

More water, less energy and reduced CO₂ emissions — the Larnaca desalination plant

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ABSTRACT

An objective of the Larnaca seawater desalination plant (LDP) was to reduce specific energy consumption while producing the same or more water while maintaining water quality criteria. A critical water quality issue was the removal of boron to levels such as those defined by the WHO. The LDP (a 10-year BOOT project) has been operating since 2001, and has the challenge of meeting a 1 mg/L boron standard. In order to cope with the boron requirement, the plant is designed with a double-stage RO configuration in order to produce boron concentrations consistently below 1 mg/L. Other innovative design features of the LDP are the eight membranes per pressure vessel, permeate from both ends of the pressure vessels and a fully automated operation. As part of a wider plant operation strategy, the plant processes have been optimized and a stable high plant performance was achieved. Further developments such as the membrane management system have improved the performance of the SWRO process and the operation of the first stage at elevated pH further improved the boron rejection of the first SWRO stage such that a second BWRO stage was not required to operate for more than 6 months of the year. Such innovative plant operation and the subsequent energy savings — translated into reduced CO₂ emissions (energy obtained from the national electricity grid) per cubic meter of water produced — has allowed the LDP to win the 2007 National Innovation Industry Prize. This paper describes the changes made and advancements in achieving lower specific plant energy while producing more water and at the same time meeting its quality and all other contractual requirements.

Keywords: Desalination; Energy; CO₂ emission/m³; Boron

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