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Summer 2002

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A "Recycled" Bridge in Allegany County, NY

by Christopher M. Ernst

We have worked with the Allegany County Department of Public Works (DPW), which is under the direction of Superintendent David Roeske, on a very interesting project this past year. A steel beam bridge with a concrete deck on County Road 4 in the Town of Granger was built in 1965 as a way to cross the Erie Lackawanna Railroad tracks. Recently, the railroad had abandoned this rail line and had removed the tracks, therefore making the bridge unnecessary. The bridge was inspected and the four 140-ft. long beams were found to be in very good condition. An idea was developed to move the beams from the former railroad crossing to another location in the County where they would be more beneficial.

The location chosen to receive the beams was the crossing of County Road 29 over the Genesee River in the Town of Willing, which is located just south of the Village of Wellsville. The existing 80 ft. span thru-girder bridge at this location has a history of flooding due to insufficient waterway opening and underclearance (the distance between the bottom of the bridge and the water surface). The Genesee River has flooded the adjacent agricultural fields and County Road 29 to the point where the County officials have been forced to close the road until the flood waters recessed. Another reason for replacing the existing bridge is the fact that the bridge has been posted for a maximum loading of 20 tons. This load posting was due to the fact that the bridge is at the age where many of the steel members used to build the structure have begun to fail. Also, the bridge has a clear width of 20 feet, which is narrow by bridge standards. This narrow width makes the bridge a safety liability for everyday motorists and an inconvenience to the County's maintenance crew, in that they are unable to cross the bridge with their snowplow when its extended wing is in the plowing position.

The first step in making this project happen was to remove the beams from their original location. The bridge was removed and the gap in the roadway was filled in with gravel and paved to match both ends of the existing road. The beams were then transported to the Allegany County DPW maintenance shop at Yorks Corners in the Town of Willing, approximately 40 miles away from their original location and less than one-half mile away from their proposed destination. The beams were refurbished and prepared for installation by the DPW maintenance crew.

The next step was the design of the new bridge using the refurbished beams and the acquisition of the necessary permits to perform the bridge replacement. A hydraulic analysis was conducted and it was determined that the best design was to place the bottom of the 58-inch tall beams at the existing road elevation (approximately 3.5 ft higher than the existing structure), therefore increasing the underclearance and reducing the risk of flooding. The risk of flooding will also be reduced since the new bridge will have a span approximately 60-feet longer than the existing bridge, therefore allowing for a greater waterway opening. The new bridge will also be substantially wider

(approx. 10-feet) and will not require a maximum load posting, therefore making the bridge accessible to a wider range of traffic. The final step was the removal of the existing structure and the construction of the new bridge, which is taking place this summer. The County is going to utilize their own staff in the removal of the existing bridge, perform all necessary earthwork and road construction and construct the sheet-piling abutments that the beams will be placed on. Transporting and setting the beams on the abutments, construction of a concrete deck and installation of bridge rail will be completed by a contractor using a competitive bid process.

This bridge is a great example of utilizing the resources that are available to you. Allegany County will be able to improve the crossing of County Road 29 over the Genesee River by not only using four "recycled" steel beams, but also by using the manpower and skills that their own staff is able to provide.

Upgrade Evaluation of Your Wastewater Treatment Plant

by Jeffrey C. Bahret, P.E

Is your municipal wastewater treatment facility in need of an upgrade? Do you have aged, failing components that have reached the end of their economic life? Is your plant hydraulically/organically overloaded? Or, has there been a change in your outfall stream standards, mandating an increased treatment level requirement? If so, this article will give some initial guidance in assessing your alternatives.

The majority of small to medium (0.1 to 5.0mgd) sized wastewater treatment facilities presently in operation are of the "Fixed Film" type of treatment process. The two primary treatment devices used in Fixed Film are; the 19th century "Trickling Filter," and its 20th century counterpart; the "Rotating Biological Contactor" (RBC). Both devices entail growing a bio-film over a media (rock or plastic) and allowing the organic laden wastewater to come in contact with it. By doing this, the dissolved and non-settleable solids are assimilated as food by the bio-film to create more organisms. Then as the bacteria gets old and heavy, it breaks away from the media and is carried away with the water stream to the secondary clarifier. This now converted organic matter has a specific gravity greater than water, and settles out of the waste stream for collection by the sludge mechanism. This is a process which has worked well for nearly 200 years. It does however have some limitations and the age of most of these units necessitate compulsory replacement.

So, the question becomes; do we keep the same process and replace in kind with current materials? Or, is there an alternative treatment method that will provide us with 21st century performance? The answer is that there is a modern treatment process with many advantages to "fixed film." And depending upon a number of operational items, it maybe the most cost-effective solution in your plant upgrade.

