Keep It Clean

Managing nutrient loading in storm water ponds

By Patrick D. Hill

The main goal of storm water management is to limit nutrient loading in storm water ponds to reduce the adverse effects on downstream aquatic environments via eutrophication. Eutrophication occurs in ecosystems where there is little or no dissolved oxygen content due to the presence of excess nutrients—namely nitrogen and phosphorous—that often cause excessive algae growth. This process severely decreases the overall health of the ecosystem and prevents aquatic life, such as fish and plants, from thriving. Additionally, as eutrophication begins to take hold, it can affect downstream environments and watersheds, creating massive "dead zones," such as the one in the Gulf of Mexico.

Storm water management has two main areas of focus: nutrient prevention and nutrient removal.

Nutrient Prevention

Nutrient prevention is the process by which regulations are installed in order to limit the amount of nutrients that enter storm water ponds as runoff. This process can be successful, but is a large task because nutrients can enter a pond via numerous sources. Fertilizers, animal excrement, runoff, organic debris (leaves, grass, sticks, etc.), industrial waste and wastewater seepage are some of the main sources of nutrient loading in storm water ponds. Preventing nutrient runoff from all of these sources is extremely challenging.

The aeration system attacks algae growth and eutrophication at the source by increasing oxygen levels and breaking down excess nutrients in the water column.

Nutrient Removal

Nutrient removal takes a different approach to combating excess nutrient loads. Instead of attempting to prevent all nutrients from entering the pond, nutrient removal focuses on treating those nutrients and breaking them down once they enter the pond.

Mill Creek Subdivision has adopted this approach to its nutrient treatment process in its storm water system.

Mill Creek is a community located near Geneva, Ill., about 40 miles west of downtown Chicago. During its construction, developers were required to create a storm water retention system to collect all accumulating precipitation and runoff that would fall on impervious surfaces. This water travels through the retention system to be discharged into nearby Mill Creek. When this construction began, developers knew that while this storm water system would be very effective in terms of preventing floods or watercourse soil erosion, it unfortunately would create the problem of eutrophication in the storm water ponds as well as in Mill Creek and other surrounding aquatic environments.

As a result, Kane County required Mill Creek Subdivision to treat the water in its storm water ponds before releasing it into Mill Creek, fully aware of the great harm that eutrophic waters could cause to the downstream environments by raising nutrient and pollutant levels, decreasing oxygen content and killing native aquatic life.

Pond Aeration

In response to this requirement, Mill Creek Subdivision employed the use of more than 35 MARS aerators, installing them in nearly all of its retention ponds.

MARS aeration technology was originally developed for usage in municipal wastewater facilities. By releasing air into the water column, the technology naturally cleans the water and decreases the nutrient load.

