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Feasibility evaluation for the industrial reuse of wastewater with moderate chloride concentration in central Italy

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ABSTRACT

The herein presented case study deals with a technical-economic evaluation of industrial reuse of wastewater from an industrial district in Lazio region (central Italy). The wastewater is presently collected in a traditional activated sludge plant and disposed into a natural stream. The treated wastewater contains a typical chloride concentration ranging from 200 to 500 mg/L which largely complies with Italian standards for surface water disposal (1200 mg/L) but poses problems for its reuse inside the same industrial district. This study evaluated the optimal chloride level required for its reuse by an analysis of the users, and led to a preliminary design of three possible options of a finishing stage allowing the reuse in a closed loop inside the district itself. They include two options of flocculation, flotation, disinfection and reverse osmosis (RO) with different capacities, both satisfying the planned water request thanks to a larger storage in the solution with the smaller plant. The third solution replaces the RO stage with the blending of supplementary flow from groundwater wells in order to reach the required concentration by simple dilution. The two RO solutions pursue the goal of a partial reuse so as to obtain low brine concentration achieving the compliance with the discharge standard in internal surface water, with significant cost savings. Although the dilution solution turned out to be the cheapest at present Italian costs, the RO solution with the smaller plant scored also a moderate water unitary cost, which turned out to be lower than that of drinking water distributed in the same area. Notwithstanding, the cost is still higher than that of mere pumping paid by industrial users presently exploiting groundwater. These results demonstrate that a correct financial policy is required to allow an equilibrate development of the exploitation of reused water.

Keywords: Industrial and civil wastewater reuse; Case study; Reverse osmosis; Blending

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