CLEARED FOR TAKEOFF

Airport expansion project adds storm water filtration

By Steve P. Hides

A worker performs maintenance on the filter.

Impervious paved surfaces prevent rainwater from infiltrating into the soil, which generates excessive storm water runoff contaminated with a wide range of pollutants. Airports often are a major contributor to storm water loading due to extensive roofed buildings and other impervious surfaces, including runways, taxiways, aprons, access roads and parking lots. The storm water runoff may be polluted with hydrocarbons from fuel, de-icer residues, suspended sediments, particulate and dissolved metals, and wind-blown trash.

While many airports were built before environmental regulations required them to conform to storm water quantity and quality standards, any facilities undergoing expansion or new construction must comply.

Airports usually are constructed on flat ground, either on a plain or valley floor. The topography therefore puts flow restrictions on the drainage, because achieving sufficient head for efficient water flow over long distances requires careful design and planning. Flat topography also favors temporary standing water; all things considered, airport drainage is a complex subject.

No Compromise on Safety

Another factor that must be considered is aircraft safety. In addition to reducing the standing water hazard on runways, airports spend time and money to minimize hazards from bird strikes on aircraft by

reducing attractions for birds. Temporary or permanent surface water pools that could attract waterfowl to the vicinity of an airport are considered dangerous. Along migration routes such as the Midwest corridor, where large waterfowl move in huge seasonal numbers, extra care must be taken.

Conventional land-based methods of managing airport runoff, such as temporary ponds and wetlands, therefore run counter to Federal Aviation Authority (FAA) guidelines, which do not allow ponds that retain water for longer than 48 hours.

Expansion at County Airport

This was the situation facing Dane County Regional Airport in Wisconsin, which is a joint civil-military commercial airport serving the Madison area in the south central part of the state. It is the second largest airport in the state, with more than 100 daily flights and more than 1.6 million passengers passing through each year. In recent years, the airport has undertaken a series of construction projects, adding new runways, parking facilities, airport ramps and office space.

One of these projects involved rebuilding an access road around the airport and resurfacing 5.3 acres of parking lots. To meet state storm water regulations for this development, airport officials were required to increase the capacity of the existing storm water treatment system, which included a small retention pond.

A traditional solution to increasing the airport's storm water treatment capacity might have included expanding the size of the existing pond, but the location of the pond in relation to the runways could have created a problem by attracting the large water birds that pose a danger to aircraft.

BMP Solution

The airport needed a structural BMP that could meet the Wisconsin Department of Natural Resources' (DNR) redevelopment requirement of treating 40% of the total suspended solids (TSS) in runoff from the new and redeveloped impervious surfaces, without creating any standing water. At the same time, Dane County airport officials could not expand the existing storm water pond, even though it was designed to stay dry except during heavy rain events, because of FAA guidelines.

Additionally, there was limited space and existing drainage infrastructure that could not be abandoned. After evaluating various conventional BMPs based on land take and retrofittability, manufactured treatment devices were considered to be the most practical type of structural BMP.

Existing Drainage

Project team members from the airport and Graef Inc., the consulting engineer on

The pre-existing pond discharges into a creek, so the filter was placed upstream of the pond.

the project, reviewed several manufactured filtration systems before choosing the Up-Flo filter from Hydro Intl.

The Wisconsin DNR requires treatment options to be modeled in WinSLAMM, a source loading and management software program developed by PV & Associates Inc. Using real rainfall data from the Dane County Regional Airport, WinSLAMM was used to generate probability distributions of flows that were expected from the 5.3-acre site. Planned for release in late 2014, version 10.2 of WinSLAMM will have the filter coded in as a standard BMP option and will allow engineers to size the filter according to treatment goals.

Performance data from filter field-testing were applied to the WinSLAMM outputs to determine the size required to comply with the DNR's goal of 40% TSS reduction.

The Up-Flo filter is a storm water filtration system that removes trash, sediment, nutrients, metals and hydrocarbons from storm water runoff. Using fluidized bed filtration technology, the filter is able to utilize the entire depth of media to filter pollutants, operate at a high surface loading rate and offer long filter life.

The filter is easy to maintain. Confined space-trained personnel with a standard vactor truck can clean the sump and change the filter bags in less than an hour. No cranes or heavy lift equipment are required to remove or install the bags.

Low Head, High Efficiency

Graef initially chose the Up-Flo filter based on cost per filtered flow rate; however, additional benefits of the filter quickly became clear. It can

The filter intercepts the majority of the most frequently occurring runoff.

operate with a 9-in. drop between inlet and outlet and filter more than 100 gpm with only 20 in. of driving head, on an overall water elevation difference of about 2.5 ft.

The pre-existing storm water pond discharges into Starkweather Creek, which feeds into Lake Monona near downtown Madison. To minimize construction costs and take full advantage of the Up-Flo filter unit's intended use for source control, Graef construction engineer Ed Premo placed the filter upstream of the existing pond. In this position, it intercepts the majority of the most frequently occurring runoff.

"The device chosen was the most economical option and solved an issue that the Wisconsin DNR had with the additional parking areas the airport had planned for the desired growth of business," Premo said. "The pond and adjacent storm sewer emptying in Starkweather Creek are free of sediment, and to this date the maintenance has been very minimal."

An existing catch basin was modified to divert more than 50% of the annual runoff to the filter prior to overflowing into the pond. The pond was used for detention and treatment of the more infrequent overflows, essentially providing a polishing stage. This kept the majority of the pollutant load in the filter and significantly reduced the maintenance needs of the pond. SWS

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