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# Case and Mechanistic Study of Corrosion Problems in clad- and welded-members in Salt Producing Plant

Mikio Takemoto and Hideo Cho
Faculty of Science and Engineering
Aoyama Gakuin University

Summary

In this research, we measured transverse residual stresses and studied the mechanism of stress corrosion cracking of austenitic stainless steel (AISI 316L) clad on carbon steel which suffered chloride-SCC in salt producing plants. Characteristic features of chloride-SCC in clad stainless steel is the crack propagation in the direction parallel to the surface (horizontal crack) and the resultant falling–out of stainless layer. The falling-out of stainless flakes is the serious problem in a food producing plant. The mechanism of such SCC failure were studied from AE source simulation during SCC test of butt-welded clad steels.

We first measured the residual stress in clad stainless layer in the direction of plate thickness using the modified Kelsey method. The residual stress is estimated to be tensile, possibly with sufficient magnitude to cause chloride-SCC by itself.

Next we monitored AE signals during chloride-SCC of butt-welded clad stainless steel (1.6 mm thick AISI316L/ 8 mm thick SS400 substrate) using three channel AE monitoring system. One channel of displacement sensitive sensor measured the out-of-plane displacement of the longitudinal (P-) and shear (S-) waves, and the two channels of small size sensors the polarity of the P-wave. A number of AE signals were monitored from 372 ks exposure. AE events till 387 ks matched the out-of-plane displacement due to cleavage-type fracture with crack normal directing to the weld bead. From 387 ks, we monitored AE events with similar waveform that simulated to cleavage-type fracture with crack normal directing to surface. It was demonstrated that onset and propagation behavior of SCC could be monitored by AE source simulation.