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The Effectiveness of Cathodic Protection on Microbiologically Influenced Corrosion Control

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Abstract : Cathodic protection (CP) is an electrochemical method to control and manage corrosion in different industries and environments. CP which is widely used, especially in buried and sub-merged environments, which both environments are susceptible to microbiologically influenced corrosion (MIC). Most of the standards recommend performing CP using -800 mV, however, if MIC threats are high or sulfate reducing bacteria (SRB) is present, the recommendation is to use more negative potentials for adequate protection of the metal. Due to the lack of knowledge and research on the effectiveness of CP on MIC, to the author's best knowledge, there is no information about what MIC threat is and how much more negative potentials should be used enabling adequate protection and not overprotection (due to hydrogen embrittlement risk). Recently, the development and cheaper price of molecular microbial methods (MMMs) open the door for more effective investigations on the corrosion in the presence of microorganisms, along with other electrochemical methods and surface analysis. In this work, using MMMs, the gene expression of SRB biofilm under different potentials of CP will be investigated. The specific genes, such as pH buffering, metal oxidizing, etc., will be compared at different potentials, enabling to determine the precise potential that protect the metal effectively from SRB. This work is the initial step to be able to standardize the recommended potential under MIC condition, resulting better protection for the infrastructures.

Keywords : cathodic protection, microbiologically influenced corrosion, molecular microbial methods, sulfate reducing bacteria
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