Different designs in energy savings of SWRO Plant of Las Palmas III

Raul Lemes*, Raul Falcon, Rafael Arocha, Jacinto Curbelo, Victor Platas, Laura De Lorenzo

Empresa Mixta de Aguas de Las Palmas S.A. (Emalsa), Operations and Maintenance Department, Avda, Juan Carlos I, 29, Las Palmas de Gran Canaria 35003, Spain
Tel. +34 928 454170; Fax: +34 928 454163; email: rlemes@emalsa.es

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ABSTRACT

This paper aims to show the development and design changes that have been done in SWRO Las Palmas III to achieve improvements in energy savings from the start-up in 1996 until today. We want to present the evolution of the different energy recovery systems and new technologies that have been adapted to this facility in operation for the last 20 years. The plant began working with a production of 36,000 m³/day with 45% recovery and six trains in two stages, with 300 ft²-surface membranes and Francis turbine as energy recovery device, getting a specific energy consumption of 6.16 kWh/m³. In 1999, the plant increased production to 39,000 m³/day maintaining recovery and the number of trains, mainly due to changes of membranes with an area of 315 ft². Besides it got a specific consumption decreased to 5.18 kWh/m³ due to the installation of a new energy recovery system, Pelton wheels. In the year 2000, Emalsa installed for first time in the world interstage pumps (so called booster pumps), increasing production to 44,000 m³/day and recovery to 48%, reducing the specific consumption to 5.10 kWh/m³. At 2001 and 2002, production is increased to 57,000 m³/day with the installation of a new RO train and with the addition of a new row of pressure vessels and membranes in all trains that increased recovery to 50% and decreased the specific consumption to 4.95 kWh/m³. From 2002 to 2007 plant increases production to 81,000 m³/day, adding new more efficient trains increasing global recovery to 52% and reducing specific consumption to 4.6 kWh/m³. Since 2008, the company began to replace the Pelton wheels for isobaric energy recovery systems, replacing in 2008 the first two Pelton wheels with a single isobaric system of two trains, reducing the specific consumption of these two trains more than 20%. In 2009, two new isobaric systems were installed, one per train, getting the plant a total of 86,000 m³/day and a total specific consumption of 4.15 kWh/m³. Currently, the company made a new train design, which improves the operating conditions when Pelton wheels are replaced for isobaric systems. This project will be operational in November 2010 and it has been predicted a decrease in specific consumption below 4 kWh/m³. With all this improvements, it can be said that Las Palmas III SWRO plant has been a pioneer in the world of desalination and a lively look at the history of energy recovery in SWRO plants.

Keywords: Improve energy savings; Designs; Production capacity; Quality of water

*Corresponding author.

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