

Pengaruh durasi curing, temperatur dan salinitas pada proses wet curing terhadap sifat mekanik komposit dan kekuatan bonding komposit-logam = Effect of curing duration, temperature and salinity on on wet curing process to mechanical properties and bonding strength of composite-metal

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Abstrak

Komposit polimer epoksi berpenguat serat gelas (GFRP) merupakan salah satu material yang dewasa ini sangat populer, karena nilai ekonomis dan kehandalan nya. Aplikasi GFRP pada lingkungan bawah air, menyebabkan terjadinya proses wet curing yang dapat mempengaruhi sifat mekanik.

Penelitian ini membahas faktor-faktor yang dapat mempengaruhi kinerja dari material GFRP dan daya rekat komposit tersebut dengan logam, faktor-faktor tersebut diantaranya seperti durasi curing, temperatur dan salinitas. Komposit GFRP dengan dua tipe hardener yaitu poliamin dan siklikamin dimanufaktur dengan menggunakan metode hand lay-up. Spesimen GFRP selanjutnya dengan variasi durasi curing 12, 24 dan 48 jam dimanufaktur pada lingkungan udara, air laut dan air distilat dengan temperatur dan salinitas yang berbeda. Kemudian dilakukan pengujian tarik, tekuk dan impak serta uji kekuatan bonding dan pengamatan SEM.

Dari hasil penelitian yang dilakukan, diperoleh kesimpulan bahwa GFRP dengan hardener poliamin gagal membuat ikatan crosslink pada proses wet curing, sedangkan dengan hardener siklikamin crosslink berhasil terbentuk, nilai karakteristik sifat mekanik pada proses wet curing sedikit menurun dibandingkan dengan proses dry curing, seperti hasil uji tarik menurun sebesar 10% dan uji daya rekat sambungan logam dengan komposit turun sebesar 16%. Pada penelitian selanjutnya dapat dilakukan uji coba dilapangan.

Glass Fiber Reinforced Polymer (GFRP) is very popular among other material due to its economic value and reliability. As an application to subsea pipeline, the main challenge of GFRP is the process of wet curing which is required by epoxy composite to form a strong bonding of cross link in subsea environment and consequently can effect mechanical properties.

This study evaluated the factors that might affect the performance of epoxy composite material and its bonding to metal, i.e. curing duration, temperature, and salinity. GFRP composite with two different types of hardener which are polyamine and cyclic amine were manufactured by hand lay-up method. Then, the specimens were manufactured in atmospheric, sea water, and distillation water with different variables such as 12, 24, and 48 hours curing time; temperature; and salinity. Then, the specimens were tested for their tensile, flexural, impact, and bonding strength. The last, observation of fracture appearance was done by SEM.

Result of the study, concluded that GFRP with polyamine hardener was failed to create cross link on wet curing process while the one with cyclic amine hardener successfully created cross link. However, the mechanical characteristic was a bit lower, such as the tensile strength decreased to 10% and the adhesion strength of the bonding decreased to 16%. For the future, this study can be investigated by field testing.