CONTINUOUS PATH CONVEYING

SUMMER/1989

Sludge Cake Discharges Over 12 Foot Arc

CONTINUOUS PATH
CONVEYING

Summer/1989 Volume 19 - Number 2

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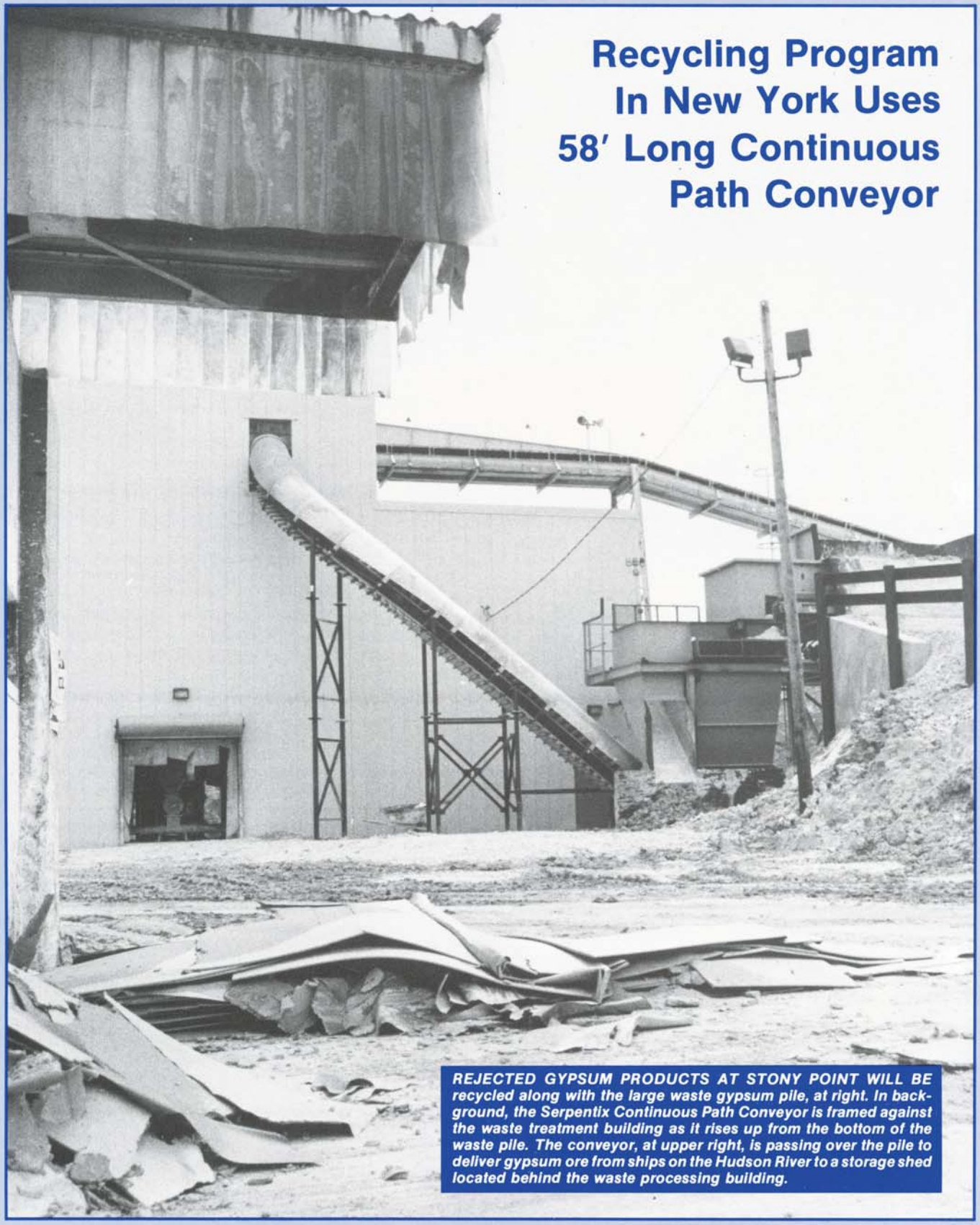
ON THE COVER

A 51' CONTINUOUS PATH CONVEYOR AT A 1.5 MGD regional wastewater treatment facility in Sedgwick County, Kansas, was designed with a discharge end capable of flexing up to six feet on either side of the Serpentix conveyor's centerline. Serpentix Conveyor Corporation design engineers worked closely with Sedgwick County's consulting engineering firm, Professional Engineering Consultants, P.A., of Wichita, to tailor the conveying system to the new plant's dewatering facility. Receiving dewatered sludge from a floor mounted belt filter press, the conveyor completes two 90 degree turns and an elevation gain of almost 10 feet to reach the truck bay in the dewatering building. Flexing of the discharge end is accomplished by pneumatically controlled actuators which can maneuver the belt at any point up to six feet on either side of the conveyor centerline. The drive station of the Four Mile Creek Continuous Path Conveyor is being checked (in the cover photo) by Jon Mills, utility maintenance crew chief. In this view, the Serpentix system is flexed all the way to the right side of the system's centerline. **Additional photographs and details of the Flex-End Serpentix are outlined in the feature article beginning on Page 9.**

Recycling Program In New York Uses 58′ Long Continuous Path Conveyor



REJECTED GYPSUM PRODUCTS AT STONY POINT WILL BE recycled along with the large waste gypsum pile, at right. In background, the Serpentix Continuous Path Conveyor is framed against the waste treatment building as it rises up from the bottom of the waste pile. The conveyor, at upper right, is passing over the pile to deliver gypsum ore from ships on the Hudson River to a storage shed located behind the waste processing building.

