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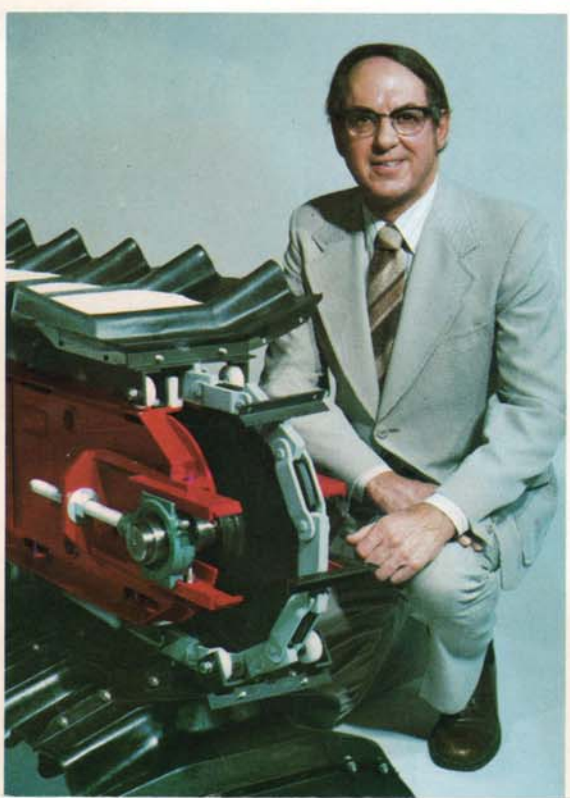
CONTINUOUS PATH CONVEYING



3 Continuous Path Serpentix Conveyors Help Solve Pine Hill Run WTP Problem

Taking a 1960s wastewater treatment facility in Maryland into the 21st century, while solving problems created by a "mystery" substance from an unknown origin, is a task successfully tackled in 1981 by The Beavin Company, a Baltimore consulting engineering firm.

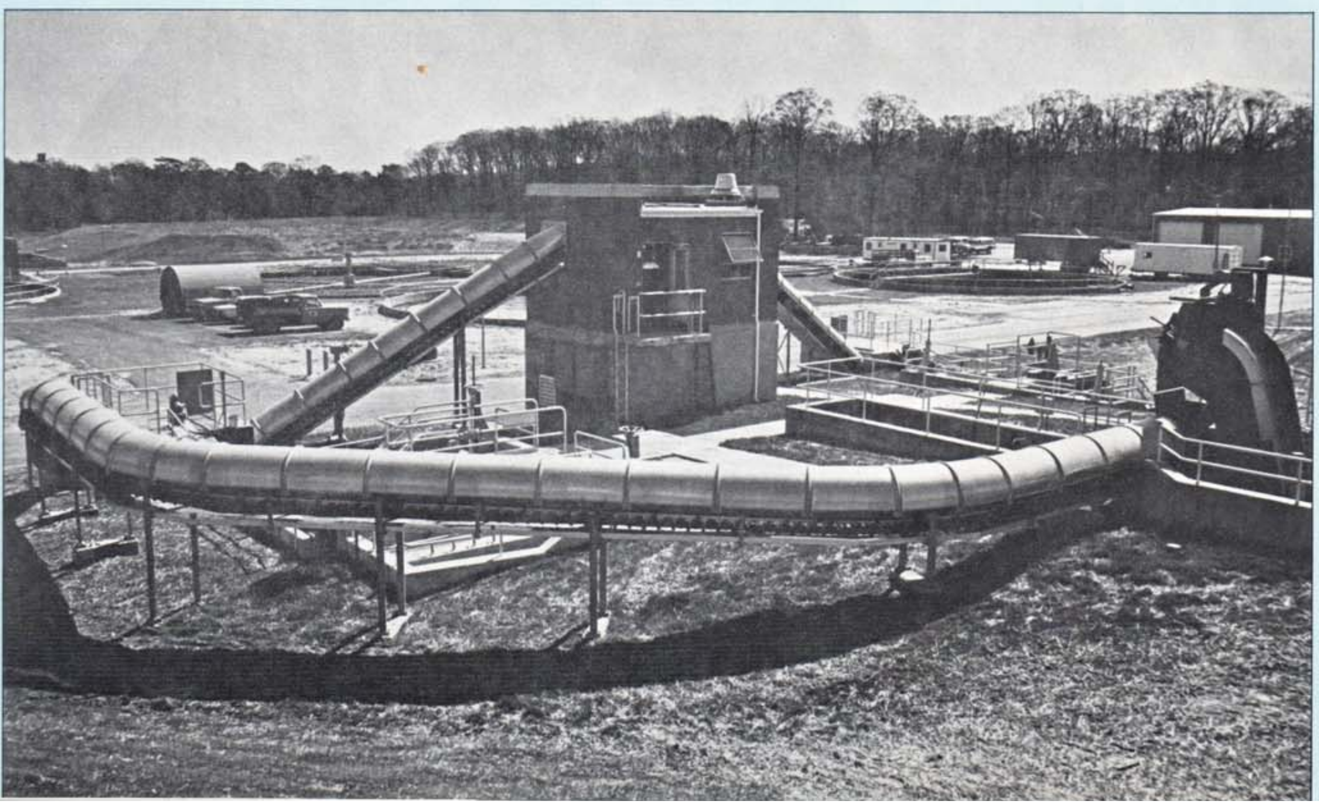
Critical components in the project were three continuous path belt conveyors. They were designed to Beavin Company specifications by Serpentix Conveyor Corporation engineers to overcome several unique problems encountered in the recently completed $10 million upgrade and expansion of the Pine Hill Run Wastewater Treatment Plant (WTP) in Lexington Park, Md.

