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Pilot scale evaluation of a novel post-treatment process for desalinated water

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ABSTRACT

New water quality standards, specific for desalinated water, have been recently approved in Israel. Consequently, a novel post-treatment process was developed, aimed at meeting the new standards in a cost effective way, as well as supplying Mg^{2+} concentration of at least 10 mg Mg/l, required for both health and agricultural reasons. A pilot plant, capable of post-treating 1600 m^3/d of desalinated water was operated for ~6 months to optimize economic and engineering aspects of the process. The article presents results from three operational scenarios differing from each other by the percentage of water that undergoes treatment, out of the total flow rate. The results indicate that the required set of water quality parameters can be produced in a stable manner in all the three scenarios tested. All scenarios were found similar with respect to both operational costs and resultant water quality. However, in terms of capital costs, treating a smaller fraction of the total flow rate was found advantageous. The article also introduces a modification to the original process, which was tested at the laboratory scale. In the modified process calcite is dissolved using $CO_{2(g)}$ (instead of H_2SO_4, as in the original process). The modified process can be implemented as an add-on to existing CO_2-based calcite dissolution post-treatment systems or in cases where a restriction is posed on the total hardness value in the product water.

Keywords: Post treatment; Desalinated water; Mg^{2+} addition; Ion exchange; Calcite dissolution

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