Stony Point Plant Using Serpentix To Help Abolish Large Waste Gypsum Pile

Almost one-half million pounds of waste gypsum are being recycled daily in a reclamation program implemented in 1988 at the U. S. Gypsum's Stony Point, N. Y. plant.

A key component in the $2 million facility, constructed for around-the-clock processing of an existing stockpile of the waste gypsum, is a 58 foot Continuous Path Conveyor by Serpentix Conveyor Corporation.

After the accumulated pile of waste gypsum is eliminated, gypsum products rejected by quality control during regular plant production will be processed through the waste recovery facility on an "as required" operating schedule, according to Plant Manager Jim Fountas.

The Stony Point facility is about 30 miles up the Hudson River from New York City.

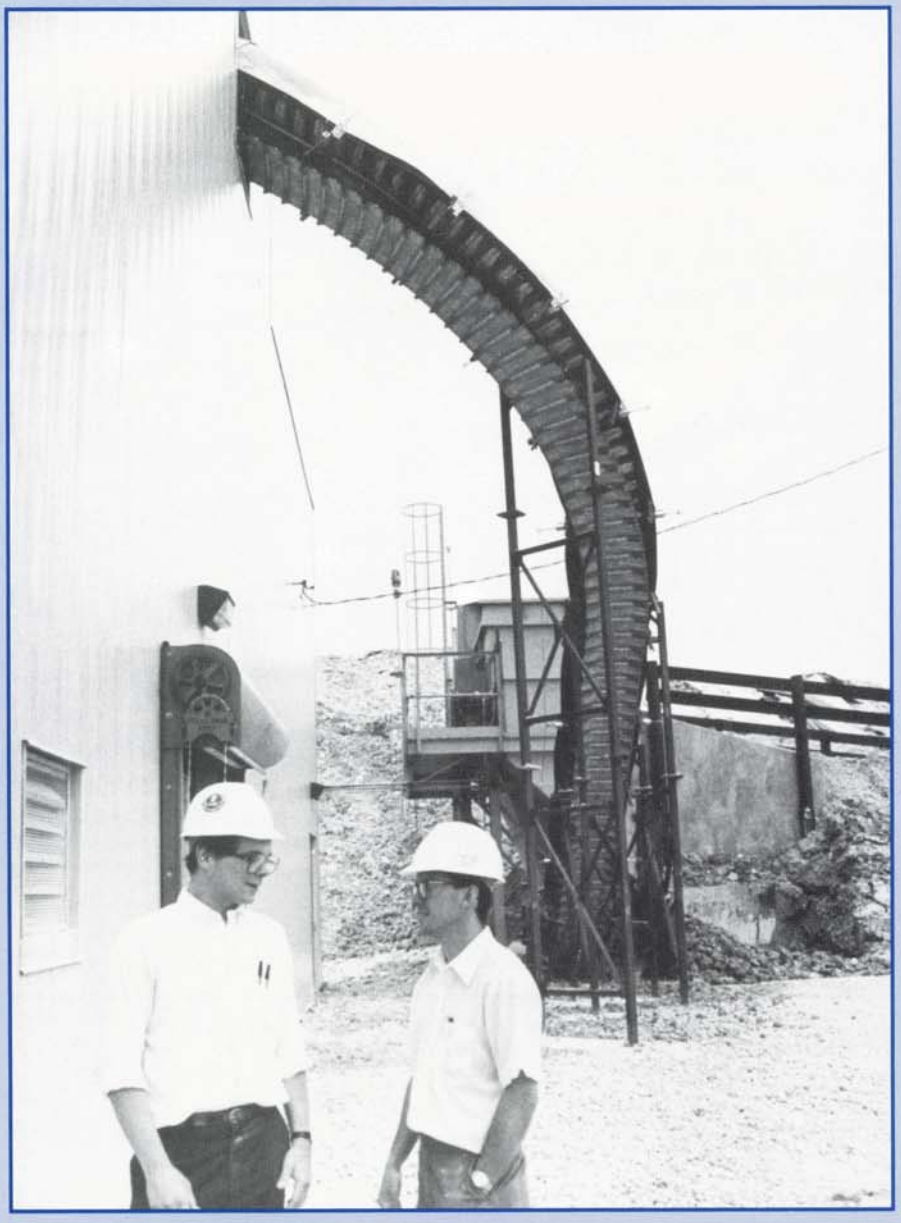
Located on the eastern shore at one of the widest points in the river, it occupies an area which once supported several brick plants. According to local talk, those plants supplied the bricks needed for constructing most of the buildings in the city of New York and adjacent areas.

The Stony Point facility is one of the largest gypsum board plants operated by U. S. Gypsum, a subsidiary of the USG Corporation.

The waste gypsum material being recycled at Stony Point looks more like mud, clay or dry dirt than the traditional sheetrock panels and other products manufactured. Before it can be mixed with the crushed ore feed for regular production, the waste must first be thoroughly dried and ground.

This posed a formidable problem in the early planning stages of the waste processing facility, according to Project Engineer Carl J. Bergsten.

When wet, the waste can range in consistency from a soupy mixture to a thick, tenacious gumbo which is almost impossible to remove from



THE 58' LONG SERPENTIX AT U. S. Gypsum's Stony Point, N. Y., facility can be seen in the background entering the new $2 million waste processing plant. In the foreground, operational details of the long range waste gypsum reclamation project at the New York facility are discussed by Stony Point Project Engineer Carl Bergsten (left) and Jeff Brummert, mill superintendent.

GYPSUM ROCK ORE FROM CANADA IS being unloaded (in the photo at left) from the large ore ship docked at its Hudson River berth, about one mile from U. S. Gypsum's Stony Point plant. A covered, conventional flat belt conveyor (seen exiting at the right of the picture) transports the gypsum ore from the ship to the rock ore storage shed for start of the manufacturing process.