Basic objectives of the expansion were to: increase plant capacity from an average design flow of 3 to 4.5 Million Gallons/Day (MGD) to serve a population/industrial base of 45,000 through the year 2000; and, make provisions for future upgrading of the plant to increase the average design flow to 6 MGD. This would provide peak flows of 11 MGD in the expansion just completed and 14 MGD by 2005.

Lexington Park is in southern Maryland, a peninsula that juts into Chesapeake Bay, and is bordered on the south by the mouth of the Potomac River. Pine Hill Run WTP, now a 4.5 MGD facility, is operated by the St. Mary's County Metropolitan Commission. Lexington Park, commercial center of the county, is on the western shore of Chesapeake Bay.

The Beavin Company was involved in the original design of the facility which was constructed in 1965 as a 3 MGD plant. The effluent was discharged into the nearby Pine Hill Run. Beavin's design expertise was

TWO OF THREE Serpentix conveyors used at Pine Hill Run enter a central collection building where grit and screenings are discharged into a common hopper. A third Serpentix is used in the facility's new sludge processing building seen in right of photograph at bottom of Page 6.



PINE HILL RUN WTP facilities are discussed by Beavin Company engineers. They are, from left: Robert H. Bertram; Michael C. Hansen; and, Donald F. Campbell. Bertram was project enginee and Thomas N. Dallapalu (not shown) was project manager in the design stage.

again called upon in this latest expansion program.

Severe problems faced by Beavin on the project included: the need for a sharp reduction in the labor intensive aspects of the 20 year old plant; dealing with a stringy, plastic-like material entering the plant which caused severe problems with the comminutors and the digester's recirculation pumps; and, providing a different discharge point for the plant effluent.

The new discharge point was needed because of effluent limitations for Pine Hill Run. This was solved with the design and construction of a 14,000 foot, 28-inch diameter underwater outfall line from the plant to a discharge point in Chesapeake Bay, according to Beavin Project Engineer Robert H. Bertram.

The labor intensive problems of the facility centered around the use of sludge drying beds, the cleaning, maintenance and routine operation of grit and screenings facilities and the recurring maintenance costs resulting from the plastic-like material entering the plant. Design solutions to those problems were assigned to Michael C. Hansen, P.E., and Donald F. Campbell. Hansen was charged with design elements involving grit and screenings applications and Campbell was in charge of sludge dewatering and handling. Project Manager during the design stage was Thomas N. Dallapalu, P.E.

A major step in reducing the labor involvement at Pine Hill Run WTP was accomplished with construction of a Sludge Dewatering and Handling Building equipped with two one-meter belt presses. This permitted conversion of five sludge drying beds, each measuring 50.0 feet by 95.0 feet, into glass enclosed sludge storage buildings having a combined storage capacity for 80,000 cubic feet of dewatered belt press sludge. The enclosed buildings protect the sludge from rain and snow and also serve as an effective odor control facility.

