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Karen Honer
Wastewater Treatment Superintendent
Lodi, Calif.

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The Neuse River Wastewater Treatment Plant plans to add equipment to make biodiesel from crops grown on the 1,000-acre site.

Sunflower Power

RALEIGH LOOKS AT USING CROPS GROWN ON TREATMENT PLANT PROPERTY TO PRODUCE BIODIESEL AS FUEL FOR ON-SITE POWER GENERATORS

By Doug Day

It is the picture of a sustainable system: nourishing crops with biosolids, converting crops into biodiesel, fueling engines to power a wastewater treatment plant, creating more biosolids. Such a closed system is being used at the Neuse River Wastewater Treatment Plant in Raleigh, N.C.

“We made the decision many years ago to take advantage of such a valuable resource,” says Tim Woody, superintendent for wastewater, reuse water and biosolids for Raleigh Public Utilities. After years of using its reclaimed water and biosolids to raise crops for animal feed on the facility’s property, the city has received a \$100,000 grant from the Biofuels Center of North Carolina to test the potential for crop-based biodiesel.

The first planting was 27 acres of sunflowers in 2010; canola was added in 2011. The seeds from both contain oils that can be processed into biodiesel, which can be mixed with diesel fuel for the plant’s engine-generators. The first sunflower crop showed promise, providing 1,074 bushels (29,700 pounds) of oilseed. That produced 1,258 gallons of biodiesel — 46 gallons per acre. The land was irrigated but had biosolids or fertilizer applied.

The cost to plant 140 pounds of sunflower seeds, grow and harvest the crop, and transport the oilseeds to a processor in Virginia came to \$2.35 per gallon of fuel. That included 28 hours of labor, but not the cost of extracting the oils and producing

biodiesel. The processor kept enough biodiesel to cover its cost of doing that, so from the original 1,258 gallons, Raleigh got only a small percentage of biodiesel for use in city vehicles.

Still, it was enough to create interest. The Neuse River plant uses 25,000 gallons of diesel fuel per year, and replacing 10 to 20 percent of that with biofuel would help the plant’s generators along with backup generators at more than 100 pump stations.

ADDING EQUIPMENT

Since the weak link was the off-site processing of the seeds, the next step is to spend about \$75,000 to install processing equipment to make biodiesel without adding personnel, Woody says. He expects that to be done in time to handle this year’s harvest; there are also 5,000 bushels of seed in storage at the plant.

Woody is working with Circle Energy of Dodgeville, Wis., which specializes in biofuels equipment. “The first piece that is critical is the seed crusher,” he says. “Making the biodiesel at that point is relatively easy. You don’t have to do a lot to the oil. A typical recipe includes sodium hydroxide [lye], alcohol [methanol], heat, and the oil.”

What crops to grow is not yet certain. Sunflowers have a large seed with good oil content. Canola has the highest oil content by volume, but the seeds are small. “Handling a seed that size is hard,” Woody says. “You can’t have openings or cracks in your equipment or storage bins or it all pours out.”

Sunflowers are also a great attention getter: “When 50 to 100 acres of sunflowers are in full bloom, it’s absolutely gorgeous. All the news agencies and media outlets pick up on the operation, and it makes



PHOTOS COURTESY OF NEUSE RIVER WASTEWATER TREATMENT PLANT

Sunflowers attract the attention of the media and the public, helping the Neuse River plant tell its clean-water story.



Farming is a full-time job for the Land Management staff at the Neuse River plant for most of the year. Along with growing crops to make biodiesel, they raise animal feed and manage biosolids land application.

BETTER BIOSOLIDS

As part of a new biosolids master plan, the 60 mgd Neuse River Wastewater Treatment Plant may add anaerobic digestion and solar biosolids drying in the near future. "We are a large facility using aerobic digestion," says Tim Woody, superintendent



for wastewater, reuse water and biosolids. "Anaerobic digestion makes better sense due to energy costs. It is obviously a large capital investment, but we see the need for anaerobic digestion for energy recovery." Five to 10 acres of solar drying for biosolids also could be added.

The plant produces Class B and Class A biosolids, but focuses on Class A because its use has fewer restrictions. "We don't need a site-specific permit and can market Class A to a larger agricultural market," Woody says. Solar drying would significantly reduce water content and cut transportation costs.

The Neuse River plant also hosts the state's first utility-scale solar power project on local government land. The public/private partnership includes a 1.25 MW photovoltaic array with 4,600 photovoltaic modules (Trina Solar) on seven acres of plant property. The solar plant went online in December 2011 at no cost to the city. NxGen Power and Southern Energy Management built, own, and operate the equipment and sell the power to Progress Energy.

After six years, the city will have the first option to buy the solar array. "It has performed very well," says Woody. "We have begun talks about possibly expanding it."

for a great story." That attention helps the plant's image and improves relations with neighbors, environmental groups, customers, regulators, and the general public.

At the same time, Woody is cautious: "We are not a research institute or a university. We are a wastewater treatment facility and that is our job. However, we also offer a real-world setting for conducting trials and considering alternatives.

"This grant gives us the opportunity to advance biodiesel commercialization and share our experiences. Part of it is to better understand all the components — how much time we are putting into it, how much equipment, herbicide, and fuel, and consider a cost-benefit analysis." It also includes sharing the findings with other municipalities through field days and training sessions.

THE FARMING ADVANTAGE

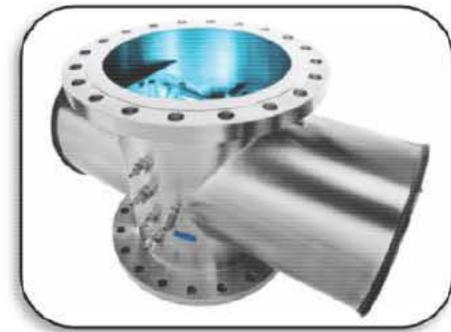
Unlike most treatment plants, the Neuse River facility has been farming some portion of the 1,000-acres site since the late '70s. The land receives biosolids and about half is irrigated with reclaimed water. Along with sunflowers and canola for biodiesel, the land grows corn, wheat, soybeans and hay, sold to granaries for animal feed.

The land management staff includes a manager, an off-site distribution coordinator, seven equipment operators, two program supervisors, and two mechanics. Farming is their full-time job from planting through harvest, and they apply about 15,000 dry tons of biosolids per year on private farm fields.

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When farming slows down, the staff members perform general site maintenance at the city's four wastewater facilities, at pump stations, and anywhere else their skills are needed. "Like many farmers, those guys are jacks of all trades, and we use them in many different settings," notes Woody.

The farming and biofuel programs fit into the city's goal of using sustainable practices. "It's a great idea," says Woody. "You grow the crop, assimilate the nutrients from biosolids, harvest the crop, make biodiesel, fuel your equipment, and do it all over again. It's a full circle." **tpo**

What's Your Story?

TPO welcomes news about environmental improvements at your facility for future articles in the Greening the Plant column. Send your ideas to editor@tpomag.com or call 877/953-3301.