THE SERPENTIX CONVEYOR AT Stony Point is located at ground level on the corner of the waste processing building. The conveyor is seen here making its helical turn to the right and entering the building after elevating gypsum from the sizing hopper at its left.

any surface. When dry it resembles a fine powder, interspersed with softball size, rock-like clods of congealed gypsum and assorted pieces of tramp metal.

"One of our very basic problems was getting the waste gypsum from the pile into the new processing plant," Bergsten explained. "Frankly, we didn't know if a conveying device such as the one we would need even existed."

"Our specification seemed to indicate the need for a complex series of units that could be very expensive to purchase and to install, and would certainly result in continuing, heavy maintenance, plant cleanup, and other related operating costs," Bergsten added.

After a great deal of research and investigations a very simple solution to Bergsten's problem was apparently found when he visited a nearby wastewater treatment plant.

There he saw a Serpentix Continuous Path Conveyor easily handling what is considered to be the world's most difficult-to-handle material, sewage sludge. And, the convolutions in the rubber-like surface of the belt were quite similar to the cleats used on conventional conveyor belts, Bergsten said.

With a little more digging, Bergsten discovered that the same type of conveyor could climb at steep angles without material rollback, make vertical and horizontal turns and, due to a unique self-cleaning feature, could remove almost 100 percent of most products conveyed from its convoluted surface.

The "clincher" came when Bergsten found out that dry, powdery and/or lumpy material could be conveyed with equal ease, and that a single Continuous Path Conveyor could be designed by Serpentix to handle the waste gypsum at Stony Point.

The waste processing facility became operational in late 1988. The 58 foot Serpentix conveyor, operating with a 26-inch wide, convoluted belt powered by a three horsepower motor, is positioned at the corner of the building at one edge of the waste gypsum pile.

Front end loaders working the pile load gypsum waste into an overhead hopper/grinder. It is then fed through a plus three-inch screen onto the Serpentix conveyor.

After a short level run, the conveyor makes a vertical turn and starts a 40

THE NEW WASTE GYPSUM PROCESSing plant is centered between the supports for the conventional conveyor transporting ore over the waste gypsum pile from the ship to the rock ore storage shed (in right of photo).

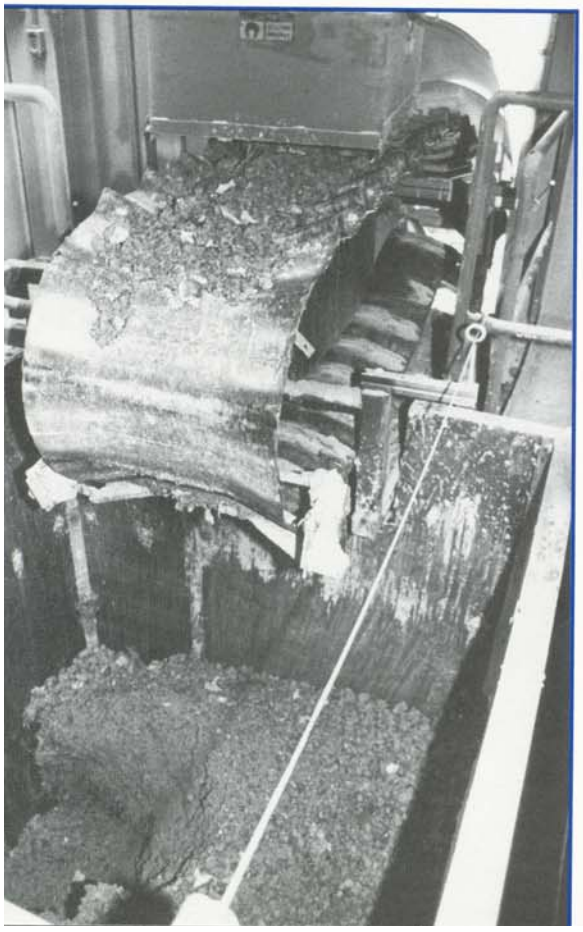
***FRONT END LOADERS CARRY WASTE** from the pile up the ramp (in left of the photo at left). There it goes into the large hopper where it is loaded onto the Serpentix Continuous Path Conveyor. Starting from ground level at the corner of the building, the Serpentix system carries the waste material up a 40 degree incline. After an elevation gain of 20 feet, the system makes a 90 degree helical turn to the right and enters the waste processing building.*

degree climb. Traveling at 40 feet per minute, the convoluted belt is designed to carry 15 tons of waste per hour up to and through a 90 degree helical turn.

The conveyor enters the waste processing building 28 feet above ground level. After another short level run the waste gypsum is discharged into a 10-ton capacity even-feeder holding hopper.

Eight screw conveyors in the bottom of the hopper then channel the waste into a pug mill for mixing then into a heated hammer mill. Drying and sizing to the fineness desired is accomplished in a 1200 degree air stream. After separation from the stream the material is processed through a classifier and cyclones.

The gypsum powder is then drawn out and pneumatically conveyed into a 50 ton storage bin. Subsequent distribution feeds the material into calcining kettles for start of the new production process.



***THE BELT CONVOLUTIONS FLATTEN** as the waste gypsum is discharged into a 10 ton capacity even-feeding holding hopper. Eight screw conveyors in the bottom of the hopper channel the waste into a pug mill for mixing then into a heated hammer mill. A special feature of the U. S. Gypsum Serpentix included the use of stainless steel stiffeners in the belt pans. This was done to permit suspension of a powerful magnet over the discharge end of the conveyor belt to extract any tramp metal from the waste before its discharge into the hopper.*

Sheetrock and other products at the Stony Point plant are made from gypsum rock ore transported from company owned mines in the Canadian province of Nova Scotia. Ships carrying approximately 20,000 ton of ore each, provide a continuous flow of gypsum to Stony Point and other east and gulf coast plants of U. S. Gypsum.

