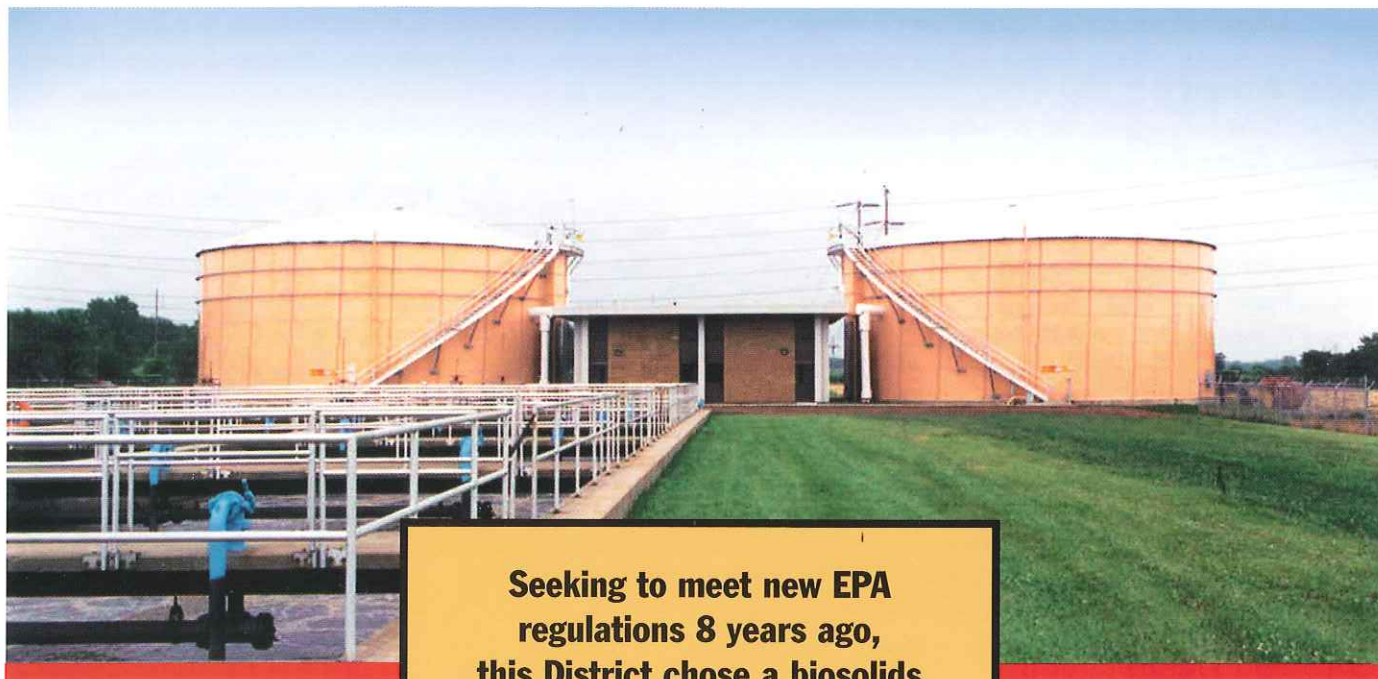


Cost-effective Compliance Solution at Springfield Sanitary District



Seeking to meet new EPA regulations 8 years ago, this District chose a biosolids storage-and-mixing design that improved a long-standing program.

by J. Mark Crump
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The old work maxim—“if it ain’t broke, don’t fix it”—doesn’t always apply in the real world.

Take the case of the Springfield Metro Sanitary District (SMSD), in Springfield, Illinois. Beginning in 1973, the SMSD sprayed accumulated biosolids onto crops in an ongoing land application program. It worked well until 1993 when the U.S. Environmental Protection Agency created new regulations regarding nitrate levels. If the SMSD wanted to continue its program, something would have to change.

To get into compliance, the SMSD chose a design that actually improved the process. The major modifications—Aquastore tanks coupled with the JetMix Vortex Mixing System—proved more energy efficient, nearly maintenance-free and, above all, effective.

Path to Compliance

In moving from problem to solution, overlapping concerns had to be resolved. The compliance issues led to upgrade issues and ultimately to mixing issues.

Specifically, the SMSD, a wastewater treatment facility that serves Springfield, Illinois and surrounding

communities, needed to meet the pathogen and vector-attraction reduction requirements and prevent nitrate levels from contaminating groundwater. After careful study, the SMSD selected a process that would allow it to store digested biosolids that accumulated when the sludge could not be applied.

What is the best way to mix biosolids that have settled over long periods of time? The District found a workable solution in the JetMix Vortex Mixing System.