The process is called the "Sequencing Batch Reactor" (SBR). Batch treatment utilizing activated sludge is not new. The first activated sludge batch systems were developed and patented in the early 1900's. However, lack of convenient and effective control systems rather than process-related developments in hardware such as electronic and solid state timers, solenoids, microprocessors, and computer software have overcome these problems and rendered this technology a viable candidate for the treatment of municipal wastewaters.

SBR technology is the treatment of wastewater on a batch basis and is no more than an activated sludge system which operates in time rather than in space, i.e., all steps of the process take place, one after the other, in the same tank instead of moving to a second tank for the continuation of the treatment. Typical SBR operation involves filling a tank with raw wastewater or primary effluent, aerating the wastewater to convert the organics into microbial mass, providing a period for settling, discharging the treated effluent, and a period identified as IDLE that represents the time after discharging the tank and before refilling. For most projects, a multiple tank

system is required. This configuration allows incoming flow to be switched to one tank while the other is going through the aeration, clarification, and discharge functions. A key element in the SBR process is that a tank is never completely emptied, but rather a portion of settled solids is left in the tank for the next cycle. The remaining portion of this residue (sludge) is wasted. The fraction wasted will depend upon the desired sludge age.

The retention of sludge within the tank establishes a population of microorganisms uniquely suited to treating the waste. During the process, the microorganisms are subject to periods of high and low oxygen and high and low food availability. This condition develops a population of organisms which is very efficient at treating the particular wastewater. This process also will prevent the filamentous organism growth which plagues the traditional activated sludge treatment method.

In summary, because the conversion from "fixed film" to SBR's is centered upon the use of existing tankage and many other in-place existing facilities, the following questions must be answered to determine if this plan is right for your WWTP:

1. Are existing trickling filter and RBC concrete tankage in good condition?
2. Can the existing concrete tank walls be raised?
3. Is your plant total gravity flow?
4. If so, can it support an additional 6 feet of water surface diversion?
5. Is the wastewater flow stream at your plant pumped once?, twice?
6. Are your existing pumping facilities in good condition?
7. Is your existing electrical service and standby generator system capable of handling an additional 20 to 30 percent increase in load?
8. Have you had a difficult time meeting you present SPDES discharge limits? Or, will stream standards for you outfall change in the near future?

Keeping Up With Technology

by Al Vanderpoel, P.E.

In 1972, I received a Civil Engineering Degree. That is less than thirty years ago, but in that short time span, I have seen the technology of the profession change greatly.

In 1972, the American Civil Engineer's Handbook, written in 1911 and revised in 1951, was still very much the bible. Computations were done long hand (a term that will be lost very soon). Computers (about the size of a garage) were just in their infancy, and hand held calculators were still to come. Drawings were done by draftsmen with ink pens, road cross sections were individually plotted, earthwork was calculated by adding strips of measured depths, and forms were made for the multitude of computations. Surveying was done with the same methodology used by George Washington, and while the transit and the level were technologically improved, the procedure was essentially unchanged. Turning angles, measuring distances and recording elevations were done with instruments and tapes, and the results were written in a field book, which was improved with a "write-in-the-rain" quality. I can recall holding a match under the plates of a transit in very cold weather to warm them slightly so they could be turned.

Now in 2002, the technology has advanced many times faster in the last thirty years than it did in the three hundred years before that. The work can be done with fewer people, and the accuracy is greater.

The "handbook" is still in the office, but it has been replaced by computer software. Engineering is still basically a process of analysis, design, construction and maintenance, but without question, the ability to analyze and the efficiency of design have been improved.

Today, surveying is done with an instrument that uses laser technology to measure distances and turn angles. Two person survey crews are normal, and one person can operate with a

Global Positioning Satellite system. The data that is measured is no longer written in a field book, but is recorded in a data collector that directly downloads (a word unheard of in 1972) the information into a computer. Computer assisted drafting (CAD) plots the data onto paper, but this to will be a thing of the past when disks will replace paper drawings. The computer can do the methodology tasks of calculations on a scale that would be impossible to do on paper. For example, cross sections can be plotted directly from the survey data, and earthwork quantities can be calculated, all with an accuracy impossible thirty years ago.

Without question, technology in the civil engineering profession will continue to improve. And E & M Engineers and Surveyors, P.C. will stay up with the current technology. The benefit to the client is the greater accuracy that comes with a computer assisting engineers. Thirty years from now, technology will have taken us further down the road, and we will again look back to say "how did things ever get done in 2002?"