The ships are unloaded from their Hudson River berths at 1,000 tons per hour. The ore is transported overland approximately one mile by a series of conventional belt conveyors to a giant rock ore storage shed.

From there it goes to a mill building for primary crushing after some of the sized rock is scalped off for use in the manufacture of Portland Cement.

After crushing, all moisture is removed in a rotary drier. Some of the ore is then used for making land plaster, with the remainder -- now an extremely fine powder of 90 to 100 mesh -- being shunted to calcining kettles which are similar to the old double boilers.

In this process, approximately 75 percent of the chemically bound water in the ore is driven off, resulting in gypsum stucco.

Transported to the board plant, the stucco is recombined with water between sheets of drywall paper. This literally creates the molecular rock structure found in the gypsum rock ore. The result is sheetrock -- or, drywall -- which is so vital to the construction industry.

Almost 100 percent of the original waste gypsum pile should be recovered, Fountas said.

The greatest benefit for both the company and the community will be the increased pride both will share in helping to restore the area environment to what it once was. ■

Durable Serpentix Unit Uses Only 5 Belt Pans In 7 Years Of Service

CHANGES TO THE OLDER SERPENTIX CONVEYOR AT BINGhamton include a new drive station to replace the take up station shown above. The railing, at right, is around the access hole leading to a lower level space extending under the older conveyor. A second 365 foot long conveyor by Serpentix will be positioned in it under the original Serpentix to receive dewatered sludge for transport to the new composting plant.

AN ENVIABLE RECORD WAS COMpiled by this 40 foot long Continuous Path Conveyor at Binghamton, N. Y., according to officials at the Binghamton-Johnson City Joint Sewage Treatment Facilities. The only spare parts required by the system during seven years of continuous service were five belt pans. No other significant efforts were necessary for its maintenance.

Binghamton Serpentix Sets Maintenance, Parts Record

The spare parts, ordered seven years ago when the Binghamton-Johnson City Joint Seweage Treatment Plant in New York purchased a 40 foot conveyor from Serpentix Conveyor Corporation, appeared to be woefully inadequate.

In retrospect, the five belt pans ordered were just enough. But, the four extra chain links and the two spare chain splices that came with it just weren't needed.

Running almost continuously since 1983, when the 20 million gallons/day (mgd) faciliity converted its old coil filters to belt filter presses, the Continous Path Conveyor transports dewatered sludge to an adjoining bay for discharge into trucks.

With a typical Irish grin...and, an understatement to emphasize two key points...Binghamton Plant Superintendent William J. Horrigan, Jr., explained that "it has only been costing us about $1,314,000 a year for the trucks to haul the cake 200 miles to a landfill near Buffalo."

That high annual cost for hauling and landfilling was one of the main

points resulting in our decision to construct an $11 million state-of-the-art composting plant which is scheduled to go on line yet this year.

The second point, Horrigan explained, hinged on the fact that we wanted to make sure that there would be no major problems in getting our sludge from here (the dewatering area) to the new composting facility (a distance of more than 300 feet) for processing.

Our engineering consultants agreed that the performance of our first Serpentix conveyor (a 40 foot Model I unit) made our selection of a second conveyor from Serpentix for the composting facility a foregone conclusion, Horrigan said. The consultants are Vernon O. Shumaker/ Calcerinos & Spina, Joint Venture Engineers of Binghamton.

"In seven years of continuous operation the only parts we have replaced have been five of the individual modules (pans) in the belt," Horrigan said. "And, the only labor expended on its maintenance has been that required for replacing those pans."

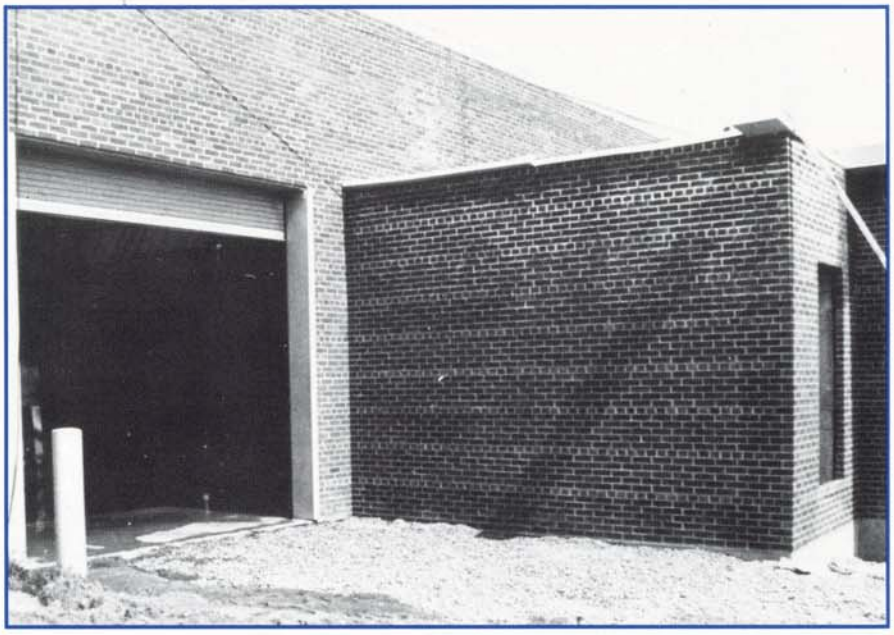
"Oh, in addition to that maybe every six months we've tightened the pulling chain," he added, "but that has been next to nothing in time expended."

