

Covington WWTP Uses Centrifuge Technology

Covington is a city of over 9000 population located in Tipton County, about an hour's drive north of Memphis in West Tennessee. For many years, the city's wastewater treatment needs were met with a trickling filter plant, but the city's growth and the requirements of the Clean Water Act dictated the construction of a new wastewater treatment plant. In 1984, a new 1.8 million gallon per day (MGD) oxidation ditch plant went into operation discharging to the Hatchie River.

For waste sludge treatment and disposal, the plant was provided with aerobic digestion and thickening followed by dewatering on sand drying beds. At that time, drying beds were common and provided a simple means of dewatering requiring little energy usage or an inordinate amount of operator attention. Covington experienced the same problems as many other wastewater treatment plants in this area. Even though Tennessee is considered a southern state with relatively mild winters, there are periods that are too cold and wet to allow the sludge to properly dewater in a reasonable time frame. The wastewater treatment plant operators were left with extended periods of time when they could not waste sludge which hampered their ability to properly operate and control the activated sludge process.

In 1988, the city abandoned the sand drying beds and contracted with a private hauler to transport liquid sludge from the thickener to a site approved by the Tennessee Division of Water Pollution Control for land application. In 1993, the EPA enacted new rules (40 CFR503) related to sludge treatment and disposal especially as related to land application. During 1994, Fisher & Arnold, Inc. designed an expansion of the wastewater treatment plant doubling its capacity to 3.6 MGD as a direct result of the need to accommodate new industry. In order to better comply with 40CFR503, the aerobic digestion capacity was tripled rather than doubled. The thickener was already adequately sized for the expansion, and the private sludge hauler was prepared to handle the anticipated increase in sludge generation.

This arrangement continued for several years, but the city had cause for concern. The Tennessee Division of Water Pollution Control considered the city responsible for the disposal of the



Above: The demolition of several sand drying beds allowed utilization of available space and allowed existing sludge lines, water lines and drains to pipe supernate back into the plant. Below: The Andritz D5L, has a throughput of 1400 pounds per hour or 100 gpm at the current 3.3 percent solids.



sludge even though hauling and disposal had been contracted to a private company. This meant that the city still had a significant liability for actions that were outside of its control. There were few options since this was the only hauler of liquid sludge in the area which eliminated the possibility for competitive bids. The city also realized that there was really no back-up plan if the existing hauler should in any way default on the contract or possibly go out of business. Eventually, it was decided to completely take over the



The enclosed part of the building housing the centrifuge and polymer feed is a 1000 sq. ft. building.



Above: Fisher & Arnold's engineers developed a design space that provided for three trucks or containers to receive the dewatered sludge.

Right: Parts replacement used to be a problem associated with centrifuge technology, but the Andritz DSL offers a scroll trade-out so that the unit can be back on line in about three days.



handling, treatment and disposal of sludge.

Since Covington owned no approved site for land application, either liquid or solid, the decision was made to construct a sludge dewatering facility. The dewatered sludge cake that would be produced would then be hauled to an approved Class D sanitary landfill.

The design of the Covington Wastewater Treatment Plant is for an average daily flow of 3.6 MGD. The actual plant loading is just over 2.0 MDG with an average BOD5 of 262 mg/l and total suspended solids (TSS) of 264 mg/l. At the design flow, the wastewater treatment plant would project to waste 80,000 gpd of liquid sludge or about 5400 pounds per day of waste solids. At the plant's current loading, 59,500 gpd or 3969 pounds per day is wasted. After digestion and thickening, the sludge can be fed to a dewatering system at a concentration of approximately 2.5 – 3.5 % solids.

At that point, the city of Covington and its engineer, Fisher & Arnold, Inc., began investigating alternatives for the sludge dewatering system. For a number of years, this part of wastewater treatment has been dominated by belt filter presses. This would work well in this application, and one was used by the contract hauler producing a sludge cake of about 15% solids. A belt filter press is a proven technology utilizing a relatively small amount of electricity and polymer, and there are several manufacturers who produce quality equipment. A two meter press would probably handle a flow rate of approximately 100 gpm allowing the operators to dewater the current sludge generated in about 16 to 18 hours per week.

Another dewatering system considered was a rotary press. This equipment has been favorably utilized in many installations. Rotary presses provide a low pressure, slow speed operation, with low energy use and comparatively low polymer use. The operation and equipment are reliable and low maintenance; however, the investigation into rotary presses revealed two significant negative aspects. Tests run utilizing a rotary press demonstrated that the sludge cake that was produced was only 12% solids. At a wastewater plant where haul distances are rather long, this is a substantial added cost since there would be a larger number of loads required to haul the amount of sludge generated. The city and Fisher & Arnold considered this a major factor in the ultimate decision on the selected dewatering equipment.

Another problem of significance was throughput. The manufacturer proposed two 5-channel units each of which would handle

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40 gpm. At the current flow, the staff would be required to operate both rotary presses 40 hours per week. If the flow to the wastewater treatment plant increased to its design flow, a third 5-channel unit would be necessary. To provide significant space for the future, a 30' x 50' building would have been needed. In order to transport the dewatered sludge to the landfill, four 20 yd loads would have to be hauled per week.

The last alternative that the city and Fisher & Arnold investigated was a centrifuge. Centrifuge technology has actually existed for decades, but until recently there were associated maintenance issues. A centrifuge is a high-speed piece of equipment with higher power requirements, and it requires more polymer than other dewatering equipment. The most serious problem in the past was with parts replacement, such as a scroll requiring several weeks downtime. That is no longer true in that the manufacturer of the Covington centrifuge, Andritz, offers a scroll trade-out so that the unit could be back on line in about three days.

Fisher & Arnold and the city of Covington were drawn to the centrifuge for two key reasons. The first, and a very important consideration, is that testing resulted in a sludge cake of 21-23% solids. In the first four weeks of operation, the Chief Operator of the Covington Wastewater Treatment Plant, Derwood Mills, has consistently achieved 22% solids. This projects to two 20 yd³ loads per week to be hauled to the landfill. At a distance of 25 miles, this represents a significant savings in man-hours and vehicle costs.

Another important factor was the fact that the chosen centrifuge, an Andritz D5L, has a throughput of 1400 pounds per hour or 100 gpm at the current 3.3% solids. The operations staff is able to

dewater the current sludge loading in about 16 hours per week. If the flow to the wastewater treatment plant should increase to the design flow, the schedule for the centrifuge can be increased to 24 hours per week. If the plant is ever expanded, the schedule would be increased to 32 or 40 hours or more if an additional operational shift is added.

The equipment cost was slightly higher than a belt filter press but about \$200,000 less than rotary presses. The space required is less with the inside area of the building being 25'- 40' saving additional construction cost.

Working with Harvey Wilson, Water Quality Manager, and Derwood Mills, Chief Operator, Fisher & Arnold's engineers developed a design which began with the demolition of eight of the sand drying beds. Locating the new dewatering facility there allowed utilization not only of the available space but also existing sludge lines, water lines and drains to pipe supernate back into the plant.

The enclosed part of the building housing the centrifuge and polymer feed is a 1000 sq. ft. building. Space was provided for three trucks or containers to receive the dewatered sludge. The sludge cake is transported by means of a progressive cavity pump with three outlets provided to each container such that the sludge is evenly distributed. The entire operation is automated so that the operators are not required to constantly monitor the system.

The project was constructed by Clifco Inc. of Dyersburg at a cost of \$1,560,260. The new waste sludge dewatering facility has only been in operation a short time but is meeting the city and engineers' expectations. **TPW**

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