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Powder-handling equipment improves filtration at desalination plant in Florida, USA

THE 2 787M² TAMPA Bay (Florida, USA) Seawater Desalination Plant produces up to 94.6 million litres of drinking water per day, making it the largest seawater desalination plant in North America. In 2005 the plant was shut down as it could not meet the expected operational sustainability. Tampa Bay Water, the government agency responsible for the plant, assigned remediation work to American Water and Acciona Agua, through their operating partnership American Water-Pridesa.

Among the firm's many improvements is the addition of Precoat Filtration using a bulk handling system for diatomaceous earth. This has proven to be instrumental in re-establishing the plant as a major source of drinking water for the Tampa Bay region.

Reverse osmosis converts seawater

During remediation at the Tampa plant, American Water Acciona Agua improved pretreatment by adding coagulation and flocculation, improving the operation of the existing sand filters and installing a diatomaceous earth (DE) filtration system to eliminate microscopic materials from the water prior to RO.

DE is a silica powder (hydrated silicon dioxide) comprised of the cell walls of phytoplankton called diatoms. Applied to the pressure side of filter elements, DE traps micron-size particles that would otherwise pass through ordinary filter media. DE powder is added to seawater upstream of

the filter, forming a cloud of DE particles that coats the filter medium and, in turn, traps solid contaminants as water passes through the DE coating. When contaminants build up, indicated by pressure increases, the filter is backwashed, after which another dose of DE is added to the water to re-coat the filter medium.

System moves DE dust-free

The DE bulk handling equipment, produced by Flexicon Corporation, consists of two identical systems, allowing cleaning and maintenance of either system with no interruption in the movement of DE from the bulk bags to the dilution tank where it is utilized.

Each system consists of a bulk bag unloader with loss-of-weight batching controls and an integral flexible screw conveyor. The unloaders are equipped with Flow-Flexer™ bag activators that raise and lower opposite bottom edges of the bulk bag at timed intervals, improving material flow into the bag's discharge spout. As the bag lightens, the stroke of the pneumatic bag activators lengthens, producing a steep "V" bag shape to promote evacuation of material.

Also promoting flow are a Spout-Lock™ clamp ring that creates a high-integrity, sealed connection with the bag spout, and a Tele-Tube™ telescoping tube that applies continual downward tension on the bag as it empties and elongates.

Above the clamp ring is a Power-

Cincher™ flow-control valve whose curved, articulated rods cinch the bag spout concentrically, allowing the operator to control the flow of material through the spout after releasing the bag spout drawstring, as well as to close and retie the spout of partially empty bags with no leakage or dusting.

DE flows from the bulk bag through the bag spout into a 1.8 m³ capacity surge bin able to hold the entire contents of one bulk bag, effectively doubling the unattended run time of dischargers having small surge hoppers.

The sealed system is vented through a port in the hopper lid to a dust collector that vacuums displaced air and dust, and collapses empty bags dust-free prior to tie-off and removal, eliminating manual flattening and associated dusting. Reverse-jet filter cleaning allows the vacuum system to operate at high efficiency, while extending filter life.

Loss-of weight batching provides accurate dosing of DE

When the DE dilution tank has discharged its contents, a level indicator signals the PLC that controls the weigh batching system to initiate a weigh batching cycle by running one of the flexible screw conveyors. Load cells supporting the bulk bag unloader frame with integral conveyor, transmit weight loss information to the PLC which reduces the conveyor speed immediately before stopping the conveyor, achieving an accurate batch weight.

"Based on the amount of weight lost, the PLC also indicates when the operator needs to load a full bag of DE into the unloader," said Lopez. Weight loss information is shown on an LCD, part of a control centre that includes a keypad, custom-engineered software, and an A/C inverter with adjustable speed control and a reversing feature for the conveyor drive.

For more information contact Flexicon Africa in Port Elizabeth on tel: +27 41 453 1871 or email: sales@flexicon.co.za.



Left: Two bulk bag unloaders unload and transfer 1814-2722 kg per day of diatomaceous earth (DE) for Tampa Bay desalination plant's DE filtration system. The crane deposits a lifting frame holding the bulk bag onto the unloader frame.

Far left: At the flexible screw conveyor's discharge end, DE flows through a transition adapter into the 1136 l tank where the DE is put in suspension with water.