
Evaluation of Alternative-to-chlorination Disinfection Technologies in the Treatment of the Maltese Potable Water

PSAKIS G. (1), SPITERI D. (2), MALLIA J. (2), VALDRAMIDIS V. (1,3)

1 University of Malta, Msida, Malta

2 Water Services Corporation, Luqa, Malta

3 National and Kapodistrian University of Athens, Athens, Greece

The Mediterranean Island of Malta is one of the most water-stressed countries in the EU and is challenged not only by water quantity concerns but also, by the deterioration of its groundwater quality. Reverse osmosis desalination of seawater provides 60-70% of the Maltese potable water content, with groundwater comprising the remaining percentage. Chlorination has been the adopted method of water disinfection prior to distribution. However, presence of chlorine residuals and chlorination by-products in the distributed tap-water compromises its organoleptic properties and deters the public from consuming it. For the first time in the long history of the Maltese water resource management, project PURILMA (a collaborative project between the Water Services Corporation and the University of Malta) is attempting to optimise the content of disinfection by-products, minerals and natural organics in the treated blended water to generate a product that not only adheres to the EU drinking-water directive but also satisfies the sensory perception of the consumer. With the objective of minimizing the impact of chlorine residual on the quality of the distributed water we attempted assessing the potential of UV-C (254 nm), hydrodynamic cavitation, chlorine dioxide and in-situ chlorination as cost- and energy-effective decontamination alternatives to standard chlorination. All the tested technologies, but hydrodynamic cavitation, achieved a minimum 3 Log₁₀ inactivation of the microbial load, with in situ chlorination and chlorine dioxide appearing more effective in the treatment of reverse osmosis and borehole water, respectively. For feasibility studies, the performance of the technologies was further evaluated on the following areas: a) implementation, b) practicality, c) adaptability, d) integration, e) environment & sustainability, and e) cost & effect. In situ chlorination, emerged as the most promising technology for implementation in pilot study work, followed by UVC and chlorine dioxide.