There have been minor tears in the belt surface, but they have caused no great concern. The longest ones are up to eight inches, and can only be seen as convolutions in the felt flatten out as it passes over the discharge or take-up terminals. But, the tears close up -- and there is no leakage -- once the belt resumes its level run, Horrigan added.

We don't necessarily have a great preventative maintenance program, Horrigan explained. However, we do have excellent mechanics and when any piece of equipment in our plant -- which is 30 years old -- goes down, it is fixed immediately.

"The conveyor (Serpentix) requires little or no maintenance," he added. "And, we've had no special program to keep it operating. That's why I wanted another one just like it for our composting plant," Horrigan said.

"In the new plant we have literally thousands of feet of many different types of conveyors...but, our new Continuous Path Conveyor is the only one that I have no worries about whatsoever," he added.



A 365 FOOT SERPENTIX CONVEYOR will be installed at Binghamton to transport dewatered sludge from the existing dewatering facility to a new composting plant now nearing completion. The new conveyor will begin at a point under the present 40 foot unit -- which will be lengthened by two feet. It will leave the dewatering building through the small opening in the right of the above photo.

As in the past, the present Serpentix conveyor at Binghamton will play an important role relative to the composting facility and the new 365 foot long Continuous Path Conveyor that will keep it supplied with dewatered sludge.

Installation of the new composting Serpentix this fall will include modifications to the old 40 foot conveyor.

THE SMALL WHITE AREA SLIGHTLY left and down from the workers on the building (in the right of the photograph) is the opening through which the Serpentix conveyor from the dewatering building will enter the composting plant (also see artist's rendering on Page 8).

This will include a new drive station, increasing the conveyor length to almost 42 feet, and reversing positions of the take up and drive stations.

This will position the take up station of the composting conveyor directly beneath the new drive station.

The modification will give the older conveyor the ability to reverse directions as needed -- supplying sludge cake to the composting conveyor or delivering it, as in the past, to the truck loadout bay.

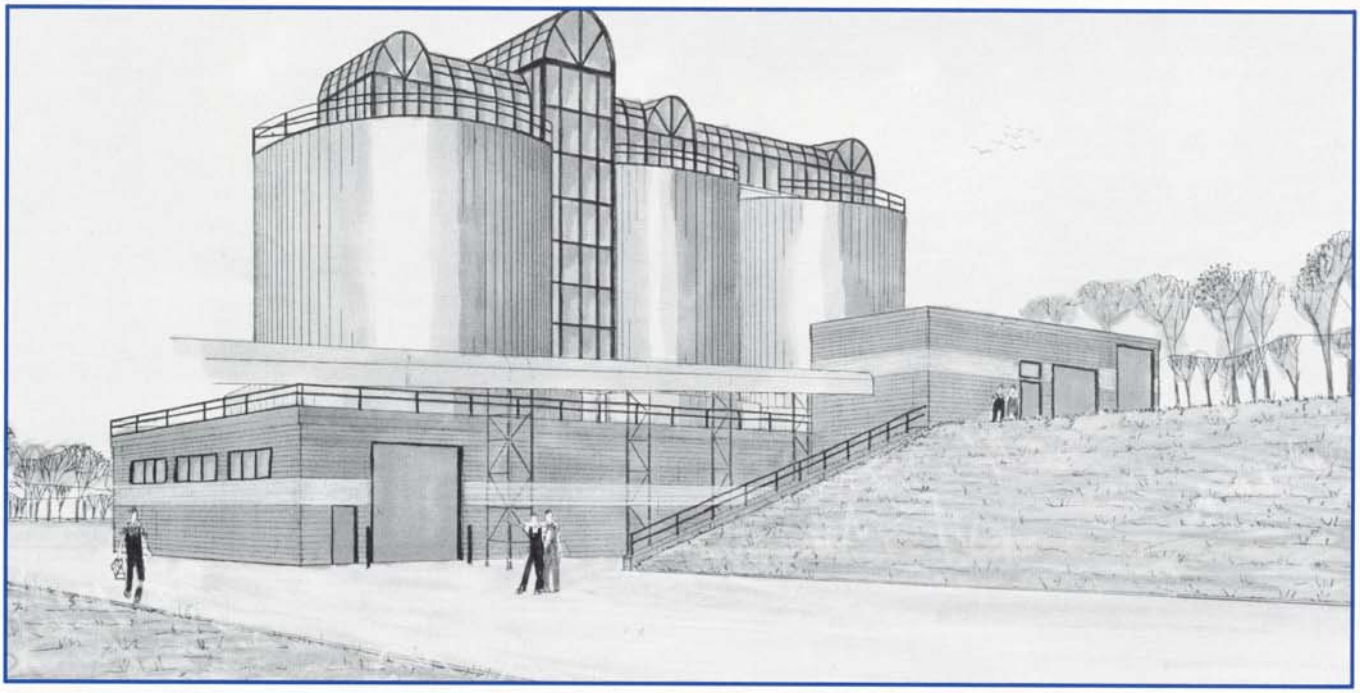
Construction and modifications at the Binghamton-Johnson City facility -- designed to treat an average daily flow of 18.25 mgd -- will have no effect on the present average daily flow of 20 mgd being treated. Horrigan explained that there is no room at its present site on the Susquehanna River for an expansion to increase the plant's capacity.

The secondary wastewater treatment facility has accountable wastewater of about 14 mgd, the rest is influent infiltration, he explained, since we have combined sewers. However, we are organically underloaded, which means we can handle more sewage, but we are hydraulically overloaded.

