

SAFE WATER DISINFECTION BY AN INNOVATIVE ION EXCHANGE MEMBRANE TECHNOLOGY

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Chlorine gas and sodium hypochlorite are disinfectants commonly used in water treatment plants, whose use requires special transport, storage and injection. It is well-known that their reaction with natural organic matter can produce undesirable disinfection by-products such as trihalomethanes, haloacetic acids and haloacetonitriles [1, 2]. The innovative CW technology developed by Ceram Hyd is able to generate pure hypochlorous acid from brine in situ, which can substitute the use of other chlorine compounds, making the disinfection process faster, safer and more reliable [3]. This free-chemicals technology mitigates the environmental impact, reduce the energy consumption, and avoid the production of chlorine by-products. Ceram Hyd technology is the sole worldwide technology able to produce hypochlorous acid at a high concentration and purity in a very secure and reliable manner.

The current prototype, named CW 1000, is based on a unique proprietary flexible ceramic membrane (CERAPEM) technology developed by Ceram Hyd (Figure 1). This ion exchange membrane is characterized by a high stability, efficiency and permselectivity able to provide highly effective electrolysis to produce hypochlorous acid from brine instead of hypochlorite or chlorine gas. The electrolytic cell consists of CERAPEM membranes and electrodes assembled in a stack, which is employed in electrochemical processes to split streams in the anodic and cathodic chambers. CW 1000 includes the stack, brine recirculation pump and tank, and a self-control system. The full system produces large quantities of pure hypochlorous acid (5.0 kg/day).



Fig 1. CERAPEM membrane (left), electrolytic cell (center) and CW 1000 prototype (right).

The system generates two chemicals, free available chlorine and caustic soda, from a raw material consisting of ordinary table salt and water. These two chemicals are widely used in water facilities, which can be now produced in situ, offering an economic, safe and environmental friendly alternative to conventional methods of active chlorine production from dangerous chlorine gas or sodium hypochlorite, which must be transported, stored at the place of use and prone to rapid storage deterioration. Aqualia and Ceram Hyd collaborate in the CLEANWATER project to demonstrate the feasibility of an innovative technology for water oxidation and disinfection as a cost-competitive, healthy and safe alternative to chlorine use. Thus, FCC Aqualia advances with its compromise to reinforce the technological capabilities and improve the quality of the operation and maintenance services of water facilities.

The technology will be demonstrated at three different water treatment plants operated by FCC Aqualia in Spain. The CW technology will be validated for wastewater regeneration, drinking water disinfection and water pre-oxidation. Actually, the CW prototype is working at the wastewater treatment plant (WWTP) “El Toyo” (Almeria) - 10,000 m³/day. The next steps are the installation of the CW system at the brackish water desalination plant “Racons” (16,200 m³/day) and the drinking water plant located in Galicia region (17,000 m³/day).

El Toyo WWTP produces irrigation water from wastewater collected from the municipality of El Toyo, which treats 3000 - 4000 m³/day during the summer time and 2000 - 2500 m³/day on average during the rest of the year (Figure 2). The WWTP consists of four main stages: pretreatment, biological treatment (activated sludge process), tertiary treatment and water storage.



Fig 2. WWTP El Toyo (left) and CW system installation (right).

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References

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