

Spatial distribution of uniform corrosion of S235 steel in the Ghent-Terneuzen canal

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Upon discovery of extensive microbiologically induced corrosion on the hull of a yacht in the marina of Zelzate in 2021, an extensive search was conducted in the neighbouring Ghent-Terneuzen Canal to elucidate the impact of geographical and industrial factors on corrosion rates and their deceleration along the canal.

Coupons (in S235 carbon steel) of 60 x 60 x 3 mm were exposed up to 9 months at 40 different locations along the entire canal, and collected at regular time intervals. Mass loss due to corrosion was measured after a cleaning step in Clarke solution (ASTM G1-03(2017)e1). An asymptotic regression model was used to analyze the corrosion rates across eleven defined zones of the canal. Results indicate a higher stabilization of corrosion rates in the northern half compared to the southern half of the canal, with a faster deceleration rate observed in the northern regions.

These findings underscore the necessity for targeted monitoring and predictive systems to manage corrosion effectively. The model demonstrates that corrosion does not progress uniformly within a singularly interconnected harbour zone. Future research should focus on the detailed investigation of physicochemical aquatic parameters and specific microbial mechanisms contributing to corrosion, as well as the development of more refined protection strategies for marine infrastructure.

Keywords

Corrosion; Canal Ghent-Terneuzen; Port Infrastructure; Maritime Innovation