Evaluation of Plastic and Recycled Plastic Composite Piling in Corrosive Soil

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In the United States millions of piles are used to support residential, commercial, and transportation structures. There are, however, some problems associated with the use of traditional piling. It is now more commonly required to install piles on corrosive and contaminated soils, due to industrialization. The durability of concrete, corrosion of steel, and deterioration of wood are serious hindrances to construction in these environments, particularly where high concentrations of sulfides or chlorides are present. Composite materials such as fiber-reinforced polymers can offer performance advantages when compared to steel, concrete or timber.

The objective of this research was to develop, test, and demonstrate the viability of polymer composite piling in corrosive soils. The research sought to evaluate engineering performance and chemical integrity of different types of plastic piles under corrosive environments and develop engineering guidelines for product design and material performance.

The scope of this research is limited to the laboratory investigation of the accelerated degradation of specimens of Seapile™, which is manufactured by Seaward International. The experimental program is intended as an empirical investigation of the effects of specific environmental variables on the degradation process, in order to estimate the product's service life.

In order to facilitate testing, specimens were exposed to solution with fixed acidic, basic & neutral liquids at elevated temperature. An Arrhenius model was used to quantify the degradation of the specimen & predict the service life of the product.

Arrhenius model estimates were based on results obtained under conditions of intensive stirring of aqueous media, which intensifies the degradation action. There fore, all calculations of strength loss should be considered as a conservative estimate for the degradation rate for in-use condition. Only the acidic environment had a considerable degradation effect on the Seapile™ samples. At this severe acidic environment (pH=2) an estimated 25% loss in resistance at 1% strain, of the coupon specimens extracted from Seapile cores takes place in about 14 years. The half-life (50% loss) is estimated to occur in 33 years. Larger diameters of plastic piles as compared to the 1/2" coupon specimens may result in delay of the degradation process, which may be caused by diffusion.

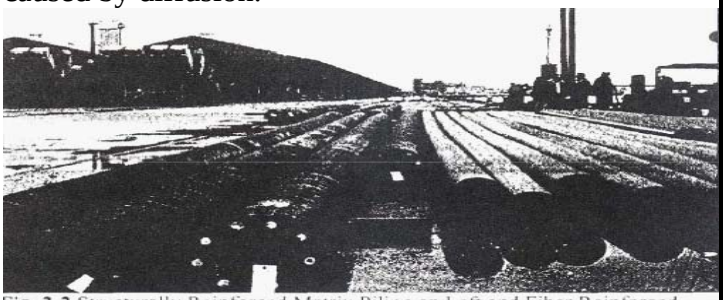

Fig. 2-2 Structurally Reinforced Matrix Piling on Left and Fiber Reinforced Plastic Piling on Right.

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