More than 10 year experience with Pulse-Chlorination dosing regime against macrofouling

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Abstract

Since decades Sodium hypochlorite is the industry standard biocide for controlling biofouling, however, the application involves environmental issues surrounding the discharged residual chlorine (oxidants) and formation of chlorination by-products. Pulse-Chlorination®, a relative new method for chlorine dosing in once through cooling water systems developed by KEMA in 1998, is based on the principle that bivalve biofouling species like oysters, mussels and clams, in general have a recovery period after exposure to a chlorination period, before fully opening their valves and start filtering water. Pulse-Chlorination takes advantage of this recovery time by short successive pulses of chlorine, alternating with periods without chlorine. Using continuous chlorination, bivalves will close for longer periods and switch to an anaerobic metabolism. When dosing intermittently, i.e. for several hours a day, bivalves will only close during the dosing period. During Pulse-Chlorination, bivalves are forced to continuously switch their metabolic mode between aerobic and anaerobic, leading to a rather quick physiological exhaustion. This dosing procedure does not apply chlorine as biocide, but rather as a trigger to force mussels to switch between their metabolic modes, resulting in a rapid effect. Pulse-Chlorination is Best Available Technique under the European terms of the Integrated Pollution Prevention and Control (EU-IPPC) for macrofouling mitigation in once-through seawater systems and is successfully implemented through on-site field tests worldwide such as Europe, Middle East, Asia and Australia (Polman 2002, 2008; MacDonald 2009). The method is universally applicable, but needs to be attuned to local conditions. The overall aim is to ensure an optimal and reliable cooling seawater system and condenser / heat exchanger performance. The backgrounds and main results of Pulse-Chlorination at the E.ON Maasvlakte Power Station will be discussed in the light of improving the protection of the cooling water system from biofouling. The full scale application at E.ON Maasvlakte Power Station between 1998 until to-date, resulted in extremely clean condensers. This was observed at all companies that implemented Pulse-Chlorination since 1998. The overall result is better performance of the cooling water system (K-value) and therefore less maintenance is necessary. This in turn allows longer intervals between planned outages and brings down the running costs on the basis of circa € 50.000 per day spread out over three years rather than two years. Improvements achieved with Pulse-Chlorination are the reduction of the amount and concentration of oxidants discharged to sea in line with (new) stringent regulatory requirements and lower the operational costs of related equipment (e.g., electro-chlorinators).