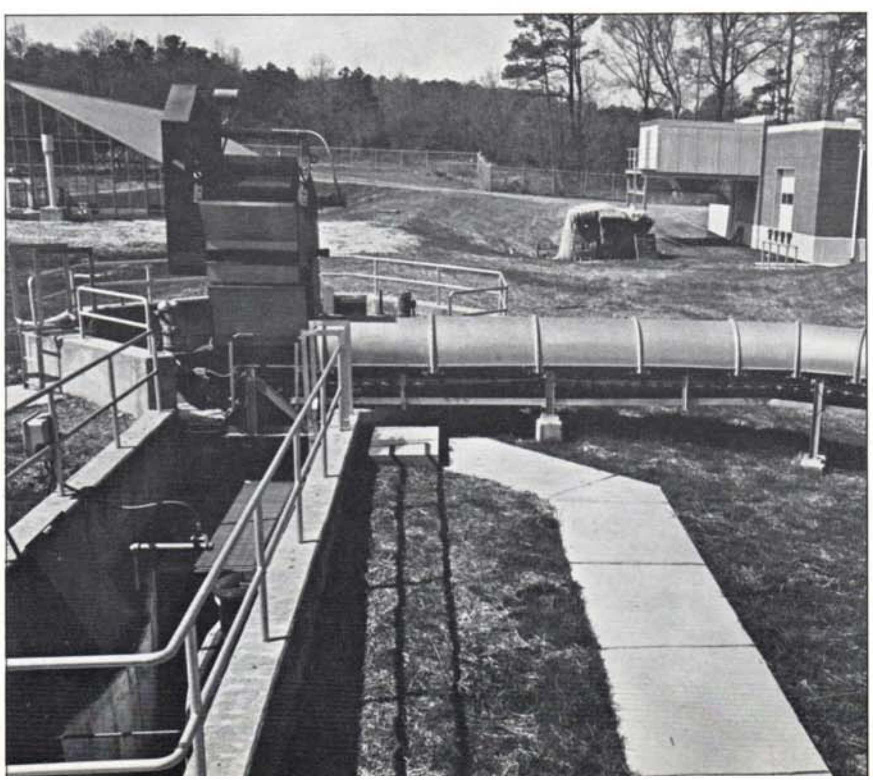
During the winter months, the dewatered sludge is picked up from the storage buildings by area farmers for use as a soil conditioner. During the summer, they can drive their vehicles under the sludge building's discharge hopper to pick up the dewatered sludge, Campbell explained.

One press operates 35 hours per week with the second serving as standby. Space in the building is available for addition of a third one-meter press. The belt press sludge feeds onto one of three Serpentix conveyors at Pine Hill Run WTP. The 51.5 feet Sepentix conveyor has a 20-inch wide, convoluted belt driven by a 2-horsepower motor. It is designed to carry 1-ton of sludge per hour up a 35-degree incline for discharge into a truck loadout hopper. From there it is discharged into the trucks of area farmers or taken to storage in one of the five sludge storage buildings.

In the grit and screenings area, Hansen explained that the problems with the stringy, plastic-like filament and the old method of grit dewatering and manual removal resulted in design of the unique continuous path conveying system used at Pine Hill Run WTP.

Prior to the expansion, the plant had a single receiving chamber where the sewage influent passed through comminutors and manually cleaned

THE NEW SLUDGE processing building is in upper right of photo at right and one of five new sludge storage buildings is at upper left. The new bar screen serving one of the three Serpentix conveyors is in left of photo.



screens. When the comminutor's broke down, which Hansen said was quite often, the material had to be collected and carried out in pails.

The plant's existing grit removal chamber is located about 150 feet away. In this facility, after the grit was removed from the influent, a bucket with an overhead crane and trolly system was used to manually remove it from the collection chamber for transport to landfill, Hansen explained.

