

## **Title: Increasing swimmers health and the quality of wastewater by using a triple electro-disinfection system (ECD) as alternative for chlorine: the results in ten Belgian public swimming pools.**

KEY WORDS: Swimmers health, Sustainability, Technological innovation, Indoor air quality, Water quality, Waste water quality, electro-disinfection, ECD, chlorine, water treatment.

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### **Abstract**

It is already widely known that chlorine and its by-products cause health problems among elite swimmers, pool workers and pose a potential danger to babies and young children. High levels of AOX in wastewater are also increasingly considered of concern by many governments.

Alternatives to chlorine have been investigated but show insufficient disinfection capacity for application in public swimming pools, lack proof of efficiency or are very expensive. Moreover, they always involve the use of chemicals (such as hydrogen peroxide) or gases (such as ozone), which are potentially dangerous. Many pool managers therefore resort to higher ventilation and more fresh water to keep chlorine levels low. This, too, is a very expensive solution.

Some filtration and flocking systems have shown good results to reduce chlorine levels. The widespread implementation of these techniques has stalled because of the high cost, legislative restrictions in many countries and the fact that installation is only possible in new constructions or major renovations.

The ECD system was developed with the goal to make safe swimming at low chlorine levels possible for everyone and in every existing pool. This, independent of the filtration system used, the chlorine injection system and the acid correction technique.

The electro-chemical disinfection system (ECD) developed by Prof. Dr. P. Lievens (P.Lievens, J. Van den Bulcke: 2015, 6th Swimming Pool & Spa conference, Amsterdam) shows that swimming can be done safely with less chlorine. Following this study, several pilot projects were started under the supervision of the Belgian-Flemish Health Agency.

A triple electro-chemical disinfection system was installed in different types of public pools: 25m pools, recreational pools and paddling pools. The system is combining electrochemical disinfection, UV and copper disinfection. In all pools it showed a spectacular decrease in chlorine levels and its by-products in air, water and wastewater. The following range of values were recorded: trichloramine in the air 75-144 µg/L, free available chlorine 0,20-0,50 ppm, combined chlorine 0,05-0,26 ppm, chlorate 5-15 mg/L, THM 9-14 µg/L, and in the wastewater AOX < 250µg/L.

Water samples were tested on E.Coli, Ps. Aerogenosus, Pos. Staphylococcus and Total Plate Count 48h. Neither pathogens nor exceedance of plate count limits were detected.

The triple electro-chemical disinfection system, in combination with a low chlorine residual disinfection, proves its safety and efficiency in real life situations without the production or use of gas or chemicals. It has been tested and approved by the Belgian-Flemish government for use in all public swimming pools.