Wastewater as a Resource

Hidden Benefits Brought into Focus



A WHITE PAPER BY TOM FOLEY, P.E. / PROJECT DEVELOPMENT - WASTEWATER

Clark Dietz

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Introduction

Providing wastewater services to communities requires a tremendous amount of energy and capital. The wastewater industry is facing unprecedented challenges to improve reliability, meet future demand, and comply with regulations. That is why now, more than ever, innovation is key to industry advancement.

Innovation can mean a variety of things: new technology, new processes, or even just looking at old problems with a different perspective. Wastewater offers incredible opportunities for innovation that can take nearly any treatment facility into a sustainability focal point of the community.



Constructed Wetlands

High flows are a concern for all wastewater treatment facilities and many of which have developed a means of holding excess flow. However, managing excess flow means more than just handling peak flows. An excess flow basin allows the facility to optimize pumping to daily average conditions rather than escalating the front-end pumping capacity resulting in energy savings.

Use of a constructed wetland as an excess flow basin provides a natural landscape which can turn a treatment facility into a picturesque setting. Wastewater treatment plants can utilize the constructed wetland for effluent polishing. For the Rock River Water Reclamation District, the adoption of an excess flow facility has meant a constructed wetlands and energy and cost saving opportunities.



The Rock River Water Reclamation District implemented a new constructed wetland excess flow facility to capture a 10 year, 24-hour storm event and minimize sanitary sewer overflows. The District developed an irrigation/ effluent polishing system which provides over 50,000 gallons per day to the wetland plants. The addition of a new pump station to the constructed wetlands has allowed the District to rethink pumping at their main pump station and switch to smaller, more efficient pumps.

This project exemplifies the significant and growing shift in how we can value water quality and preservation. Compliance with regulatory requirements drove the need for this project. However, the realization of the constructed wetland for excess flow storage and effluent polishing is a testimony to the impact of communities, engineering, and regulatory bodies working in unison to achieve water quality goals. Integrating the existing grey infrastructure of the WWTP with the green infrastructure of the wetland provided unique engineering and environmental challenges. Overcoming them required a non-traditional perspective and multi-disciplined collaboration to generate solutions that met all needs. Setting a precedent as the first approved unlined constructed wetland for wastewater polishing and treatment in Illinois, this project opens the door to future constructed wetland projects and the naturalized treatment of wastewater.

The constructed wetland at RRWRD is now a thriving ecosystem supporting insect and wildlife habitats and plant life, while protecting water quality and public health. It is an amazing example of what can be accomplished when everyone is driven by a common goal to achieve quality of life.







Naturalized plantings thrive in wetland environment



Aerial of Rock River constructed wetland

- Natural plantings control erosion of side slopes.
- Deep rooted plants and sandy soils infiltrate water in the basin.
- Insects and wildlife inhabit the wetland.









Biosolids Management

As wastewater treatment facilities transition into resource recovery facilities, biosolids management is increasingly coming into focus. The transition to Class A solids production can mean big operational changes aside from the capital construction costs.

The intricacies of biosolids handling are often overlooked but can offer opportunities for increasing savings and improving operations. Clark Dietz has developed an innovative method to uncover the hidden truths behind biosolids management by modeling all aspects of the biosolids treatment processes.



Real Life Solution

A two-phased approach to develop a long-term biosolids management program was developed for the Walworth County Metropolitan Sewerage District (WalCoMet) which features an alternatives analysis paired with an interactive financial model. Factors such as phosphorous removal processes, reduction in available agricultural land, regulations on

application rates, and the need for sustainability were all considered as impacts on the way the District manages biosolids in the future. Alternatives such as land application, landfilling, composting, heat drying, lime stabilization, thermophilic digestion, and thermal hydrolysis were evaluated in addition to the current operation.

The key to the approach was the development of an interactive financial modeling tool which allows the District to determine the cost of biosolids management over time. The model includes the costs of each feasible alternative determined in the evaluation process: electrical loadings, labor, mass balances, and equipment inputs which are used to produce cost projections and analytic tools to aid decision making. The final model is formatted to include an easy to operate user interface to enter current utility and operational costs to update the projections and visualize the impact of changing regulatory and economic conditions. In this manner, the District will be able to use and update this tool for years to come to guide their biosolids management decisions. For example, by examining current weather and hauling trends, it was determined that WalCoMet could save as much as \$2,000,000 over a 20-year life cycle by expanding its farm field.



Below: Close-up of biosolids compost

Life Cycle Cost



Comparison of Operating and Construction Costs with Present Worth





Life Cycle Cost Over Time







Energy Reduction and Energy Production

The landscape of the wastewater industry has become one of both energy reduction and energy production. New technologies combined with energy dense waste streams have allowed several facilities to begin achieving energy neutrality or better. There are several ways to take advantage of these such as optimizing processes, upgrading equipment, and harnessing energy from the waste streams.





Fox Lake Northwest Regional Water Reclamation Facility (NWRWRF)



Real Life Solution

The Fox Lake Northwest Regional Water Reclamation Facility (NWRWRF) installed a biogas fueled generator that allows the plant to convert once wasted gas to combined heat and power, saving an average of \$5,600 per month.

The aeration system upgrade included the conversion of the biological process to a Modified Ludzack-Ettinger (MLE) to lower the overall oxygen demand of the system by almost 50%. Replacing the blowers and diffusers with two 200-HP high speed turbo blowers and fine bubble membrane diffusers more efficiently delivered the air needed, saving the Village an average of \$13,000 per month in additional energy costs.

Combined, the improvements resulted in a total annual electrical savings of 38%. These monthly cost savings were then used to fund additional phases of the sustainable upgrades to the plant.



Visibility Within the Community

Sustainability doesn't end with cost and energy savings. Evaluating non-traditional alternatives, such as green infrastructure solutions, allows you to meet your sustainability goals while also benefiting the community you serve. The responsible use of funding, priority of energy savings, and stewardship of the environment are important values to the public.



Above: 38 MGD lift station in Juan Solomon Park with community room, playground, and rain gardens



Real Life Solution

A lift station for the City of Indianapolis was designed with a green roof, pervious pavement, and rain gardens, which will infiltrate stormwater runoff and improve water quality in the adjacent receiving stream. This lift station, which is located in a city park, was given special consideration to make it an amenity to the public. The city park was transformed into a vibrant community space by incorporating a community room within the building, adding new playground equipment, and performing extensive landscaping.



Investing in the Future

Wastewater treatment facilities are in a unique and exciting position. Every facility has opportunities for improvement and these improvements *generate resources*. They can break down barriers separating wastewater facilities from the community and create more interest and push for sustainable projects. The best part? These solutions have real economic benefits which can lower costs for years to come.

There are several avenues that can provide funding for innovative projects.

Contact us at <u>info@clarkdietz.com</u> to find out what's best for your facility.

About the Author

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Mr. Foley is an integral part of Clark Dietz's wastewater design team. Tom strives to discover new perspectives and share the projects and ideas that can change the way we approach wastewater treatment. His goal is to expand the dialogue surrounding these opportunities to make water and wastewater a focal point for communities.



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