Forum

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Jones & Henry Engineers, Ltd.

# Adrian Wastewater Treatment Plant - Phase II

**By Daniel W. Miller, P.E.**

The City of Adrian, Michigan utilized a two phase approach, funded by the State Revolving Loan fund, to improve both the wet and solids streams of the wastewater treatment plant.

In 2003, the wet stream portion, Phase I, was completed, including new final clarifiers, fine bubble diffusers, and hydraulic improvements. The project resulted in an increase in peak flow capacity from 7.0 to 21.0 mgd. The Phase II design started in 2004 concentrated on the solids stream and two other major concerns.

The risk to the community through use of one-ton chlorine cylinders utilized for disinfection, was the first concern. Various options were reviewed and ultraviolet disinfection was selected based upon a lowest present worth. A high intensity/low pressure horizontal bulb configuration was installed for a 7.0 mgd average and 21.0 mgd peak hydraulic capacity. The system channel included a reduction baffle to permit expanding the system to a 10.0 mgd average and 28.0 mgd peak.

The second concern was the site utilities including the plant water system, site heating loops, pavement, and general site drainage. The plant water and site heating loops were suffering many failures due to age, corrosive soils, and unstable soils. To combat the corrosive soils, C-900 PVC piping was utilized for the new plant water system and insulated PEX for the site heating loop.

The solids stream improvements focused on three areas.

The first area was the general condition of the anaerobic digesters, including insulation, digester gas equipment, and valves. All the digesters required cleaning. No digester cleaning had been performed for over twenty years. A separate contract was developed and a construction sequence was devised to permit the cleaning of the digesters with minimal interruption to the main construction contract.

The digestion system consists of three concrete fixed cover primaries and three steel floating secondary gas holders. The


insulation on the primary covers had failed due to digester gas leaking through the fixed concrete covers and age. Concrete restoration, interior recoating and new insulation was planned and installed on the fixed concrete primaries. Insulation on the secondary steel covers was removed and the steel covers scheduled for recoating.

The second improvement area was to improve the digester heating and mixing systems. A fixed nozzle pumped mixing system was installed for each of the three primary digesters to mix the contents.

Spiral heat exchangers were selected to transfer the heat from the rehabilitated hot water system to the digested sludge.

Digested biosolids are stored before land application in two one million gallon - 110 foot diameter sludge storage tanks. The tanks did not have a mixing system and required extensive cleaning after each land application cycle due to heavy accumulation of solids in the bottom of the tanks. A fixed nozzle mixing system was also installed in the sludge storage tanks. Each tank has twelve nozzles and a 2,500 gpm mixing pump. Visible rotation can be observed in the tanks during operation of the mixing system.

The construction cost for the project was $5,600,000.

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## Inside this issue:

## Storm Water Quality

By Homer B. Wilson


Water quality in U.S. lakes, rivers and streams has improved in the last thirty years, thanks to the efforts of the Clean Water Act (CWA) to control point sources of pollution, but many water bodies are still impaired. One reason for this is polluted runoff from urbanized areas. Developed land, with roads, parking lots, roof tops, and sidewalks, prevents or hinders natural percolation of rainwater into the soil. These nonporous, or impervious areas, create runoff and force communities to construct and maintain storm water collection systems. The storm water runoff in these collection systems carries pollutants such as oil, chemicals, lawn fertilizers and dirt from construction sites directly to streams and rivers, where they can impair water quality. Also, the flow rates to streams can increase causing damage to the stream.

Jones & Henry has assisted many communities with their storm water management programs, from design of new conveyance and storage systems, to compliance with recent federal and state storm water quality standards and regulations.

Phase I of the U.S. Environmental Protection Agency's (EPA) storm water program was initiated in the 1990's, and relied on National Pollutant Discharge Elimination System (NPDES) permit coverage to address storm water runoff from:

- Medium and large municipal separate storm sewer systems (MS4s) serving populations of 100,000 or greater
- Construction activity disturbing five acres of land or more
- Ten categories of industrial activity

The Storm Water Phase II Program expanded the Phase I Program by requiring operators of small MS4s in urbanized areas to implement programs and practices to control polluted storm water runoff. Operators of regulated small MS4s are required to:

- Develop a storm water management program which includes the six minimum control measures
- Implement the storm water management program using appropriate storm water management controls, or best management practices (BMP)
- Develop measurable goals for the program
- Evaluate the effectiveness of the program

The six minimum control measures that operators of regulated MS4s must incorporate into their storm water management programs are listed below. These measures are expected to result in significant reductions of pollutants discharged into receiving water bodies.

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping

Jones & Henry can help a community develop and implement a storm water management program. We can:

- Develop a plan with measurable goals
- Map the storm water system, including outfalls, catch basins, pipes and culverts
- Develop a public education and participation program
- Participate in public meetings to discuss the technical aspects of the program and requirements
- Prepare handouts or brochures describing federal and state regulations and requirements
- Identify storm water sampling sites
- Identify funding sources for programs, including storm water utilities
- Locate illicit discharges
- Provide language to a community's legal counsel for the development of a storm sewer use ordinance
- Assist in preparing reports
- Develop strategies to achieve compliance that include both structural and non-structural approaches
- Design required structural BMPs
- Develop a Soil Erosion and Sediment Control Plan
- Develop procedures for construction site inspection of storm water control measures
- Develop public outreach programs to involve residents in the efforts to reduce runoff pollution

Please contact one of our offices for more information.