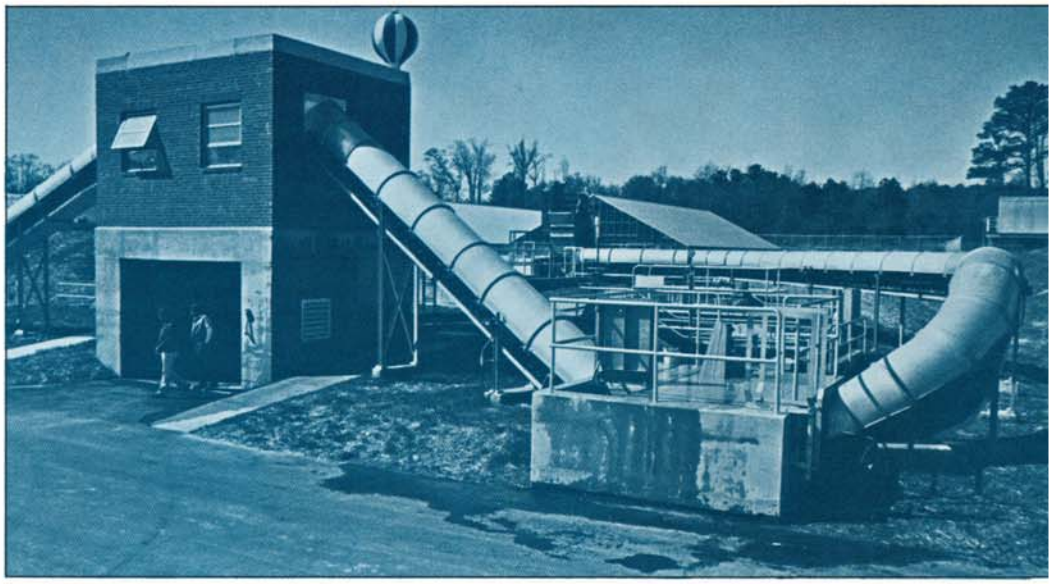
Compounding this problem and intensifying the labor requirements was the plastic filament entering the plant. Its origin has never been determined, Hansen said. However, as it entered the receiving chamber the comminutors would chop it up, which only increased its stringiness. In addition, the material created heavy wear on the comminutors and made them difficult to keep in alignment. Pumped into the digesters along with the sludge, the material would form a matrix on the surface which was almost strong enough to stand on.

A "scum breaker" was used to break it up, Hansen explained. However, the broken-up matrix would then be pulled into the suction line of the circulation system. Within a short time the recirculation pumps would jam and have to be torn down.

It was apparent that additional comminutors would not correct the problem, the material must be eliminated before it could enter the plant. The solution was installation of a self-cleaning filter screen. The fine screen (15 mm) could pick up most of the material without causing excessive head loss and the comminutors could be utilized as backup for the self cleaning screen.

In addition, because of the increase in flows it was necessary to add a new grit removal chamber to work in tandem with the existing grit removal facility. Also modifications were needed on the old chamber to eliminate the bucket, crane, trolly method used for disposing of the dewatered grit.

Due to the symetrical layout of the grit and screening facility, a maze of conventional conveying devices



AFTER RECEIVING SCREENINGS (center, background) the longest Serpentix dips down (foreground) to receive collected grit. It then climbs sharply to discharge its load in the new collection building. A second Serpentix enters the building from the other side.

would have been necessary for collecting and disposing of the screened material resulting from the new system, Hansen said. The answer was the design and installation of a three dimensional, continuous path conveying system that, according to Serpentix engineers, is one of the most unique and effective grit and screenings conveying systems in the world.

Two continuous path conveyors were needed: one is a 48.5 feet system which receives grit from the existing grit removal facility; the other is a 145.0 feet system that is shaped like a horseshoe. After receiving screenings from the new self cleaning bar screen, the belt travels in an arc to a point immediately north of the new grit removal facility. There it makes a 90 degree right turn and dips sharply downward to enter the chamber and pick up the grit. It then makes a sharp upward turn to begin a steep incline.

Located at a point midway between the old and the new grit chambers is a central collection building where the two conveyors meet and discharge their loads into a common hopper. Trucks back into the facility to receive discharge from the hopper then transport the grit and screenings to an on-site landfill.

The 145' Serpentix conveyor makes two 45 degree horizontal turns, one 90 degree helical turn, a 16-degree helical curve and a total of four vertical turns. The shorter unit makes a 14 degree helical curve. Both conveyors negotiate 30 degree inclines to achieve an elevation gain of 14 feet before entering the collection building from opposite sides. Both conveyors have 20-inch wide, convoluted belts. The longer Serpentix conveyor uses a 3-horsepower motor and the other has a 2-horsepower motor.

Operation of the two conveyors are hooked into the bar screen control so they run only when the bar screens are operating, Hansen added.

Other additions in the $10 million upgrade and expansion at Pine Hill Run WTP include: a primary digester, control building with laboratory, a new primary clarifier, two new trickling filters, two final clarifiers, two additional chlorine contact tanks, a dechlorination tank for removal of chlorine residual, a post aeration tank to maintain a dissolved oxygen limitation, an effluent pumping station, an emergency holding pond with a 4.5 million gallon capacity for shellfish protection and a septage receiving facility.