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JANUARY 2010

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The Farm Next Door

The team of Annetta Grillo, Peter Hartz and William Radue stand in the prairie they planted on the grounds of the Johnson Creek Wastewater Treatment Plant, with help from an environmental group. (Photography by Kim Bumgardaner of Juhl Photography)

profile

Johnson Creek (Wis.) Waterworks

BUILT:	1982; upgrade in 2000
FLOWS:	0.7-mgd design, 0.32-mgd average, 2.1-mgd hourly peak
TREATMENT LEVEL:	Secondary
TREATMENT PROCESS:	Rotating biological contractors
RECEIVING WATER:	Rock River
BIOSOLIDS PROCESS:	Lime stabilization and plate-and-frame press dewatering
BIOSOLIDS VOLUME:	400 cubic yards per year
BIOSOLIDS USE:	Land application of Class A cake (40 to 50 percent solids)
WEB SITE:	www.johnsoncreek.govoffice2.com

THE VILLAGE OF JOHNSON CREEK (WIS.) RELIES ON A SINGLE BIOSOLIDS APPLICATION SITE, WHILE LOOKING AHEAD TO PROSPECTS FOR GASIFIER TECHNOLOGY AND SALEABLE PRODUCT

By Diane Gow McDilda

Rotating biological contactors (RBCs) are the heart of the plant's secondary treatment process.

THE VILLAGE OF JOHNSON CREEK, WIS., LAND-APPLIES biosolids almost next door. With just one application site, one mile from the treatment plant, it's a partnership worth nurturing.

"We keep our relationship good with that farmer, since he's so close," says Peter Hartz, water/wastewater superintendent at the Johnson Creek Waterworks. Since 2004, the plant has produced a Class A exceptional quality product using lime stabilization to achieve pathogen reduction and a plate-and-frame press for dewatering. The biosolids are stored outside in a pole barn before being transported.

Historically, biosolids hauling was handled in a variety of ways. Either the treatment plant staff hauled the material to local farms, or various farmers hauled the material themselves (or contracted for hauling).

Johnson Creek, in southern Wisconsin, is surrounded by farms, but the plant staff eventually saw advantages in minimizing the number of land application sites. The plant now delivers to its farmer partner every other year. The plant flow averages 0.32 mgd, making the biosolids volume easily manageable.

"Four hundred cubic yards per year doesn't cover too many acres, so we go every other spring or fall," says Hartz. "Otherwise we would have to look for smaller pieces of land. We would need about 10 acres of land every year or 20 acres for the two years of biosolids."

Even with the successful treatment plant-farmer partnership, Hartz would eventually like to make the system even more sustainable and possibly produce a product that can be sold. For Hartz, pelletizing biosolids to produce gasifier fuel seems the way to go and he's working to prove its viability. But in the meantime, it's business as usual.

The plant produces dewatered biosolids cake that qualifies as Class A material.

SIMPLE PROCESS

The treatment plant uses a primary clarifier followed by rotating biological contactors (RBCs) and a secondary clarifier, all manufactured by Walker Process Equipment. A Trojan UV system provides disinfection. Effluent flows to the Rock River, a popular destination for anglers and paddlers.

Solids from the aerobic digestion process are pumped to a 12,000-gallon reactor tank. The solids content of the incoming material controls how it is processed at any given time. "The solids content is usually 1.75 to 2.75 percent, even up to 3 percent," says Hartz. "If solids decrease, then the volume in the reactor tank increases, and vice versa."

> "We don't really need other means due to the good relationship we have with the farmer, but if the land goes away, or the farmer retires, or cuts come about, the biosolids can be a source of revenue."
>
> **PETER HARTZ**

Lime slurry is added to the reactor tank to raise the pH to at least 12. The mixture is held at this pH for two hours. The contents are then blended and held at a pH of at least 11.5 for an additional 22 hours. This allows the process to meet U.S. EPA pathogen reduction requirements for Class A biosolids.

Solids are dewatered in a Netzsch plate-and-frame press. A seepex progressive cavity pump pulls a batch out of the reactor tank and pushes it into the press, which operates in two stages. During the first stage, the plate is filled at a low speed as it begins to press air out from the solids. In the second stage, the press continues to squeeze the solids, pushing out filtrate, which is pumped back into the treatment process.

