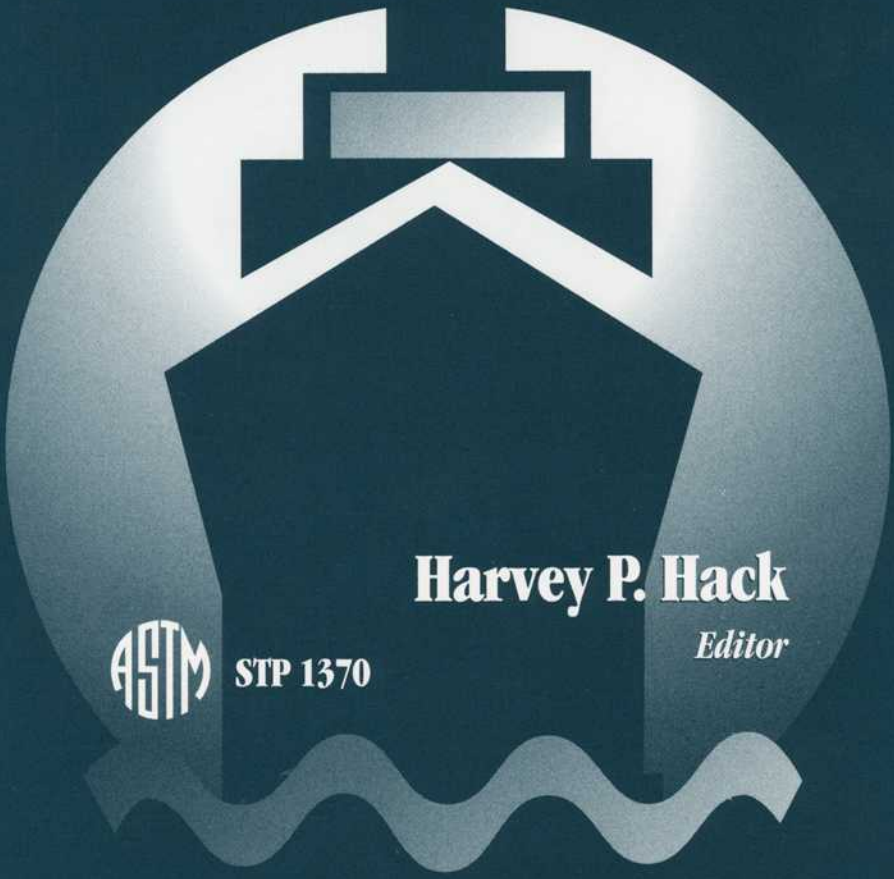
Designing Cathodic Protection Systems *for* Marine Structures *and* Vehicles



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Editor

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Foreword

The Symposium on Designing Cathodic Protection Systems for Marine Structures and Systems was held 3 Nov. 1998 in Norfolk, Virginia. Committee G1 on Corrosion of Metals sponsored the symposium. Harvey P. Hack, Northrop Grumman Corporation, presided as symposium chairman and is editor of this publication.

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Overview

Cathodic protection is an important method of protecting structures and ships from the corrosive effects of seawater. Design of cathodic protection systems can significantly effect the usable lifetime of a structure. Poor designs can be far more costly to implement than optimal designs. Improper design can cause overprotection, with resulting paint blistering and accelerated corrosion of some alloys, underprotection, with resultant structure corrosion, or stray current corrosion of nearby structures. The first ASTM symposium specifically aimed at cathodic protection in seawater was held on 3 November, 1998, in Norfolk, VA. This symposium intended to compile all the criteria and philosophy for designing both sacrificial and impressed current cathodic protection systems for structures and vehicles in seawater. It was not possible to comprehensively cover this topic in a single day, however. The papers which are included in this STP are significant in that they summarize the major seawater cathodic protection system design philosophies.

The first paper, by Hartt, is a summary of the latest approach to determining cathodic protection current requirements for marine structures. This approach, called the Slope Parameter Approach, allows for the formation of calcareous deposits in a more accurate fashion than the older, traditional, methods, and has recently been used as the basis for development of a Standard by NACE International.

The U.S. Navy has probably designed more cathodic protection systems for ships than any other organization. In recent years, the Navy has begun to use physical scale modeling to optimally place reference cells and anodes, and to select the best system size and capacity. The paper by Lucas et al. describes the method that the Navy uses to test scale models, and how this information is translated into actual ship designs.

In the past, zinc was the most common material used for sacrificial cathodic protection anodes. In recent years, aluminum alloys have surpassed zinc in popularity due to their increased efficiency, lower weight, and lower cost. Formulation of aluminum anodes is critical. The paper by Schrieber, a renowned expert in aluminum anode formulations and performance, details how these anodes are properly formulated for various environments.

All cathodic protection design elements are put together in the example of a protection system for a complex wharf structure presented in the paper by Nikolakakos. The complexity of the geometry of this wharf makes for unique challenges to the cathodic protection design.

Providing cathodic protection for structures in deep water, such as offshore oil platforms, **offers** unique challenges. **The paper by Menendez et al. gives the experiences of a company that has done many deep water designs.** These practical experiences are invaluable to anyone considering a design in deep water.

The latest technology for predicting cathodic protection current distribution and magnitude is the use of Boundary Element computer modeling. One of the leaders in this field, the U.S. Navy, shows examples of the utility of this approach in the paper by DeGiorgi et al. In this paper, the results of computer models of shipboard cathodic protection systems are compared to the performance of these systems on ships in service.

The final paper in this volume by Zook discusses a unique application of cathodic protection—preventing corrosion of space shuttle solid rocket boosters during ocean recovery. The challenges of

designing a system which is very weight-critical and which must protect a large area for a short time are unique in the corrosion world.

Each of these papers summarizes a particular aspect of marine cathodic protection design. Therefore, this volume will be a valuable reference for designers of marine cathodic protection systems and evaluators of designs performed by others.

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