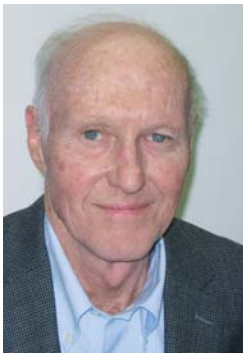
Green Infrastructure for Industrial Water & Wastewater



By Robert McIlvaine

Techniques to incorporate for truly green infrastructure

Industrial plants consume and discharge much more water than municipalities; therefore, to obtain a greener infrastructure it is essential that much of the contribution come from industry.

Industrial plants have several ways to improve green infrastructure, which involve either discharges from the property or initiatives on the property. Onsite options include rain gardens, bioswales, green roofs, porous pavement, greenways, constructed wetlands, storm water tree trenches and other green infrastructure measures.

Wetlands Approach

Power plants, chemical plants and other large industrial plants are creating wetlands. At the North Seadrift, Texas, site of Dow subsidiary Union Carbide, for example, the company developed a constructed wetland for wastewater treatment. The Seadrift complex is used to produce plastic resins and other chemicals. Wastewater from multiple facilities, along with storm water, originally was routed through a traditional treatment system using primary and secondary treatment ponds; however, the existing system was not meeting U.S. Environmental Protection Agency (EPA) effluent standards.

The solution was a 110-acre constructed wetland that met EPA requirements for total suspended solids, eliminated algae blooms and naturally controlled the pH of the discharge. The wetland is now a truly green natural habitat where the worry is not water quality, but dealing with alligators and bobcats.

Power plants also are using the wetlands approach. The U.S. power industry is faced with the problem of preventing selenium from reaching water resources. Selenium is vaporized from coal when it is burned. There are no restrictions on selenium emissions. As a result, little attention was paid to this pollutant. As plants began installing scrubbers to capture SO_2, however, they captured selenium as well. This created a wastewater issue.

North Carolina was the first state to address the problem. Stringent water quality selenium limitations were imposed on power plants. Their initial response was to install wetlands. The approach has been quite successful, but relatively costly. Newer biological treatment technology has proved less costly and equally efficient. Many plants now are opting for treatment systems rather than the natural approach.

Reuse & Evaporation

The greenest approach to industrial wastewater discharges is to eliminate them completely. This can be accomplished in one of two ways.

Industry uses water for manufacturing steam, cooling and product processing. Power plants extract huge amounts of water for cooling in the U.S.—far greater than the 40 billion gal per day used for drinking water. With the use of cooling towers, the water can be recycled. New effluent limitations will prevent power plants from creating "thermal" pollution in the future.

Power plants also can utilize municipal wastewater as a source of cooling water. Nearly all plants are close enough to a source of municipally treated wastewater to make use economically attractive. Power plants around the world burn sewage sludge trucked from wastewater plants some distance away. Many plants also are using municipal wastewater, which is transported by pipeline. There is a much more economical option: Expansions of sewage treatment can be undertaken at power plants.

The advantages of co-location are not just eliminating the transportation costs of sewage sludge and wastewater. The big advantage is using the waste heat from the power plant to reduce the energy consumption of the sewage treatment process. This also results in a significant net CO_2 reduction. The waste heat also can be used for other green purposes. The Blue Flint ethanol plant at the Great Rivers Energy power plant, for example, has no dedicated boiler. All of the energy comes from the power plant waste heat. The result is greenhouse gas reduction and a lower ethanol production cost.

Waste heat also can be used for a new form of aquaculture. Recirculating aquaculture systems are sophisticated tank systems that grow large quantities of fish in closely controlled environments. This green option substitutes for wild fish harvesting and for the less green traditional ponds.

Zero-liquid discharge (ZLD). Ultimately, there has to be wastewater disposal. Cooling water can be reused, but with each reuse the concentration of dissolved solids increases. At some point the water must be bled from the cycling system; however, rather than discharging treated water to the environment ZLD systems can be utilized. Evaporators create distilled water or vapor and concentrated solids, which can be sent to landfills.

Power plants and large industrial plants built in western China are incorporating ZLD technologies. Plants located in areas with plentiful water also are buying ZLD systems. The reason is typically to assure approval of the plant by local residents. In the U.S. there are a number of new gas turbine projects where ZLD has been selected. Some of these plants are in New Jersey and Pennsylvania, where water is plentiful. **iWWD**

Robert McIlvaine is president of McIlvaine Co. McIlvaine can be reached at rmcilvaine@mcilvainecompany.com or 847.784.0012.