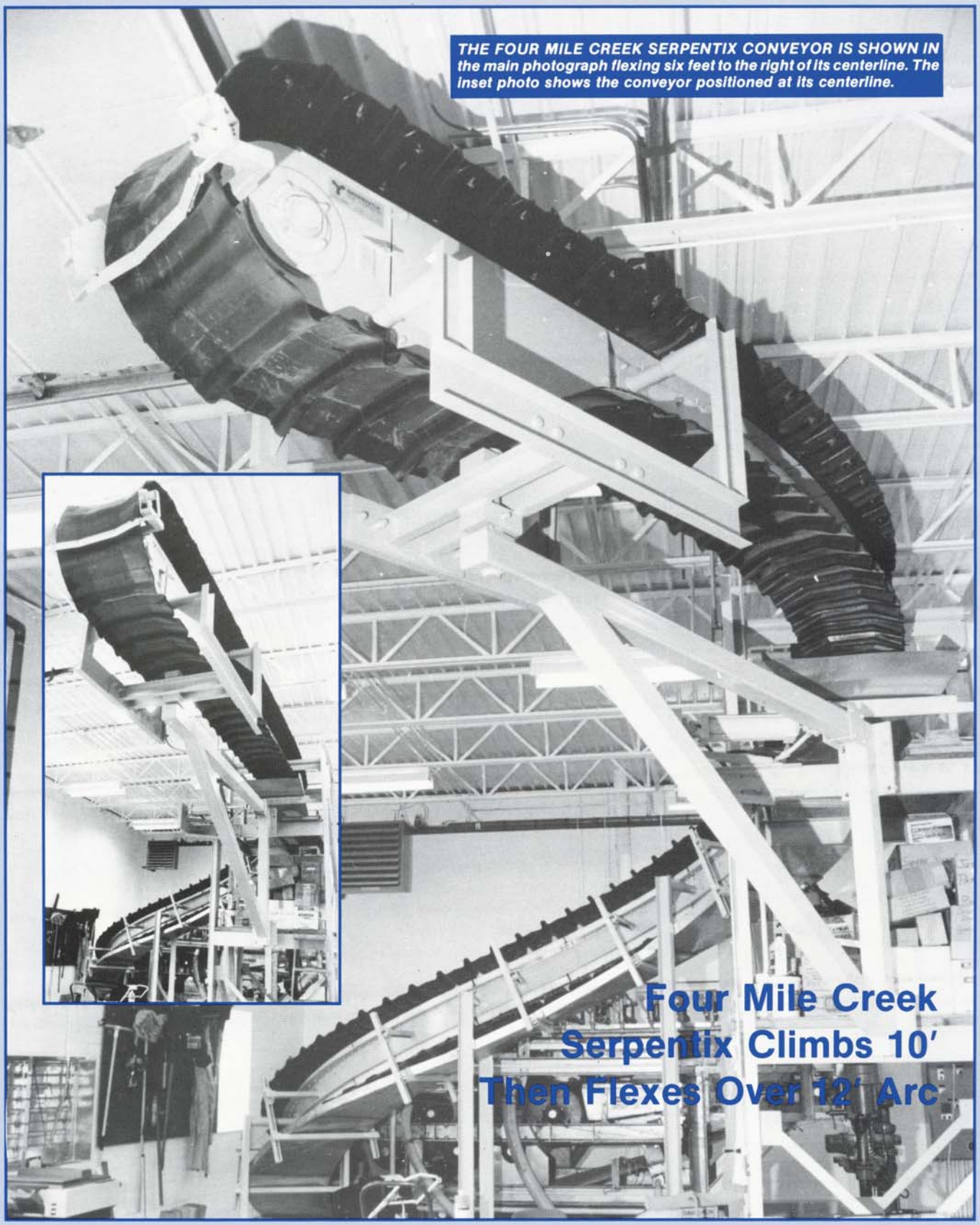
The only way we can increase our capacity at this facility without physical expansion -- for which there is no space -- would be to separate our existing sewers to eliminate influent in-flow (storm water runoff) and infiltration, Horrigan explained.

It is estimated that the new composting facility, which will go on line in early 1990, will save Binghamton-Johnson City approximately $1,314,000 annually in trucking and landfilling costs. In addition, the composted sludge will provide a marketable product which, during the first year is expected to provide a sales income ranging from $30,000 to $50,000.

Operational savings, elimination of trucking and landfilling costs and income from compost sales is expected to provide a full payback on the new composting plant and equipment within two years, Horrigan said. ■



***THIS ARTIST'S SKETCH DEPICTS THE** new composting facility as it will appear when completed later this year. The circular tanks are reactors. The two smaller ones -- where the biological process takes place -- are the bio-reactors. The large one on the left is the cure reactor. The sludge and carbon hoppers are on the right side of the facility where the Serpentix conveyor can be seen entering after having left the dewatering building in the main facility. In the bottom photograph, the relation between the main (older) facility (at left) and the new composting plant (right) can be seen.*



THE FOUR MILE CREEK SERPENTIX CONVEYOR IS SHOWN IN the main photograph flexing six feet to the right of its centerline. The inset photo shows the conveyor positioned at its centerline.

Four Mile Creek Serpentix Climbs 10′ Then Flexes Over 12′ Arc

Continuous Path Conveyor In Kansas Flexes Over 12' Arc To Spread Cake In Truck Bed

A 51 foot long Continuous Path Conveyor that will flex six feet on either side of the system's centerline is one of two Serpentix conveyors installed at the new Four Mile Creek Regional Wastewater Treatment Facility in Sedgwick County, Kansas.

