

COMPARISON BETWEEN THE MICROBIOTA SESSILE AND PLANKTONIC ASSOCIATED WITH COOLING TOWERS WITH APPLICATION MONOCHLORAMINE AS BIOCIDES

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Resumo:

Cooling tower (CT) systems are used to dispose of excess heat generated in industrial processes, as in oil refineries. CTs provide a unique environment for planktonic microbial growth and biofilm formation, which can lead to decreased efficiency of heat exchangers, besides increasing the risk of occurrence of the microbiologically influenced corrosion. Biofilm cells also show greater resistance to environmental challenges including biocides, than their planktonic counterparts, mainly by polymeric matrix barrier formation. Several studies have reported that monochloramine is effective in controlling both planktonic and sessile microbial populations. Therefore, evaluation of biofilms and planktonic microbiota on CT is necessary for the understanding of corrosion process, evaluation of the efficiency of biocides and optimization of microbial control. In this context, this study aimed to monitor the sessile and planktonic microbial density on two industrial scale-cooling towers (CTA and CTB) of a petroleum refinery in Minas Gerais in order to evaluate the effectiveness of in situ formed monochloramine on the microbiological control. The CTs are responsible for cooling of catalytic treatment units and operate with clarified and chlorinated river freshwater as makeup water. At each sessile microbiota evaluation, three glass slides maintained in the towers water basin for 7 days were dip-rinsed in sterile saline solution (NaCl 0.85%) to remove unattached cells and transferred to the flasks containing sterile saline. The flasks were subjected to ultrasonic bath (3 cycles of 2 minutes at 40Khz) for biofilm removal; and the resulting suspensions were serially diluted and inoculated in plates containing PCA for the quantification of heterotrophic bacteria (THB) (UFC/cm²). In the period of March to April, the sessile BHT density varied from 260 to 6.3 x 10² CFU/cm² on the CTA and 180 to 1.22 x 10³ CFU/cm² in CTB. The Adherence Index (IA) values also were highest on the CTB. In general, the higher planktonic BHT media density was observed for the CTA that presented higher temperature values and lower monochloramine levels. The values in 12 evaluated samples ranged from 2 to 1.7x10⁴ CFU/mL⁻¹; while in the CTB, the values ranged from 2 to 9.6 x10³ CFU/mL⁻¹. The density of planktonic bacteria remained below the microbiological growth control criteria, i.e. less than 10⁴ CFU/mL⁻¹, suggesting that treatment strategies based on monochloramine were effective for microbial control.

Keywords: Cooling Tower, monochloramine, biofilm

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