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Iowa's First Algaewheel Treatment Plant

"The Scott County Conservation Board is extremely excited to be the first entity in Iowa to be approved by the DNR to utilize the Algae Wheel technology to replace our existing traditional extended aeration plant. While there are many contributing factors, we feel Algae Wheel helps us meet the conservation and sustainability goals that we try to promote in our park system, and it gives us another real-life demonstration project to be used by our environmental education staff for public programming, and to help teach science, technology, and the need for cleaner water."

Roger A. Kean
Executive Director
Scott County Conservation Board

It all began with a continuing education class. Scott County Conservation Board (SCCB) operates a Waste Water Treatment Plant to handle sewage discharge from a large campground and other park facilities. Roger Larson, West Lake Park Manager and the licensed operator for the plant, was attending a conference in LeClaire Iowa sponsored by Quad City Analytical. This local conference provides the opportunity to obtain Continuing Education Units to maintain that license. OneWater Inc. was a vendor providing a class on a new method of treating sewage utilizing algae and bacteria in an environmentally friendly manner. From this class, Roger brought back the information and the research and planning process began.

The original treatment facility was constructed as part of the original development of the 620-acre park. This traditional system consisted of an aeration basin along with a two acre "polishing" lagoon that provided insufficient treatment. As the decades changed, so did water quality standards. With more stringent current requirements, the original plant struggled to meet permit requirements for discharge into Blackhawk Creek, and eventually, the Mississippi River. With the lakes at West Lake Park also being on the State's Impaired Waters list, another major project was undertaken to do lake restoration to improve this water quality, so the two projects timing just happen to coincide. Improving

OUR MISSION: To improve the quality of life and promote and preserve the health, welfare and enjoyment for the citizens of Scott County and the general public by acquiring, developing, operating, and preserving the historical, educational, environmental, recreational and natural resources of the

water quality became a focused objective.

With the need for a new plant clearly a requirement, and new more stringent discharge permit limits, the process to select a plant was underway. Different treatment methods and options were reviewed along with associated cost analysis. However, being a Conservation Board, the intent was to focus and promote a system that would meet the water quality needs and do it in an environmentally friendly manner. The goal was to have it all --- low energy requirements, minimal mechanical aspect, no chemical inputs, must produce enhanced water quality, and be sustainable for a small-scale operation.

The Algaewheel option rose to the top as the best system to meet our desired requirements efficiently. On 1 November 2019, the system went "on-line," meeting all permit requirements within just 30 days of operation.

Why Algae? This system utilizes the symbiotic relationship between algae and bacteria. Algae produces oxygen promoting aerobic bio-degradation of pollutants. The treatment process uses naturally occurring microorganisms to degrade contaminants in the wastewater. Algae grows on rotating wheels, using light, carbon dioxide (CO₂) and nutrients. Through coevolution, algae and bacteria have developed an intricate relationship where the by-products of one group are the inputs for the other. Algae produce oxygen, consume carbon-dioxide, generate polysaccharides (sugars), and assimilate ammonia, nitrate, and phosphorous. Bacteria consume the oxygen and sugars and produce carbon-dioxide, which completes the cycle. This sustainable method provides stable and effective treatment, which reduces energy and operator requirements. This is what separates it from the other types of treatment facilities.

What is the facility like? The treatment facility is a state-of the art fully enclosed greenhouse for controlled year-round treatment. It would fit in any community and no noise or odor is produced. Inside are a series of large tanks with wheels containing bacterial and algal colonies. Water being treated flows through the tanks where the photosynthetic algal biofilm grows on the Algaewheels. This sustains a large and diverse algal and bacterial ecosystem that provides enhanced treatment performance. The rotation of the algaewheels into and out of the air and water supply the oxygen required by the bacteria for breakdown of the waste. Each tank or basin consists of two stages; primary algaewheels followed by secondary algaewheels (separated by a movable internal divider baffle). Daylight is the key energy source to enable the production of oxygen through photosynthesis. This hybrid type technology, utilizing more natural methods, enhances treatment efficiency, reduces nitrogen, phosphorous, ammonia, and reduces biological oxygen demand. No chemicals are needed or used in the treatment process.

As an organization, Scott County Conservation Board, pushed this innovative program forward, being the first operational treatment plant in the State of Iowa to utilize this method of treatment. Not only is this a natural form of treatment improving/maintaining water quality, it is cost effective and will be a model for many of the smaller communities in Iowa to consider for implementation.