Construction planning, which started more than 10 years ago, culminated this year when the solids concentration at the new Kansas facility built up sufficiently to begin dewatering operations, according to Four Mile Creek Superintendent Darryl Osburn.

Located due east of Wichita on an 80 acre tract just inside the Sedgwick/Butler County line, the $4 million plant presently serves approximately 1,500 homes. The project cost was increased by an additional $2.3 million for construction of two interceptor lines to service the 13,000 acre area.

Designed to serve a population equivalent of 15,000, Four Mile Creek is presently operating at about one-half of its permitted capacity, or one-third of design capacity.

James Weber, P.E., director of sewer operations and maintenance for Sedgwick County, estimated that,

THE EXTREME FLEXING ACTION OF the Continuous Path Conveyor at the Four Mile Creek Wastewater Treatment Facility in Sedgwick County, Kansas can be seen below. The center photo shows the system on its centerline. At left, and right, the Serpentix conveyor is flexed six feet on either side of its centerline.

depending on the area growth rate, Four Mile Creek will reach capacity in "another 10 to 15 years."

At that time, our plans call for increasing our capabilities to 3 mgd which would let us service up to 30,000 people. This can be achieved easily and with minimal additional cost since our original design is predicated on such an increase, he said.

Resembling a city park more than a wastewater treatment facility, the Four Mile Creek plant is on the eastern side of a north/south ridge running through Sedgwick County. The city of Wichita is located west of the ridge in the westward flowing Arkansas River drainage basin.

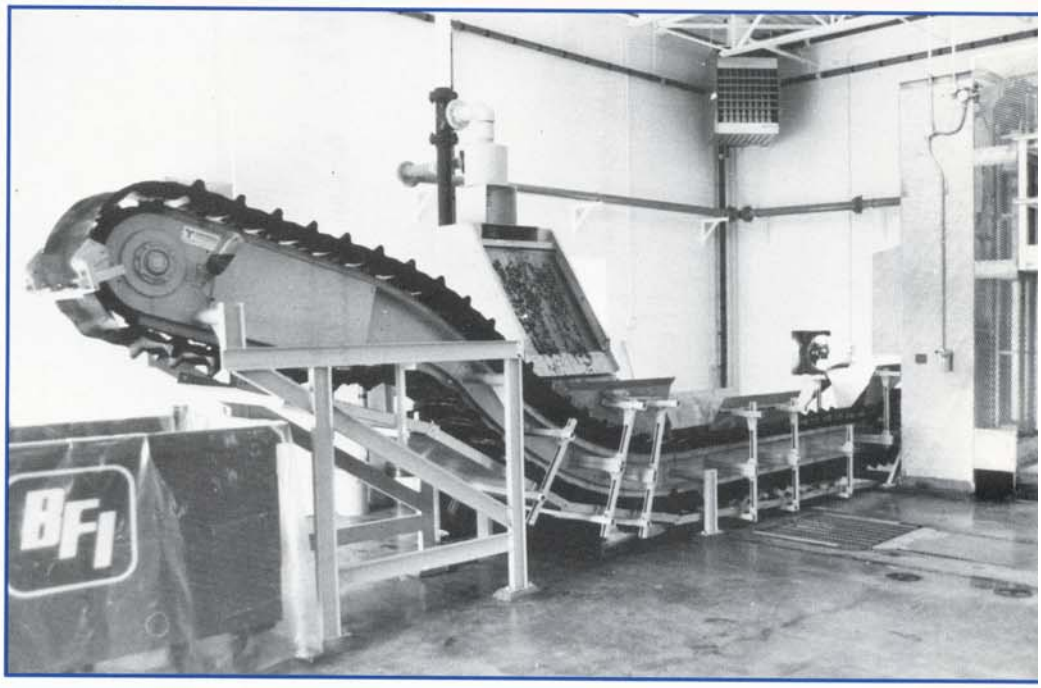
The Four Mile Creek drainage basin flows eastward, exiting Sedgwick County into Butler County with the flow eventually going into the Walnut River.

The shorter of the two Serpentix conveyors -- a 31 foot unit -- collects grit and screenings in a separate headworks facility located approximately 150 yards from the main plant building.

Operating on a straight line at floor level, the 20-inch wide, convoluted belt conveyor receives screenings from a bar screen, passes a degritter unit where it receives the grit, then makes two vertical curves to gain sufficient elevation for discharging into a floor hopper.

The second Serentix conveyor also has a 20-inch wide belt. It is in the main building where the laboratory, administrative offices and the dewatering area are located. In the dewatering process, a three-meter, floor mounted belt filter press feeds sludge cake onto the flex-end conveyor.

Starting its climb almost immediately, the 51' 06" Continuous Path Conveyor makes a 90 degree turn to the left and another to the right. It then levels off with its flexible end extending almost 10 feet above a drive-in truck bay.



THE SECOND SERPENTIX AT THE regional treatment facility near Wichita, Kansas, transports grit and screenings to a dumpster. The smaller system is 31' 4" long and the larger, flexible end system is 51' 6".

The dewatered sludge can then be evenly distributed over the length of the truck bed by pneumatically controlled flexing of the conveyor's discharge end up to six feet on either side of the conveyor centerline. Each conveyor, powered by a 3 horsepower motor, is designed to transport one ton-per-hour at a rate of 22 feet-per-minute.

The new Four Mile Creek plant replaces four older wastewater treatment facilities. They included the Timber Lakes-Springdale Sewage Lagoons, a two cell lagoon that had been expanded to three; the Park Meadows Sewage Lagoon, a one cell system; the Shadybrook Farm Lagoon, a two cell system; and, the Crestview Treatment Plant. At first, the Crestview plant was a lagoon system. It was replaced by a package plant which later became a larger package plant.

