

Stormwater to Leachate to Filtration

Facing fines, a landfill cost-effectively deals with its leachate problem.

Located off Highway 64 in Bradenton, FL, the Lena Landfill in Manatee County has faced many obstacles in an effort to control its waste. Manatee County has a population of over 310,000 residents and collects over 350,000 tons of solid waste per year. Occupying over 330 acres of land, the landfill must bury the trash while preserving and protecting the environment in the surrounding area.

One way of protecting the environment is to keep leachate from entering groundwater or rivers and ponds. To accomplish this, the landfill has a system to direct all runoff and stormwater to a 120-acre holding/settling pond. In 2005, Manatee County's Lena Landfill was facing fines and penalties if some water quality issues were not addressed.

The Florida Environmental Protection Agency (EPA) requires that all water discharged to stormwater ditches and drains meets a quality standard of 29 Nephelometric Turbidity Units (NTU) or less. The Lena Landfill was operating with a turbidity of 35 to 40 NTU. There were limited options on how to remedy the problem. One option was to build another holding pond, which would occupy an additional 60 acres of the landfill's valuable land. Receiving a permit from the department

of environmental protection for a new hazardous waste site takes many years and can be difficult to obtain. Another option was to filter the water in the existing settling pond, while preserving the unused acreage for future use to bury solid waste from the rapidly growing population in the county.

In an effort to avoid millions of dollars of lost revenues, Manatee County contracted with PBS&J (www.pbsj.com) to develop a solution. There are many factors considered when choosing a filtration system including capital cost, efficiency, and maintenance. David Weber of PBS&J specified the installation of an automatic disc filter system capable of handling two mgd. The automatic Turbo-Disc Filter system was designed and manufactured by Miller-Leaman, Inc. (www.millerleaman.com). The system consists of two 24-pod systems, complete with booster pumps. As the water in the leachate or settling pond rises to a pre-determined level, submersible pumps activated by a float switch are engaged. The water is then directed through the fully automatic, self-cleaning Turbo-Disc Filter system and discharged into adjacent waterways, after meeting the Florida EPA requirements. The automatic filters were designed to accommodate 1,400 gpm of water contaminated with particles, sediment, and organics.

The cost of the automatic disc filter



Outlet water piping from Miller-Leaman's 1,400-gpm Turbo-Disc Filtration system.

system was substantially less compared to a traveling bridge sand media filter, which was also being considered for the project. In addition, the automatic disc filter uses a fraction of the backwash water required by competing sand filters, which was one of the main attractions to the consultant.

Time to Test

Now it was time for the test. In an effort to validate its technology and familiarize landfill personnel with the filter, the manufacturer transported its fully operational demonstration trailer to the site. The demo trailer can pump water from the actual water source to determine the particle ppm, the particle distribution size, NTU level, and other important variables. The filter housings in the demo trailer are transparent, allowing the customer to visualize the effectiveness of the filter, both in filtration and backwash modes. Each micron size was tested and water samples were taken to check the NTU level. Once the appropriate micron size was determined



Manatee County Lena Landfill.

to satisfy the NTU requirement specified, the information learned from the demo was extrapolated to properly size the filter system.

Each filter housing or pod utilizes a stack of color-coded polypropylene discs, with grooves molded across the surface of the individual discs, offering three-dimensional filtration capability. When stacked, the grooves overlap in a “cross hatching” effect, therefore creating a tortuous path through which the dirty water must flow. As the dirty water passes through the disc media, particles are trapped within the disc grooves, allowing clean water to flow to the outlet manifold of the filter and downstream. Disc filtration technology was developed decades ago by a company contracted by the Boeing Corporation and was originally used to filter fine metal particles from hydraulic fluid on aircraft.

An automatic backwash cycle is initiated by an onboard Maxim backwash controller, also from Miller-Leaman. The controller comes complete with a differential-pressure switch-gauge, which continuously monitors the differential-pressure across the stainless steel inlet/outlet manifolds of the filter. When the differential-pressure set-point is reached, an automatic backwash cycle is initiated. First, the filters’ booster pumps engage and a sequence of three-way backwash valves are actuated, allowing a flow of filtered water to sequentially reverse through each filter pod. The filter system was designed with booster pumps to minimize the operating costs of the system; the booster pumps only engage during the backwash cycle when higher pressure is necessary for optimal cleaning of the disc media.

Compressed air is also utilized to actuate the backwash valves. In addition, a small burst of compressed air is used to evacuate the dirty water out of each filter pod, just before the pod is backwashed. During the backwash cycle, clean filtered water is sprayed from four spray bars, which are located on the inside of the discs and spray outward. Each of the four spray posts have multiple spray nozzles that are tangentially orientated relative to the disc media, therefore causing the discs to

spin at a high velocity during the duration of the backwash cycle. Each pod takes about 20 to 30 seconds to backwash using as little as eight to ten gallons of water. The dirty water comes out the two-in. backwash line.

The automatic disc filter system is maintained about once a year, depending on water quality of a given application, and is relatively simple. For example, the top piston of each disc cartridge has a lubricated O-ring, allowing a piston to open up to decompress the disc media during the backwash cycle. The maintenance staff can simply unthread (no tools necessary) the entire piston cap to lubricate these O-rings.

The manufacturer’s automatic disc filter systems are custom designed for



Intake water piping to Turbo-Disc system with booster pumps.

each specific application, according to the particular purpose. For example, depending on the pressure of the application, a booster pump may not be necessary. The polypropylene discs are available in a variety of color-coded micron sizes, depending on the micron requirements of the application. In addition to this unique project, the filters have many other uses, including water reuse for irrigation projects. **GE**



Manufacturer’s fully operational trailer is used for demonstration and water testing purposes.