

Studi Pengaruh Penambahan Silika dengan Metode Dispersi Sonikasi pada Campuran Komposit Epoksi terhadap Ketahanan Korosi Baja Karbon dengan Metode Preparasi Permukaan Power Tool Cleaning dan Abrasive Blast Cleaning = Study of the Effect of Silica Addition Using the Sonic Dispersion Method on Epoxy Composite Mixtures on the Corrosion Resistance of Carbon Steel Using the Power Tool Cleaning and Abrasive Blast Cleaning Surface Preparation Methods

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Abstrak

Baja karbon banyak digunakan dalam industri maritim karena sifat mekaniknya yang baik dan biaya produksinya yang rendah, namun sangat rentan terhadap korosi, terutama di lingkungan laut. Penelitian ini bertujuan untuk mengevaluasi pengaruh penambahan silika pada pelapis komposit epoksi dengan variasi penambahan berat silika (0, 0.3, 0.5, 0.75, 1, 3, dan 5 wt%) serta mengamati ketahanan korosi baja karbon berlapis komposit epoksi yang diterapkan dengan dua metode preparasi permukaan berbeda, yaitu power tool cleaning dan abrasive blast cleaning. Pengujian ketahanan korosi dilakukan dengan uji kabut garam, baja karbon berlapis komposit epoksi dipaparkan pada larutan NaCl 5% selama 72 jam, dengan pengukuran pelebaran korosi setiap 24 jam. Hasil pengujian menunjukkan bahwa variasi penambahan silika dan metode preparasi permukaan yang tepat dapat meningkatkan ketahanan korosi, dengan hasil terbaik pada power tool cleaning adalah penambahan silika 0.75 wt% (1.25 mm), sedangkan pada abrasive blast cleaning adalah penambahan silika 5 wt% (0.55 mm). Pengujian degradasi lapisan menggunakan metode EIS pada sistem tiga elektroda dengan larutan NaCl 3.5% menunjukkan bahwa pada power tool cleaning, plot nyquist tidak membentuk setengah lingkaran sempurna, melainkan hanya menunjukkan tren kenaikan pada frekuensi rendah yang mengindikasikan pelapis epoksi berfungsi baik untuk menahan laju korosi. Sedangkan pada abrasive blast cleaning, plot nyquist menunjukkan adanya kegagalan lapisan yang ditandai dengan terbentuknya double semicircle dan semicircle. Penelitian ini menyimpulkan bahwa penambahan silika dapat meningkatkan ketahanan korosi pada kedua metode preparasi permukaan, dengan performa terbaik pada power tool cleaning pada 0.75 wt% silika dan abrasive blast cleaning pada 5 wt%.

.....Carbon steel is widely used in the maritime industry due to its good mechanical properties and low production costs, but it is highly susceptible to corrosion, especially in marine environments. This study aims to evaluate the effect of silica addition on epoxy composite coatings with varying silica weight percentages (0, 0.3, 0.5, 0.75, 1, 3, and 5 wt%) and to observe the corrosion resistance of carbon steel coated with epoxy composite applied using two different surface preparation methods, namely power tool cleaning and abrasive blast cleaning. Corrosion resistance testing was conducted using a salt spray test, where the carbon steel coated with epoxy composite was exposed to a 5% NaCl solution for 72 hours, with corrosion expansion measurements taken every 24 hours. The test results showed that variations in silica addition and the appropriate surface preparation method could enhance corrosion resistance, with the best results for power tool cleaning achieved at 0.75 wt% silica addition (1.25 mm), while for abrasive blast cleaning, the best results were obtained at 5 wt% silica addition (0.55 mm). Corrosion degradation testing using the EIS method on a three-electrode system with a 3.5% NaCl solution showed that in power tool cleaning, the

Nyquist plot did not form a perfect semicircle but only showed an upward trend at low frequencies, indicating that the epoxy coating effectively inhibits corrosion rates. In contrast, in abrasive blast cleaning, the Nyquist plot showed coating failure, marked by the formation of a double semicircle and a semicircle. This study concluded that the addition of silica can improve corrosion resistance in both surface preparation methods, with the best performance in power tool cleaning at 0.75 wt% silica and in abrasive blast cleaning at 5 wt%.