



Ecological Conditioning and Optimisation of a Once-Through Cooling Water System

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Presented at the Watersymposium 1999, Breda (Netherlands)

ABSTRACT

For the coming decade, Dow Benelux will need antifouling treatment for its cooling water system. Hypochlorite dosing is still considered to be the best available technology (BAT). This is based on proven effectiveness, large experience, moderate costs, opportunities to further optimise the chlorination procedure, and by the fact that in earlier studies low-level chlorination has not proven to have major ecological impact.

In an optimisation study for anti-fouling treatment with elevated hypochlorite regimes at Dow Benelux environmental impact and effectiveness were evaluated. The study was carried out from 1995 to 1998. The environmental impact was evaluated by measuring and comparing the amount of chlorination by-products (CBP's) and the potential toxicity formed. The effectiveness was evaluated by looking at: the incidence of leakage's of heat exchangers tubes caused by mussels, the amount of biological growth (macrofouling attachment) in KEMA Biofouling Monitors[®], and the behaviour of oysters (valve movements) placed in MosselMonitors[®]. Improvements in conditioning regimes were developed, employed and verified.

Results show that it is possible to counteract macro- and microfouling successful, both in the inlet conduits and in water boxes of heat exchangers. The measured CBP's in the outlet increased by 30 to 90% during application of the elevated chlorination level (outlet concentration 0,2 mg/L instead of 0,1 mg/L as Cl₂) however, no significant increase in potential toxicity was found at the outlet. The incoming water quality (i.e. chlorine demand) plays an important role in the overall needed amount of hypochlorite. The final plant operation result was a drastic reduction in condenser tube leakages caused by erosion by mussel shells at the hydrocarbon cracker units. Further reduction in the use of hypochlorite is foreseen by the application of Pulse-Chlorination[®].

Key words: Cooling water, Fouling, Mussels, Antifouling substances, Optimisation, Pulse-Chlorination, Chlorination byproducts (CBPs), Environmental impact, IPPC, Best Available Technique