General conclusion

Among the chemical solutions for disinfecting wastewater that have emerged over the last few decades, performic acid is an adapted solution for wastewater treatment plant outfalls. This book has consolidated the present state of knowledge and moreover provided evidence of its suitability for wastewater disinfection. The purpose here has been threefold: characterize the performance of chemical disinfection by performic acid, define the most suitable implementation conditions (treatment rate, in particular), and ensure environmental protections when implementing this additional treatment step.

To meet these objectives, the Greater Paris Sanitation Authority (SIAAP) and its scientific and industrial partners undertook a two-year research effort on two different scales. On the one hand, tests were carried out at the laboratory scale to define the performance of this disinfection method and, in particular, to identify the links between its effectiveness and implementation conditions. This laboratory scale provided technical and scientific information on the harmlessness of such treatment for the environment, using a large panel of bioassays. On the other hand, trials were conducted at an industrial scale. Disinfection facilities, allowing for the injection of performic acid, were set up at the Seine Valenton wastewater treatment plant (SIAAP, Valenton) in order to assess the performance of this technology in an industrial application while also confirming the lack of impact from the disinfected water on the river.

The effectiveness of performic acid in removing fecal bacteria has been demonstrated. The application of a dose of 1 ppm, corresponding to a $C \times t$ ranging from 10 to 30 ppm.min in the Seine Valenton configuration, made it

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possible to maintain, under all circumstances, fecal bacteria concentrations below the bathing quality thresholds (Directive 2006/7/EC). The introduction of a wide array of biological tools has indeed proven the lack of harmful effects from performic acid within the aquatic environment regarding endocrine disruption (thyroid, estrogenic, androgenic) and so-called general toxicity (effect on the growth of single-cell organisms). The fact that this disinfection method leads to irreversible damage to bacteria, along with its ability to remove some of the other pathogens (sulfate-reducing spores), yields an even broader range of uses.

We are therefore hoping that this book will assist stakeholders and operators in making choices and managing their wastewater flows in light of changes in social expectations and, more broadly, in offering solutions to mitigate water-related challenges through guidance on sustainable use or reuse.

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