Johnson Creek Waterworks WASTEWATER PERMIT REQUIREMENTS	
PARAMETER	**PERMITTED AVG.**
BOD_5	30 mg/l monthly avg.
TSS	30 mg/l monthly avg.
Ammonia as N	4.1 mg/l weekly avg. in summer
Total Phosphorus	1 mg/l monthly avg.

PASSING THE TESTS

When it comes to ensuring regulatory compliance for biosolids, Peter Hartz and his team at the Johnson Creek wastewater treatment plant (William Radue and Annetta Grillo, both grade 2 operators) don't take any chances.

They can collect samples from various stages in the biosolids process to ensure that the material meets the requirements for land application. A composite sample is collected from material that has been through the plate-and-frame press, and it is analyzed for enteric viruses, viable helminth ova, and compliance with exceptional quality solids requirements for pathogens.

"Samples can be collected on raw sludge, pre-dewatered sludge, and dewatered sludge," says Hartz. "But by testing the dewatered sludge, we verify that the process is destroying pathogens." The staff also performs a composite coliform test on the material stored in the pole barn to verify no re-growth. To date, none has been found.

Because the solids content fluctuates from batch to batch, the system isn't entirely hands-free. The pump can operate at pressures up to 100 psi, but staff must measure the solids content and make the necessary pressure adjustments. "It's automated to a point," says Hartz. "But we have to adjust set points on every batch."

From the press, biosolids drop onto a conveyor belt and are moved to the open-sides pole barn, next to the dewatering building. As more solids are conveyed to the barn, they are moved and shifted using a Bobcat skid-steer or front-end loader. The storage capacity is about 1,000 cubic yards, or at least two years of biosolids. The barn's concrete floor has a drain that conveys leachate to the sanitary sewer system.

OFF TO THE FARM

Farmers in the area grow corn, beans, and wheat and would gladly take the biosolids as a nutrient supplement, but for now only one farmer gets the goods. "We currently use only one farmer, but we have two others who accept the biosolids," says Hartz. "We have the material hauled to the farmer's field, where it is applied with manure spreaders."

Hartz marks the areas of the field where land application will take place. He works with an agronomist who calculates the best loading rates based on crop nutrient needs.

Water/wastewater superintendent Peter Hartz with the plant's Netzsch plate-and-frame biosolids dewatering press.

If the village looked to land-apply at any of the other farms, it would hardly be a hurdle to overcome: The delivery system is flexible, and the volume is manageable. But that doesn't mean Hartz isn't on the lookout for other options. While he may not be actively looking for more farmers, he is looking at other technologies.

"We don't really need other means due to the good relationship we have with the farmer, but if the land goes away, or the farmer retires, or cuts come about, the biosolids can be a source of revenue," Hartz says.

The treatment plant lab includes a Barnstead Mega Pure 3A water still (Thermo Fisher Scientific).

He is part of an organization called the Community-Supported Energy Group, a sub-group of Sustain Jefferson County, a nonprofit organization that works with local companies, individuals, and municipalities to make transitions to more sustainable practices. Together, the group members are working on a bench-scale study to determine whether a commercial pelletizer would be a wise investment for the village.

BETTER WAY?

"We have a diverse group of members, some young and some older," Hartz says. "We have retired engineers, working farmers, hobbyists, wastewater operators, business people, and ordinary citizens."

The pellets could be used as a soil amendment or as fuel in a stove or gasifier. A gasifier would burn at 1,200 to 1,400 degrees C and produce about 20 percent hydrogen, 20 percent carbon monoxide, and small amounts of methane, all combustible. Nitrogen would comprise 50 to 60 percent of the gas and is not combustible.

"The synthesis gas, or syngas, burns cleaner than coal and is comparable to natural gas as the products of combustion are carbon dioxide and water vapor," Hartz says. As part of the pilot study, the biosolids are mixed with leaves and compost before being pelletized. Full-scale plans would include using the pellets on site to produce heat and electricity. Leftover pellets could be sold to the general public, and excess electricity produced could be sold for carbon credits.

Annetta Grillo sets up BOD samples for testing.

"Energy production is possible in a sustainable manner and we have the means to do so at the present time."
PETER HARTZ

Peter Hartz checks out a seepex progressive cavity pump.

Before any large-scale changes can be made, the village council would need to hire an engineer to specify a gasifier for the site. Even with a successful land application program, Hartz hopes the plan for the pelletizer will move forward. "Energy production is possible in a sustainable manner, and we have the means to do so at the present time," Hartz says. tpo

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