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Corrosion resistance and performance of copper–nickel and titanium alloys in MSF distillation plants

Ali Al-Odwani, Essam E.F. El-Sayed*, Mohamed Al-Tabtabaei, Mohamed Safar

*Water Technologies Department, Water Resources Division, Kuwait Institute for Scientific Research,
P.O. Box 24885, Safat 13109, Kuwait
Tel. +965 4878122/4878124; Fax +965 4879238; email: esayed@kisr.edu.kw*

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Abstract

A comprehensive study was aimed at testing materials of construction of multistage flash (MSF) distillation plants. The study included testing corrosion resistance and performance of several alloys under real operating conditions similar to those of high, medium, and low temperature stages of the heat recovery section in MSF plants. Three alloys, namely copper–nickel alloys UNS C70600 and C71500, and titanium-based UNS R50400 were included in the study along with other ferric-based alloys. Tests were conducted in both liquid and vapor environments under well controlled conditions at three different temperatures: 90, 70, and 50°C for durations ranging from 30 to 300 days. Test results included weight loss measurements, scanning electron microscopy (SEM) and electrochemical potential analysis. This is the third and final paper in a series of three. The paper describes test conditions and presents results obtained from weight loss measurements. The paper also provides an overall ranking of the alloys tested in comparison with some stainless steel alloys in terms of their corrosion resistance. Highest corrosion rates measured were 0.027 and 0.0075 mm/y for copper-nickel alloys C70600 and C71500, respectively, whereas highest corrosion rate recorded for titanium R50400 was 0.00076 mm/y. In general, highest corrosion rates were measured after 30 days initial exposure; thereafter corrosion rates dropped due to formation of protective films on the alloys surfaces.

Keywords: Material performance; Weight loss; Electrochemical analysis; Oxide film

*Corresponding author.