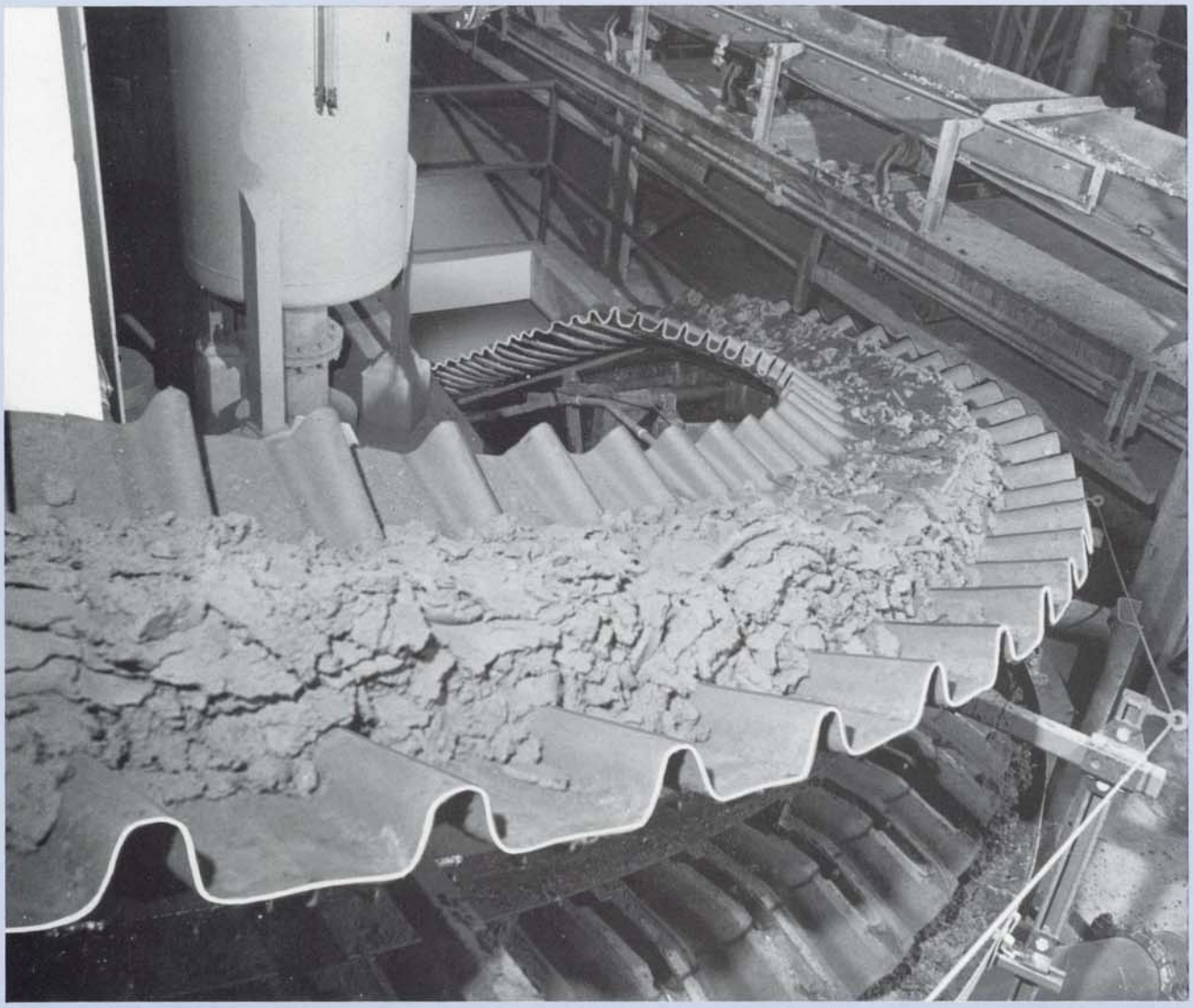
The Timber Lakes lagoons were kept to become part of the new plant, serving as over-flow basins during heavy rains.

The Four Mile Creek facility currently has a 1.5 mgd rating with an average daily flow between .7 and .8 and a peak flow of 4.5 mgd. It is an extended aeration facility which retains the wastewater within the facility for 18 to 24 hours, allowing ample time for breaking down of the more difficult sewage compounds.

Four mile Creek is fed by a conventional pump station serving two interceptors. Surcharge relief is provided by a second pump station at the Timber Lakes lagoons, which will contain excess flows until conditions permit return of the excess to the main treatment plant.

The present Phase 1 plant has two primary aeration basins and one clarifier. The primary means of sludge disposal is through the application of wet sludge to the land at the plant site, or through the use of the belt filter press and subsequent hauling for disposal in a sanitary landfill.

The Four Mile Creek plant operates 16 hours a day during the week and eight hours daily on weekends, Osburn said. The seven member work force includes three maintenance people, three operators and the plant superintendent. ■



Serpentix is the world's only mechanical belt conveyor which can carry most bulk materials in a three-dimensional, continuous path where turning and/or inclining in excess of 18 degrees is required. This ability to operate in all planes allows creative, three-dimensional design of future facilities and retro-fitting of existing plants — holding down design, construction and equipment costs.

Its convoluted belt lets the Serpentix conveyor move materials, regardless of density or flowability, at up to 400 TPH while making horizontal, vertical and helical turns.

Continuous Path Conveying by Serpentix eliminates troublesome transfer points with a belt that is self-cleaning. The convolutions in the belt flatten as they pass over the terminal, letting most material drop off naturally. Sticky material is easily removed by scraping.

Operating over a continuous path, Serpentix easily outperforms — at less cost — old-fashioned, conventional conveyors which can only operate along a straight line.

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