

## Study of Biofouling Wastewater Treatment Technology

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**Abstract :** The International Maritime Organization (IMO) recognized the problem of invasive species invasion and adopted the "International Convention for the Control and Management of Ships' Ballast Water and Sediments" in 2004, which came into force on September 8, 2017. In 2011, the IMO approved the "Guidelines for the Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species" to minimize the movement of invasive species by hull-attached organisms and required ships to manage the organisms attached to their hulls. Invasive species enter new environments through ships' ballast water and hull attachment. However, several obstacles to implementing these guidelines have been identified, including a lack of underwater cleaning equipment, regulations on underwater cleaning activities in ports, and difficulty accessing crevices in underwater areas. The shipping industry, which is the party responsible for understanding these guidelines, wants to implement them for fuel cost savings resulting from the removal of organisms attached to the hull, but they anticipate significant difficulties in implementing the guidelines due to the obstacles mentioned above. Robots or people remove the organisms attached to the hull underwater, and the resulting wastewater includes various species of organisms and particles of paint and other pollutants. Currently, there is no technology available to sterilize the organisms in the wastewater or stabilize the heavy metals in the paint particles. In this study, we aim to analyze the characteristics of the wastewater generated from the removal of hull-attached organisms and select the optimal treatment technology. The organisms in the wastewater generated from the removal of the attached organisms meet the biological treatment standard (D-2) using the sterilization technology applied in the ships' ballast water treatment system. The heavy metals and other pollutants in the paint particles generated during removal are treated using stabilization technologies such as thermal decomposition. The wastewater generated is treated using a two-step process: 1) development of sterilization technology through pretreatment filtration equipment and electrolytic sterilization treatment and 2) development of technology for removing particle pollutants such as heavy metals and dissolved inorganic substances. Through this study, we will develop a biological removal technology and an environmentally friendly processing system for the waste generated after removal that meets the requirements of the government and the shipping industry and lays the groundwork for future treatment standards.

**Keywords :** biofouling, ballast water treatment system, filtration, sterilization, wastewater

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