

Use of biocides in the control of filamentous bulking in activated-sludge

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Filamentous bulking can be controlled by specific and/or non-specific methods. Specific methods intend to recognize and resolve the major causes of filamentous bacterial proliferation and are preferred because they are selective for the target microorganism and cause limited damage to the remaining biomass. In what concerns non-specific methods, chlorination was one of the first methods to be used to control filamentous bulking and is still used, but its action is only temporary and tend to damage floc-forming bacteria, leading to floc and process breakdown [1]. The use of alternative biocides has attracted the attention of wastewater treatment technicians and researchers for the potential of its use in the control of filamentous overgrowth (ability to induce filamentous cell lysis) and is presently one of the most commonly used methods for the control of filamentous bulking under critical conditions [2].

Triclosan, cetyltrimethyl ammonium bromide (CTAB) and glutaraldehyde were used in a series of experiments to test its usefulness in the optimization of the performance of activated-sludge processes, with particular interest in the bulking filamentous overgrowth process. In a first set of assays, the referred biocides were tested in pure cultures of specific filamentous gram positive and gram negative bacteria, *Nocardia amarae* and *Sphaerotilus natans* respectively, through *in vitro* assessment methods: XTT reduction assay and live/dead viability assay (using epifluorescence microscopy and cytometry). For both filamentous bacteria, all the concentrations tested, the toxicity was found to be almost complete and the efficacy of the tested biocides varied between strains. The results showed a dose-dependent effect on bacterial viability, but a different mechanism of action for all biocides. In a second set of assays, the action of these biocides was studied in activated-sludge batch assays to assess the action in the community and in the overall performance of the treatment systems.

Results show potential in the use of these compounds in the cases of critical overgrowth of filamentous bacteria, but their effects on the protozoa and little metazoan as well as in the overall performance of the WWTP are non-negligible. The study also proved that the use of low concentrations of these compounds are not of significant interest.

References

- [1] Caravelli, A., Giannuzzi, L., Zaritzky, N., 2007. Inhibitory effect of a surfactant on pure cultures of a filamentous and a floc forming micro-organism. *Environ Technol* 28, 137–146.
- [2] Guo, J., Peng, Y., Wang, Z., Yuan, Z., Yang, X., Wang, S., 2012. Control filamentous bulking caused by chlorine-resistant Type 021N bacteria through adding a biocide CTAB. *Water Research* 46, 6531–6542.