DECANTERS PROVIDE SMOOTH OPERATION FOR MILITARY BASE'S WWTP

By **Daniel Lakovic**

In 2014, the Northern Wastewater Treatment Plant of Marine Corps Training Base Camp Pendleton in Southern California, was designed with purpose and efficiency in mind for its migratory population of around 200,000 people, which includes 18,000 troops, plus employees and their families. The $66 million plant was built to consolidate all the pump stations and lift stations of 12 treatment plants down to just the Northern and Southern Treatment Plants, covering some 85,000 hectares.

While the Southern plant kept its older equipment, the Northern plant was outfitted with new Flottweg centrifuge decanters and 3.2 megawatts of solar power. The base supplies the power, but the solar power feeds the facility. Excess power returns to the base's grid. There is a 2,000 kW generator for backup. The plant produces a megawatt of produced power every two to three days that returns to the main grid at the base.

The Northern plant was outfitted with new Flottweg centrifuge decanters.

The centrifuge runs once or twice a month on average, according to Chief Plant Operator Phil Starks. "At times the centrifuge must be used multiple times a week," he said. "Digestion is over 200 days sludge retention time (SRT) with good sludge concentrations. We have excellent aerobic sludge digestion available with a lot of volume reduction and two extremely large digesters. One is kept about half full at all times. When the level gets high, the decanters are run to bring the level back down."

With constant sunshine, the plant is able to spread out the solids to naturally dry them. The primary goal for the operation of the centrifuges is not for the percentage of solids produced. Instead, the focus is on the centrate going back to the plant. "I want the cleanest centrate possible because neither drying nor volume is an issue," Starks explained.

"We have absolutely no problems with the centrifuges. The only issue has been an experiment to see how the centrifuge would react to a thicker solid coming in from the digester. It operated great, but we didn't flush the unit appropriately with the thicker solids, causing just a few minor adjustments."

Clean water is becoming an increasingly valuable raw material, which is why the importance of municipal wastewater treatment continues to grow. Sludges resulting from drinking water and wastewater treatment must be separated as efficiently as possible. For the dewatering and thickening of sewage sludge, industrial centrifuges are now considered the state of the art. They are cost-effective, energy-saving, and efficient.

The most important goal in dewatering is to maximize the reduction of the volume of sewage sludge. The reason for this is that every tenth of a percent increase in dry solids in the sludge reduces the costs of sludge disposal. The dewatering decanters of the Flottweg C-series and X-series reduce operating costs and energy consumption and achieve a higher dry solids content.

During thickening, a high degree of separation and a low polymer consumption are extremely important. Both relieve the burden on subsequent processes and improve the overall performance of the wastewater treatment plant.

A decanter can be regarded as a sedimentation tank that is wound around an axis. In the sedimentation tank, the solid particles, which are heavier than the liquid, move to the bottom by gravity and form a sediment (solid phase) at the bottom of the tank. For example, a wine decanter can be understood as a kind of sediment vessel. In a centrifuge, the solid and liquid phases are separated by means of centrifugal acceleration.

In the rotating bowl of the centrifuge, the solid particles, which have a higher density and are therefore heavier than

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the liquid, move outward because of centrifugal force. Sediment is formed on the inner wall of the centrifuge bowl. Since centrifugal forces of approximately 3000 g are exerted in a centrifuge as opposed to 1 g in a gravitational field, the separation of the solid particles from the liquid is much faster and more efficient.

Product is fed into the inlet chamber of the decanter scroll through the centrally arranged feed pipe. From there, after gentle pre-acceleration, it passes through the distributor openings into the decanter bowl.

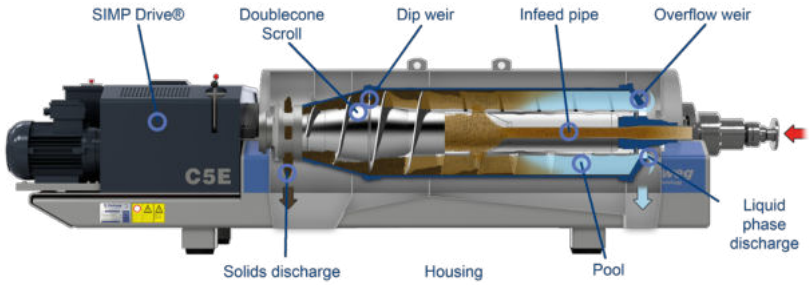
The decanter bowl has a cylindrical/conical shape and rotates at a pre-set speed optimally adjusted to the application. The slurry rotates within the bowl at the operating speed and forms a cylindrical layer at the bowl wall. Due to the higher density, the solids contained in the product settle on the inner wall of the bowl under the action of centrifugal force. The length of the cylindrical bowl section and the cone angle are selected to meet the specific requirements of an application.

The decanter scroll rotates at a slightly different speed than the bowl and conveys the separated solids toward the conical end of the bowl. This differential speed determines the residence time of the solids in the decanter bowl. Residence time is a critical factor for cake dryness. It can be adjusted by changing the differential speed of the scroll, and therefore providing optimal separation. Depending on the application and task, the scrolls are designed differently.

Settled solids are ejected through ports at the conical end of the bowl into the solids housing and fall through the discharge chute.

The clarified liquids (fluid phase) flow to the cylindrical end of the bowl where they exit over weir plates. In these openings there are very precisely adjustable weir plates (overflow weirs) with which the pond depth (liquid layer) in the bowl is adjusted. The liquid is collected in the drain housing and discharged without pressure.

As an alternative to the overflow weir, the clarified liquid can also be discharged via an impeller and discharged from the bowl under pressure in a closed system. This eliminates the need for a separate chamber pump. A further developed variant, the adjustable impeller, allows infinitely variable adjustment of the pond depth during the run. This allows a fast and fine adjustment to changed conditions without having to take the centrifuge out of operation.



The decanter scroll rotates at a slightly different speed than the bowl and conveys the separated solids toward the conical end of the bowl.

At the Northern Camp Pendleton Plant, Starks said the centrifuge works smoothly and requires little maintenance. "It's doing exactly what it's intended to do," he said. "The equipment operates with little to no issues. It takes about 30 minutes to an hour for the unit to settle into a nice rhythm after a few adjustments are made with the variables like temperature and solids concentration.

"A centrifuge is like a moving dart board. It is three dimensional, and you're always trying to hit that exact right spot. It takes experience, combined with high quality equipment. As long as everything is set with the variables, these units just have to start up, and then we really don't have to do much."

According to Starks the sophisticated decanters have many features that make finding that sweet spot easier. "Instrumentation is key and getting the feedback on the screens is essential," he explained. "I control the unit by scroll torque. It also has differential controls, but I don't need to use them as much. The scroll torque is much more responsive. I can also make adjustments with the feed rate of the polymer. There are so many adjustable parameters, you could over adjust if you're not patient. It's important to make one adjustment and then give it 15 or 20 minutes and then check on it. Then you can make another adjustment from that point."

With a small staff, Starks said another advantage is that one person can easily operate the equipment and little to no maintenance is required. "Having maintenance free separation is just the best thing for a plant like this," Starks explained. "You don't want to continuously have to take things apart and fix them. The Southern Plant is constantly having issues because it was not designed with purpose. This is actually a very boring plant. The plant just runs so well, we rarely ever have any issues. Sometimes we are running so smoothly, we can help out at the Southern half."

The Northern Plant is designed to handle a much larger population and this could double or even triple easily in the future without breaking capacity. ■

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