

## Rehabilitating Aerated Lagoons and Increasing Energy Efficiency

### Overview

Geneva, Illinois – the Mill Creek Wastewater Reclamation District is the subject of a real-world study completed to determine the economic and engineering merits of a full scale MARS Aeration System deployment. This study was conducted by civil engineering firm Sheaffer & Roland as a follow-up to the successful MARS pilot study at the Glenwood School for Girls and Boys in Kane County, Illinois.



*Aerial photograph of Mill Creek wastewater facility*

The Mill Creek Wastewater Facility is based around a four-cell lagoon system, with two treatment cells and two reserved for storage. Serving approximately 2,000 homes, the facility experiences flows as high as 350,000 gallons of wastewater per day. The existing aeration infrastructure is comprised of static-tube coarse bubble diffusers. Three 60hp blowers supply 2200cfm of air to these diffusers from a remote building. These blowers consume 950,000 kWh of electricity, amounting to an annual energy expenditure of \$85,300. Additionally,

because of their age, the blowers require frequent repair.

Responding to today's tough economic times, the Mill Creek Water Reclamation District is seeking out ways to cut spending. After reviewing years worth of data on the facility, Sheaffer & Roland developed a proposal to save the District 68% on its energy bill—representing a savings of 41% on Mill Creek's total operations cost.

### Why MARS Aeration?

1. **Energy Efficiency:** Utilizing fine bubble technology, the MARS offers energy savings of up to 70% over traditional coarse bubble systems.
2. **Effective Mixing:** The MARS, with its static tube component and venturi action, provides more effective mixing than traditional fine bubble aerators.
3. **Equal Treatment:** The MARS sufficiently treats wastewater while still realizing energy savings.
4. **Sludge Treatment:** Through the venturi action of the MARS, sludge is lifted and oxygenated within the lagoon, avoiding the need for remediation.
5. **Ease of Installation:** Because it can be installed from the surface of the lagoon, the MARS is process non-interruptive. This

means that the facility will incur no treatment downtime during installation and will avoid high installation costs.

## The Plan

44 MARS aerators are to be installed in Mill Creek's wastewater lagoons around the existing infrastructure; the majority of which (34 units) will be located in the primary treatment cell. The coarse bubble system will remain operational, and will act as a redundancy in case of emergencies.

A total of 950cfm of air will be pumped through the MARS Aerators, originating from 5 decentralized 20hp blowers situated on the berm of the lagoons. These blowers will be decentralized in order to gain maximum efficiencies by avoiding unnecessary head-loss, and will be placed in sound-resistant enclosures to avoid disturbing residents of neighboring homes.

A variable frequency drive motor will control each blower, allowing for a dissolved oxygen-targeting program. Aiming for a D.O. level of 4.0 mg/L, the program seeks to gain peak efficiencies by never under or over-aerating the lagoons. In recognition of daily and seasonal D.O. fluctuations, the program will require multiple D.O. readings and subsequent VFD adjustments. This will ensure adequate treatment while avoiding excess energy expenditures.

## Benefits of MARS Installation

1. **Energy Savings:** Between fine bubble efficiencies and dissolved oxygen targeting, Mill Creek will save approximately 650,000 kWh per year.
2. **Cost Savings:** The district will be saving nearly \$58,000 in energy costs, and will avoid spending thousands of dollars annually on repairs of antiquated blowers. Even after paying monthly installments on loans financing the MARS system, Mill Creek will accrue \$22,700 savings per year.
3. **Upgrade:** The 14 year old Mill Creek Facility will be given new life, protecting the district against future wear-and-tear related breakdowns.
4. **Ease of Implementation:** Because it can be installed from the surface of the lagoon, the MARS is process non-interruptive. This means that the facility will incur no treatment downtime during installation and will avoid high installation costs.
5. **Incentives Eligibility:** With the MARS's high-energy savings, Mill Creek will become eligible to receive a rebate from Commonwealth Edison as part of its Electric Efficiency Program. Amounting to 13% of the total project cost, the rebate comes in at \$45,900.