



Investigation on the Corrosion of Coated Steel Plates with Impact Defect using Divided Steel Plates

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Abstract

A method utilizing divided steel plates was used to investigate the corrosion of coated steel plates with impact defect while continuously submerged in 3% NaCl solution. The polarization behavior of circular divided steel plates was first compared to that of undivided ones. Half-cell potential and polarization resistance results show similar trend in divided and undivided form especially at the later stages of exposure. The method of using circular divided steel plates was then used to monitor the macrocell as well as microcell corrosion in coated steel plates induced with defect. The test results show that the defect causes macrocell corrosion to occur between the defect and sound portions. The impact defect also caused the reduction in the polarization resistance and consequently higher microcell corrosion at the neighbouring sound coated portions.

Keywords: Macrocell Corrosion; Microcell Corrosion; Defect; Coated Steel Plates.

1. Introduction

Under ideal conditions paint coating protects the steel by preventing the access of aggressive elements. It is one of the practical materials used to protect metals against corrosion [1, 2]. However, a coated steel structure exposed directly to the harsh water of the sea can be hit or bombarded by floating objects that leaves impact defects on the coating surface. It is on these impact defects where the steel substrate becomes directly exposed to the aggressive elements of the marine water thus allowing the process of corrosion to instigate. With time, the impact defect can even influence the corrosion of the sound coated portions at the vicinity of the defect. It is reported that once the corrosion is instigated on steel panel protected by an organic paint system, growing blisters appear on the intact portions followed by rapid deterioration [3, 4].

In order to monitor corrosion at the defect and sound portions, the impedance measurement technique was used. In the work of Schmidt, Shaw, Sikora, Shaw, and Laliberte [3], the impedance at the lowest frequency was used to evaluate the corrosion protection performance at the defect and intact sites. The areas for examining the defect and sound portions were controlled using specialized conducting agar cells. However, this technique can only be used when measurement is done in atmospheric exposure conditions.

In this study, the examination of corrosion at the defect and sound portions while in submerged exposure condition was made possible by using divided steel plates. An important feature of the divided steel plate is that its steel

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