Optimization of Cathodic Protection System for River-Crossing District Heating Pipeline using Computational Analysis: Part I. The Basic Model

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In this case study, we optimized cathodic protection (CP) design for river-crossing district heating (DH) pipeline under the Han River. This pipeline is not electrically insulated with other adjacent pipelines. Therefore, additional consideration for CP current loss to connected pipelines at both sides (North and South side) is needed. Furthermore, there are some limitations on anode installation. For these reasons, computational analysis of CP design was performed considering environmental factors. The minimum current for CP of river-crossing DH pipeline was found to be 100 A, although theoretical calculation result was 74 A. This might be due to the following three reasons. First, the distance of the center area is too far from both anode groups. Second, electrically connected south/north pipe can absorb some CP current. Third, the three pipelines are too close to each other. Thus, incorporating practical corrosion properties of metal and environmental factors in the computational analysis can improve the reliability of CP design for a pipeline.

Keywords: Cathodic Protection; District Heating; Potentiodynamic Polarization test; Computational Analysis; River-Crossing Pipeline

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