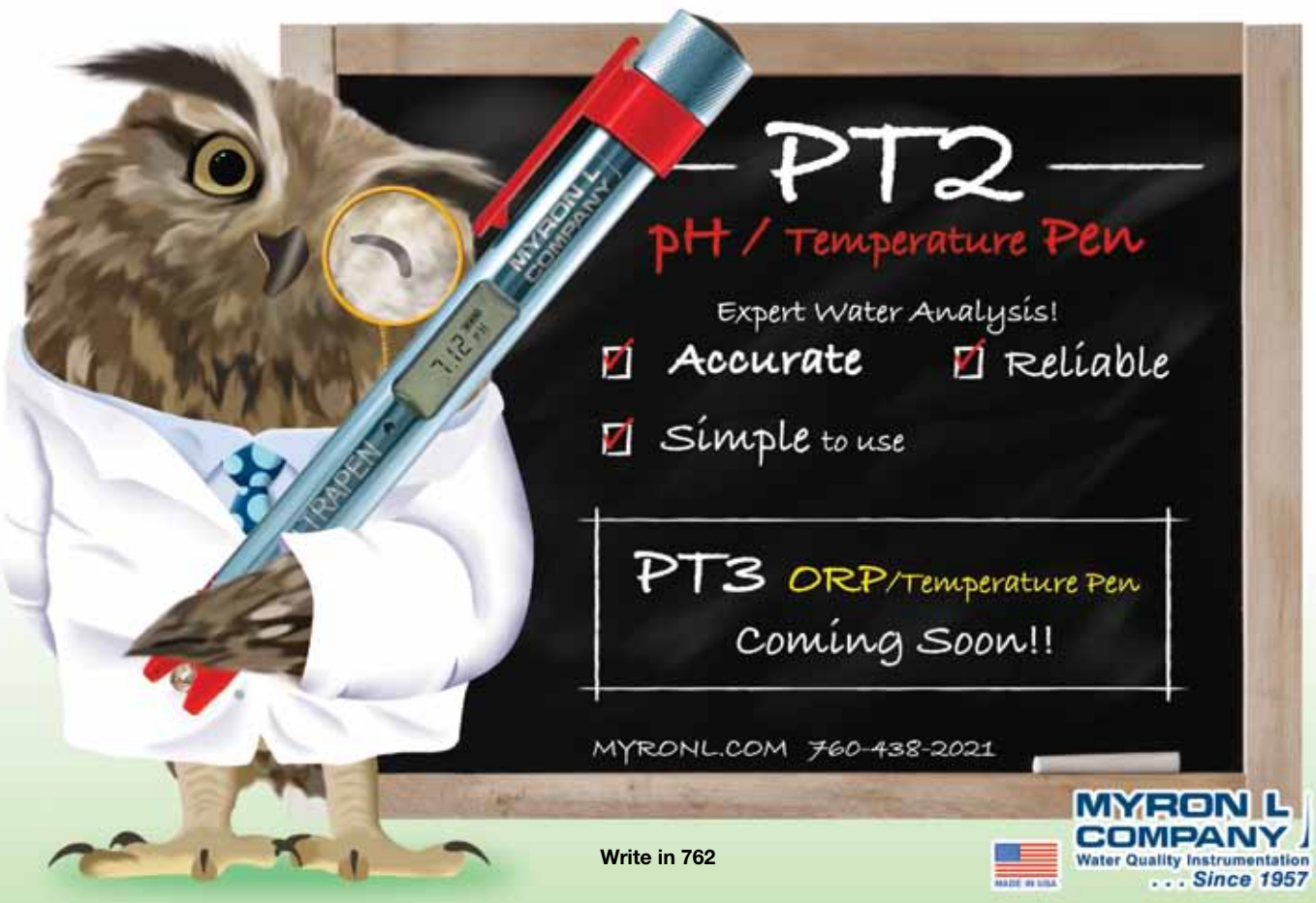
Similar to treating wastewater, the system uses patented Double Bubble Technology to promote a healthy, sustainable pond ecosystem. The aeration process attacks the algae growth and eutrophication at their source by increasing oxygen levels and breaking down excess nutrients in the water column.

"The difference in what it had looked like prior to the installation and afterwards was just outstanding," said Jenny Gatske, former property manager of Mill Creek.

Increase Oxygen

In any given storm water retention pond, there is a natural collection of decomposing bacteria, which has the primary responsibility of breaking down excess nutrients in the water column. However, these bacteria require an ample oxygen supply in order to break down algae-forming nutrients that can eventually cause eutrophication.

The aeration system addresses this by releasing thousands of micro-bubbles every second. Because these small bubbles have a large collective surface



Mill Creek storm water ponds are cleaner, healthier and do not suffer from euthrophication because of the aeration system.

area and rise slowly through the water column, they are able to transfer lots of oxygen to the water column. As a result, oxygen levels increase overall, and the bacteria are able to efficiently and effectively perform their task.

Promote Mixing

In addition to the release of thousands of small bubbles per second, the aeration system also releases a steady stream of large bubbles. These large bubbles displace more water upon their release, and as a result create a turbulent mixing of the water column. This mixing effect causes more intimate contact between the bacteria and the nutrients in the storm water, creating a more effective breakdown.

As a result, not only are the storm water ponds at Mill Creek cleaner and healthier, but downstream environments no longer suffer from eutrophication.

While nutrient prevention is one way to stop eutrophication, nutrient removal provides an alternative option that oftentimes is more achievable. Additionally, it allows for more options, such as bacteria treatments, to supplement the nutrient breakdown. This results in a healthier storm water pond with a higher oxygen content and lower nutrient levels, as well as cleaner downstream watersheds.

In this way, nutrient removal techniques such as aeration not only eliminate storm water problems associated with nutrient loading, but they also improve aesthetics and surrounding property value. SWS

Patrick D. Hill is business development manager for Triplepoint Water Technologies. Hill can be reached at patrick.hill@triplepointwater.com or 630.208.0720.

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