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A NEW CORROSION MODEL TO PREDICT STEEL STRENGTH

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ABSTRACT

In order to ensure a safe design of a ship's hull, it is necessary to accurately evaluate the capacity of the hull girder considering extreme loads and effect of steel corrosion. The goal of this work is to perform a new model of steel corrosion. This model is based on the approach which was taken from (Shengping Qin and Weicheng, 2002); it used to develop a methodology to predict reduction of thickness of structural elements due to corrosion. The results obtained using the prediction methods were verified against the experimental data. The effect of corrosion to section modulus and section area of cargo deck was investigated, as a function of time and exponential depth of corrosion. However the relationship between weight and ratio of section modulus during 25 year service of a tanker were involved. It has been found that the reduction of the section modulus and the section area of the deck cargo follow polynomial.

Keywords: corrosion, strength analysis, least square method.

INTRODUCTION

Corrosion is an important industrial problem, which is considered as an indirect consequence of many accidents. It is estimated that about 5 tons of steel per second are transformed into iron oxide.

Basically, a model is considered to be a representation of some object, behaviour, or system that one wants to understand. Models are abstract vehicles for learning about the world. With a well-developed model, significant parts of scientific investigation could be carried out the results are verified by experiments.

In the present paper the least squares method has been employed to evaluate the parameters of Weibull distribution. The results are verified against with reference data given in (Offshore Technology Conference, 5 May-8May 2003).

The goal of work is to define the lost depth of steel plate, to assess the section and area modulus of structural element. Many works has been done before (Yao T. *et al*. 2000), however it can be more complicated to evaluate degradation of plate unction time because many parameters infected.

Once validated, corrosion models can support a variety of analyses, such as estimating the required interval between maintenance and repair actions, gauging the effectiveness of various corrosion mitigation approaches, aiding in the selection of materials and coatings, and performing sensitivity analysis regarding the basic assumptions and the initial; boundary conditions used in a corrosion analysis.

RESULTS AND CONCLUSIONS

The results of the proposed model are as illustrated in Figure 1, in comparison with the experimental data and other existing models.

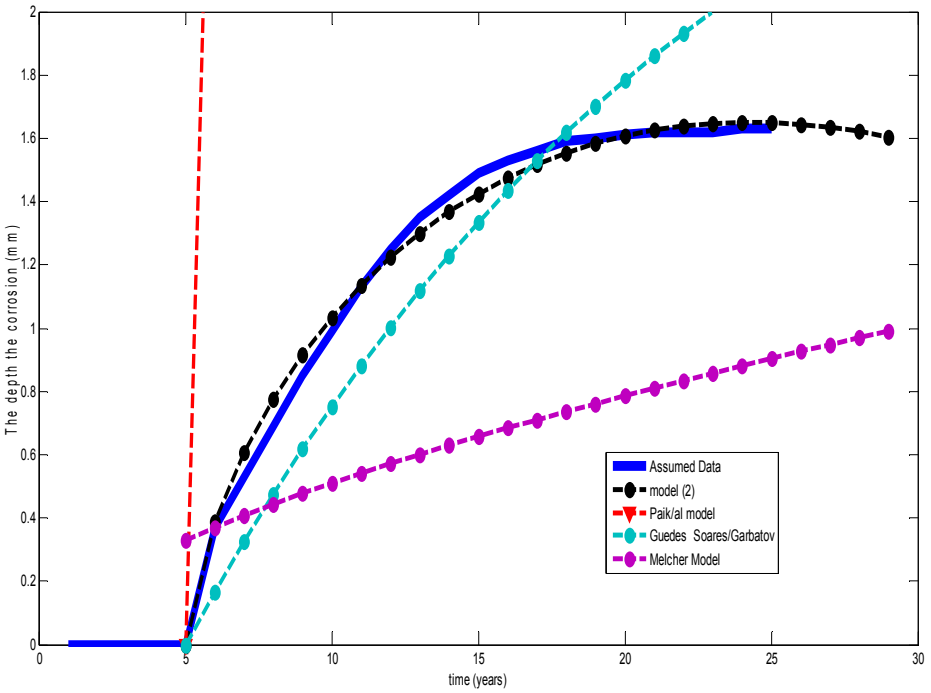

Fig. 1 - Results from the proposed model and comparison with other models by Soares, Paik/al, Melcher

It has been found that the reduction of the section modulus and the section area of the deck cargo follow polynomial model of the sixth order. Finally there is 5% loss of the section modulus of the deck cargo during 15 years of the ship service, and for the mean section area, 9.3% lost during 25 years.

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