Using reverse osmosis technology for recycling wastewater from a coal-fired power plant

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ABSTRACT

Use of reverse osmosis for treatment of water with high scaling potential was investigated in this study. Treated water comes from a disposal site of ash and desulfurization products and its saturation index of calcium sulfate dihydrate (gypsum) ~0.94. Among other components of the leachate are other dissolved solids (~800 mg/L) with significant content of iron ions (~2.7 mg/L). A series of experiments were performed to study the gypsum bulk crystallization in the presence of antiscalant and iron ions followed by pilot plant testing at the locality with raw leachate and leachate pretreated by coagulation/flocculation to investigate membrane scaling. The results showed that the presence of iron ions significantly reduced the induction time of gypsum crystallization, thereby reducing antiscalant effectiveness for its crystallization suppression. Severe membrane scaling confirmed by permeate flux measurement and pressure drop measurement was found, when raw leachate was treated. Removal of most of iron by pretreatment caused that no undesirable precipitation of solution components and an abrupt decrease in permeate flux was detected during separation process. Average rejection of total dissolved solids was 99.5% in this case. Produced permeate could be reuse as source water for the power plant, thus 80% of wastewater could be recycled by means of reverse osmosis.

Keywords: Reverse osmosis; Calcium sulfate; Induction time; Antiscalant

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