Optimization of cathodic protection for jacket with COMSOL Multiphysics

Chunlian Luo

Jimei University, Xiamen 361021, PR China

Abstract Purpose: Optimizing the impressed current from auxiliary anode during lifetime protection period based on simulation, preventing potential of jacket from over-protection and under-protection. Method: By means of establishing cathodic protection model, adjusting coating damage rate and exchange current density, calculating impressed current, the impressed currents are optimized based on simulation. Research: At the early stage of protection, the potential remains almost unchanged, because of the small coating damage rate. At the later stage of protection, the potential gradually moves in the positive direction; The further the auxiliary anodes are from jacket, the more uniform the potentials are, and vice versa, the more uneven they are; The area where the jacket is closest to the auxiliary anode has the highest current density and is prone to over-protection. Conclusion: There is insufficient protection when calculating the impressed current cathodic protection of the jacket based on the traditional specification; The finite element method can be used to optimize the calculation quickly and determine the minimum impressed current required; When calculating impressed current based on traditional specification, the value of impressed current from auxiliary anode should be increased in the later stage, avoiding under-protection; The impressed current in the early stage can be appropriately reduced which meet the necessary protection requirements; The closer the area is to the auxiliary anode, the more uneven the potential distribution of the jacket, and vice versa, the more uniform it is.