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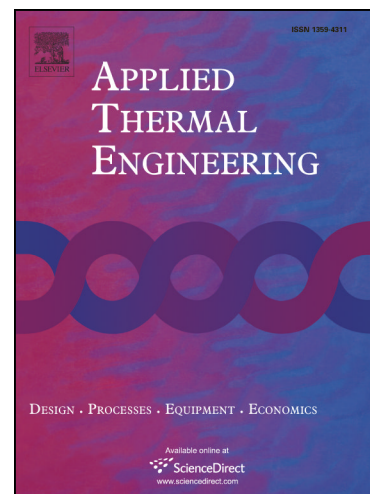
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Experimental evaluation of the temporal effects of paint-based protective films on composite fouling inside admiralty brass and titanium steam surface condenser tubes

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Abstract

Paint-based protective films (PPFs) are inorganic thin coatings currently used in industry to mitigate corrosion and erosion. In this paper the fouling characteristics of one of these PPFs is experimentally investigated using a purpose-built test facility installed at a thermal power plant. Details are provided describing the apparatus which uses actual cooling water from the condenser outlet that passes through six parallel double-pipe heat exchangers. Admiralty brass and titanium tubes are tested simultaneously with and without the same PPF applied, enabling the fouling factor to be measured as a function of exposure time. The predominate fouling mechanisms occurring at this plant are found to be biological, precipitation, and particulate fouling. The results indicate that the PPF fouls identically to the titanium tube and the admiralty brass tube reaches the lowest fouling factor (five times less than all other tubes). The toxicity of the copper ions in the brass with respect to biofilm development is suggested to cause this. Therefore when a new tube alloy is used instead of a copper-based alloy, or when a non-biocidal PPF is employed in conditions liable to biofouling, the water treatment program must be effectively upgraded with respect to its biofouling countermeasures.

Keywords: fouling, biofouling, coating, condenser tube, brass, titanium

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