20 ml/litre of water (i.e. 20 litres of Actiw Water per 1000 litres of water)

Example: If a hot tub has 600 litres of capacity:

600 l × 2% = **12 litres Actiw Water**

*"This dose raises the **ORP value > 850 mV**, effectively eliminating bacteria and biofilm."*

STEP 3: Timing

Allow the solution to circulate (turn on jets, massage system) for a minimum of 30 minutes - ideally up to 1 hour. When finished, switch off the system and allow the water to stand still for an additional 30 minutes (if possible).

STEP 4: Rinsing. Drain all the water from the hot tub.

Fill with fresh water. Run the jets for a few minutes, then rinse again. Let the water out and fill the hot tub with fresh, clean water for use.

STEP 5: Control

Measure ORP and pH after filling with fresh water. target pH: **6.5-7.2** ORP: **650-800** mV (maintain continuous disinfection - a small amount of HOCl 5-10 ppm can be added to the running water)

FINAL REMARKS

Actiw Water (HOCl) in this concentration **does not contain chlorine gas or cause an irritating odour.** It is **safe for acrylic surfaces, PVC pipes and users,** provided it is properly rinsed. Regular disinfection (every 1-2 weeks or after each user group) prevents biofilm formation.

WHAT CAN INCREASE THE DEMAND FOR ACTIWATER (HOCl 2000 ppm)?

Presence of biofilm

Biofilm is a layer of bacteria and organic debris adhering to the walls of pipes, nozzles and tanks. **HOCl first oxidises the biofilm** before it acts on the free bacteria. Therefore, in installations **with a developed biofilm, much of Actiw Water is consumed** before it reaches the required ORP.

=> In such a situation, it is necessary to add an additional amount of product to reach the target level of disinfection.

2. Organic and chemical contaminants

Sweat, sebum, cosmetics, urine, detergent residues - all these substances 'absorb' HOCl. The greater the contamination, **the greater the dose needed for an effective chemical reaction** and achieve an ORP ≥ 800-900 mV.

3. High pH (>7.5)

HOCl loses activity at high pH - instead of effective hypochlorous acid, a less active hypochlorite ion (OCl-) is produced. In this case, **it is either necessary to correct the pH to a level of 6.5-7.2, or use a higher dose of HOCl.**

High volume or complexity of installation

The more branched or extensive the installation, the more surfaces covered by biofilm. In addition, dead zones (e.g. buffer tanks, standpipes) may require more saturation with disinfectant.

% concentration	Quantity per 1,000 l of water	Purpose/Considerations
2%	20 litres	Standard disinfection, light biofilm deposit
3%	30 litres	Presence of biofilm, organic contamination
4%	40 litres	Advanced biofilm, low ORP despite a dose of 2-3%

=> E.g. instead of 12 litres (2%) for a 600 litre hot tub, 18 litres (3%) or even 24 litres (4%) should be used if the ORP does not reach the disinfection level, if the biofilm is pronounced.

RECOMMENDATIONS: monitor ORP after adding HOCl. If it does not reach ≥ 800 mV after 30 minutes, add another 0.5-1% (e.g. 5-10 l per 1000 l).
Do not exceed pH 7.5 - correcting with acid is cheaper than wasting HOCl. With higher HOCl consumption - a technical inspection of the installation is recommended (deposits, dead zones, filters).

Mains water in Poland (and across the EU) typically has a pH of 7.0 to 8.0.

What increases the pH in hot tubs and swimming pools? In an enclosed environment such as a hot tub or swimming pool, pH tends to rise for several reasons:

1. Water aeration. The hot tub has jets that strongly aerate the water → this causes the CO_2 escaping from the water. As CO_2 escapes, the pH increases (a phenomenon known as carbon dioxide outgassing).

2. Organic load (sweat, cosmetics, urine, detergents). Some organic compounds have a as alkaline buffers → they maintain or raise the pH.

3. Addition of unsuitable chemicals. Some disinfectants based on sodium hypochlorite (NaOCl) or calcium ($Ca(ClO)_2$) are strongly alkaline - pH >11. If such agents have been used previously, the pH in the water may have been raised.

4. Poor quality of make-up water. If so-called "hard water" is poured into the hot tub with high calcium and magnesium content, the pH can also rise (carbonate alkalinity).

Practical conclusion: Control the pH in the hot tub, in the pool. Keep the pH between 6.5 and 7.2, especially if you use HOCl (Actiw Water). If necessary, lower the pH with: citric acid,specialised pH regulators (e.g. pH minus).

Why the redox value is so important in disinfection:

Whether a pathogen (viruses, bacteria, fungi) survives in a given environment largely depends on the oxidation level of the environment. Therefore, in order for disinfection to be considered effective, care must be taken to achieve and maintain the correct oxidation - redox - level. ACTIW WATER is the product with the highest oxidation potential on the market, which results in its exceptional efficacy against pathogens in the aquatic environment.

Disinfection efficiency as a function of redox potential (ORP)

< 400 mV
Lack of effective disinfection. Microorganisms survive.

~ 450 mV
Onset of elimination of faecal bacteria, e.g. *E. coli*.

500–550 mV
Removal of *E. coli*, limited effectiveness against other bacteria.

600–650 mV
Effective neutralisation of *Pseudomonas aeruginosa*, some gram-negative bacteria.

650–700 mV
Elimination of *Legionella pneumophila* in biofilm-unprotected water.

700–750 mV
Neutralisation of most viruses (adenoviruses, enteroviruses, noroviruses).

750–800 mV
Comprehensive disinfection: high efficacy against bacteria, viruses and fungi.

> 850 mV
Shock disinfection: effective penetration of biofilm, elimination of latent bacteria

(e.g. *Legionella, Pseudomonas*), complete disinfection of pipes, filters and tanks.

> 900 mV
Use only without people present. Extreme disinfection, rapid destruction of biological structures.

ACTIW WATER is an effective concentrate with a concentration of 2000 ppm of pure HOCL acid for the removal of biofilms from circulating water systems in hot tubs and pool water, where the habitat for bacteria is the pool filters just above their bottom. The inability to fluidise the beds that are used for pool filtration causes ongoing problems with the growth of high levels of bacteriology in water filtration systems. The problem is that bacteria have the greatest scope for growth in pools with increased water temperature, where they are created ideal conditions for development. As a rule, these are mostly hot tubs and leisure pools. If oxidisers cannot reach them directly, biofilm clusters form in the interlocked beds near the bottom, which multiply in millions of units per hour. Therefore, it is important to choose a well-suited filter media technology as well as regular flushing of the filters in such a way that the bed is constantly fluffed up and thus the disinfectant is supplied to the lower parts of the filter mass. An example of a bed with such characteristics, fast and thorough regeneration of the bottom is the ACTIW FILTER. The bed has unique filtration properties.

Due to its specific crystalline structure, it has adsorption capacity and the ability to retain microbial contaminants on its surface. In addition, it has the ability to bind heavy metal cations and ammonium compounds. Reduces radioactive elements.

This characterisation of the deposit allows specific technological effects to be achieved:
- molecular biological sieve: ability to retain micro-organisms such as E.coli bacteria, parasites etc.
- filtration at a level of 2-5 microns (quartz bed 10-30 microns)
- reduced filtration resistance by 30% - reduced energy load on submersible pumps
- reduced backwash regeneration times of up to 50%
- binding capacity of heavy metal cations