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Crystallization Fouling from Potable Water in Heat Exchangers and Evaporators

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Abstract : Formation of inorganic scale on heat transfer surfaces is a serious problem encountered in industrial, commercial, and domestic heat exchangers and systems. Several industries use potable/groundwater sources such as rivers, lakes, and oceans to use water as a working fluid in heat exchangers and steamers. As potable/surface water contains diverse salt ionic species, the scaling kinetics and deposit morphology are expected to be different from those found in artificially hardened solutions. In this work, scale formation on the heat transfer surfaces from potable water has been studied using a once-through open flow cell under atmospheric pressure. The surface scaling mechanism and deposit morphology are investigated at high surface temperature. Thus the water evaporation process has to be considered. The effect of surface temperature, flow rate, and inhibitor deployment on the thermal resistance and morphology of the scale have been investigated. The study findings show how an increase in surface temperature enhances the crystallization reaction kinetics on the surface. There is an increase in the amount of scale and the resistance to heat transfer. The fluid flow rate also increases the fouling resistance and the thickness of the scale layer.

Keywords : fouling, heat exchanger, thermal resistance, crystallization, potable water
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