## City of Carmel - Solar Drying "Mole"

**By Daniel W. Miller, P.E.**

After a solids study, the City of Carmel, Indiana selected biopasteurization to achieve a Class A biosolid. The process was selected based upon it's utilization of plant's digester gas, best use of their existing facilities (anaerobic digesters), did not increase sludge volumes, simple process components, and lowest present worth.

Pathogen reduction is achieved by time and temperature in the biopasteurization process. The process runs at 170°F for one hour. Vector attraction is achieved through anaerobic digestion which follows the process.

Following biopasteurization and digestion, the Class A liquid biosolids is converted to a cake by two centrifuges. Average cake solids achieved are approximately 22-24%.

After certifying the Class A process with the State, a local soil blender began to haul the product; however they had trouble handling the 24% biosolids. The blenders wanted a dryer product.

Excess digester gas was available after biopasteurization and Jones & Henry studied processes which would utilize the excess gas and achieve a better product for the soil blenders.

Jones & Henry reviewed several alternatives:

- Sludge drying
- Microturbines
- Use the hot water to heat other plant buildings
- Solar drying with supplemental heat

Solar drying was selected based on its simplicity, continual use of the digester gas, a $50,000 energy grant award, and the "green" component of the project.

Due to the timing of the grant, the solar drying system was constructed first at a cost of $1,400,000. The 200 feet by 40 feet greenhouse style building was designed to process 1,300 wet tons without supplemental heat, raising the solids from 24% to 65%, to create a more desirable product. Exhaust and circulation fans, temperature controls, and a weather station provided data to a PLC based control system to maintain optimum drying conditions. Everything is automatic except filling and unloading. The PLC calculates drying conditions, maintains optimum drying conditions, and estimates the sludge dryness from temperature and humidity data.

*Lisa the Mole, named after the Simpson's character, moves randomly through the greenhouse turning the solids and has sensors to turn when walls are encountered.*

On January 31, 2008, 200 cubic yards was loaded into the greenhouse, at 8-12 inches in depth. This batch was removed April 5th at 45% solids. The product consistency met the soil blenders needs so the initial target dryness was reduced. Batch two was loaded on May 19, 2008 and removed June 6th at 55% solids. Only 18 days to dry.

**Step Two – Supplemental Heat**

Hot water unit heaters and a back-up boiler are now being added to utilize the excess digester gas and provide supplemental heat to the solar drying system. The additional heat can be utilized during all seasons and will increase the system output from 1,300 wet tons to 3,600 wet tons per year. Carmel expects to batch product in and out of the system approximately every two weeks with the new supplemental heat.

The project has drawn a significant amount of public attention due to it's "green" nature and the plant plans to blend some of the dried product with native soils on City projects.

Look for a future Forum article in regards to results after the supplemental heating is completed.

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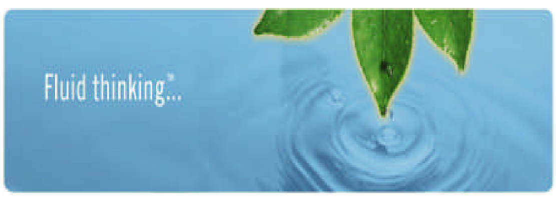


Fluids are not only the matter we deal with, but represent the process we use in developing solutions to unique problems. We are not limited to past solutions. Our success is demonstrated by our repeat business. Whether we are designing, modifying, or optimizing a system, our experienced engineers and operators lend their expertise for quality results. Our commitment to our clients and employees is best stated in our Mission Statement.

*Jones & Henry is dedicated to providing quality engineering services. We are committed to meeting project requirements with exceptional service; to developing long-term relationships with our clients; and to providing continuing opportunities for our colleagues*.

Developing long term relationships is rooted in our professionalism.

## 2008 Award Winners

Once again, Jones & Henry is pleased to recognize award winners from the Ohio and Michigan Water Environment Association conferences:

**OWEA**

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| William D. Hatfield – | Randy Bruback, City of Painesville |
| Safety Certificates – | Village of Jackson Center |

**MWEA**

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| WEF Service Award – | Larry DeLong, Battle Creek |
| William D. Hatfield – | Joseph Goergen, Genesee County |
| William F. Shephard Awards – | Sue Foune, Kalamazoo<br>Bruce Merchant, Kalamazoo<br>John O'Brien, Genesee County |
| Groundwater Management Professional of the Year – | John Paquin, Kalamazoo |
| IPP Professional of the Year – | Michael Andrews, Battle Creek |
| Public Utilities Management Professional of the Year – | Charles Ken Kohs, Battle Creek |