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Formulate of Guidelines to Prevent Microbial Induced Corrosion

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Summary

When bacteria attach to a metal surface and form a biofilm, the relative abundance of bacteria that cause metal corrosion in the biofilm increases over time, causing metal corrosion. Metal corrosion leads to increased running costs due to a shortened service life, causing economic losses of more than 60 trillion yen worldwide, so corrosion prevention measures are essential for steel materials in contact with seawater. In our previous study, bacterial community analysis was performed on biofilms formed on a corrosion-free metal surface and enrichment culture with a corrosion-free metal piece, and the corrosion-causing bacteria were not identified. Those results showed that the bacterial community changes significantly in biofilms before and after the occurrence of metal corrosion, and metal corrosion occurs by increasing the relative abundance of the corrosion-causing bacteria. In this study, to obtain the knowledge necessary to formulate guidelines to prevent microbial-induced corrosion, we focused on changes in the bacterial community in river-brackish water-marine systems, which is one of the lacking academic knowledge.

After sampling environmental water at six locations in the Inba floodway (Lake Inban-Tokyo Bay), various environmental waters and metal pieces were added to 10% R2A medium, and then cultured statically to form biofilms on the metal pieces. Subsequently, the biofilms were washed using sterilized water, and then analyzed for bacterial communities contained in each biofilm. When analyzing the bacterial community of biofilms prepared using environmental water collected from Tokyo Bay, various bacteria of the genera *Agrobacterium*, *Bacillus*, and *Ralstonia* were identified. By construction, the various bacteria of the genera *Comamonas*, *Caulobacter*, *Pedobacter*, and *Hydrogenophaga* that were identified in other biofilms were not identified. A common feature of these seven bacteria is that those bacteria can form biofilms, although no association with metal corrosion has been suggested. These results suggested that the bacterial species involved in biofilm formation change significantly with changes in water bodies. Based on the findings obtained, a draft guideline was proposed.