“Basically, the tanks were installed to store the sludge during periods when it couldn’t be applied, winter time and harvest time, for instance,” explains William H. Peffley, an environmental engineer with Crawford, Murphy & Tilly, Inc., the consulting engineers contracted by the SMSD to design the upgrades. “Then, the mixing system would resuspend the stored sludge for a relatively short period just prior to application.”

Not only were these modifications effective, they kept the SMSD within its project budget. Originally, the District estimated that compliance would cost about \$3.5 million. The eventual solution cut that figure in half. Also, the storage-and-mixing solution allowed the SMSD

to meet regulations with little impact on its disposal program.

“The alternatives would have entailed a lot of expensive construction, but the District chose a method that saved a substantial amount of money,” says Peffley.

Mixing Systems

SMSD operates two domestic wastewater treatment plants — Spring Creek and Sugar Creek. Upgrades at the Sugar Creek aerobic facility included two above-ground storage tanks, three new mixing pumps and two relocated biosolids farm pumps. At the Spring Creek facility, the new equipment included two storage tanks, two new mixing pumps and two new biosolids farm pumps.

The choice of storage tanks seemed the easy part. Choosing an appropriate mixing system was a more complex issue.

“The sludge settles when you store it for a long time,” says Peffley. “You have to get it stirred up to be able to pump it out and apply it to the ground.

Settled sludge results in accumulation of solids, “dead areas” in the center of tanks, or chunks of sludge that rise to the surface. These problems make pumping the sludge

for land application more difficult. Adequate mixing would be crucial.

The trouble with most mixing systems is that they vary in effectiveness. Continuous mixing, the traditional approach, is expensive. It requires a lot of energy and maintenance and is unreliable. Options like fixed liquid jets and pivoting propeller mixers are only partially effective in mixing the stored contents.

The other, more intriguing option was infrequent mixing. The process uses far less energy as the biosolids need only be mixed several days before application. However, while intermittent mixing has definite advantages, it poses a major problem: obtaining a homogenous mixture often is difficult—and a homogenous mix is necessary for the best land application.



Still, the District was attracted to the energy savings. After careful evaluation, SMSD opted for the JetMix system as a solution to the mixing problem.

"There are several different mixing systems on the market, but the one we felt was the most promising was JetMix," says Peffley.

The JetMix system, which includes rotatable nozzles, was developed especially to tackle the kinds of problems associated with long-term sludge storage and sludge disposal. With its simple components, JetMix sweeps all areas of a storage tank by creating a unique torroidal flow pattern. Essentially, its floor-mounted nozzles combine with the action of chopper pumps to keep solids suspended or to resuspend solids that have settled, resulting in the desired homogenous mix.

The system's floor nozzles and top nozzles can be adjusted to tackle unique mixing problems. The nozzles are normally aimed in the same circular pattern, generally perpendicular to the radius of the tank on which the nozzle is located. If unusual conditions develop in one sector of the tank, the nozzles can easily be redirected by the operator to clear up the situation and then returned to the original position. The top nozzle is a unique item that can be rotated around its horizontal axis as well as its vertical axis. Thus an operator can use it to wash

down walls, if desired.

The system is relatively easy to operate. The nozzle arrangement creates a good rotation of the tank contents to resuspend and keep solids in suspension. The need for nozzle adjustment is not normally required on a normal basis for most applications. Even after the tank sits idle for several months, the solids can be resuspended without involved operator attention. Even maintenance is simple with only the external pump requiring periodic service.

"Let's say that the tank contents have settled for quite a while and you've got the solids on the bottom and the supernatant on top," says Peffley. "The way the system is designed, you can draw the liquid down and then pump it back. You can rotate the nozzles to different angles and directions, which gives you the ability to resuspend all of those solids in a very short amount of time."

By using two chopper pumps, the SMSD can resuspend solids at each of its plants in 36 to 48 hours.

"A chopping impeller shears and breaks up the big chunks of solids and sends them back as smaller chunks," says Peffley. "So, it is a combination of the flow and the chopper pumps."

Benefits

The energy savings using a JetMix system are substantial. The SMSD estimates that it saves \$170,000, or approximately 90 percent of the power costs otherwise required during a three-month storage period at the two facilities. Annually, that adds up to \$680,000.

The new equipment at both plants allowed SDMS to store biosolids in the digesters or in drying beds during times when land application is prohibited. More expensive options, such as buying additional land, would have cost as much as \$7 million.

Also, the District realizes significant savings on maintenance.

"The JetMix system is a very low-maintenance option," says Peffley. "Essentially, it is self-cleaning."

When normal care is taken, the SMSD tanks can be pumped empty of biosolids, and the storage-tank nozzles can also be used to clean the tank through a combination of spraying patterns.

Peffley says his first experience with the JetMix system has been a major success and he would highly recommend it.

"I would install it again, given the appropriate situation," he says. "It was promoted to achieve certain things, it was expected to achieve certain things, and it did all of that."

