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Turning waste into energy

by Cynthia McFarland

In a world that has grown increasingly conscious of the environment and ways to protect it, today's livestock farmers are faced with growing pressure to dispose of animal waste efficiently with fewer negative effects on the environment. Most likely, more stringent government regulations eventually will make this a necessity, not just the smart, green thing to do.

Indeed, equine waste is more than a disposal problem. Horse manure and used bedding attract insect pests and vermin, produce unpleasant odors, and can contaminate water sources due to runoff. Disposal costs will only increase with the higher price of fuel. But what if this abundant, endless supply of biodegradable waste could be used to create energy? Several businesses have taken this concept seriously and come up with effective ways to do just that.

Incineration

When a local horse club struggled to deal with waste disposal, its plight came to the attention of Swebo Bioenergy (www.swebo.com), and in 1994 the Swedish company began researching ways to solve the problem. Costs had risen markedly to have the manure hauled away for disposal, so Swebo considered ways to eliminate the need for disposal by burning the waste. The result was the Swebo BioTherm, a multi-fuel burner.

"This is not a research project; the first unit has been up and running for five years now," said Mattias Lindgren, export director at Swebo, which is based in Boden, Sweden. "We started this project together with Lulea Technical University and have done all the research and technology, and built a new laboratory with them."

Lindgren noted that discovering a way to burn the waste solved three problems: Not only did incineration eliminate the cost of disposal, but it also provided an immediate energy supply in an environmentally friendly manner.

After cleaning stalls, the manure and used bedding are dumped into a storage bin, which feeds this material directly into the burner. The material going into the burner

must contain no more than 50% moisture, so more dry material, such as used shavings, can be added if necessary. Horse manure is normally about 45% moisture. A control system on the burner regulates how much waste is fed into the burner at a time.

"When the manure gets into the burner, there is a two-step combustion process," Lindgren said. "Smoke and gases from the process go into a boiler to produce hot water for heating the facility. We are replacing the oil or gas that was used to heat these facilities."

The combustion process is so efficient that very little smoke is produced. Lindgren said the emissions produced during the process are highly regulated and considered very clean. Ash from the burner is automatically fed into an ash container, and can later be used as fertilizer.

Bioburner units vary in size and can handle the waste from a minimum of 20 horses up to 1,500 horses. (If more than 1,500 horses are on site, additional burners would be necessary.)

At this point, the bioburner creates energy units that are used to produce hot water and steam used in facilities and factories. By 2009, Swebo will make available the option of producing both hot water and electricity from the same unit.

Because the Swebo BioTherm is a multi-fuel burner, it can be used not only for equine waste but also for manure from other farm animals, as well as many wood-based materials. The system has generated interest from potential customers in the United States, and Swebo Bioenergy International is currently working to establish a presence in the U.S.

Lindgren, who has been talking to farm owners in different states, believes it is just a matter of time before American farmers start using the Swebo BioTherm.

"This would fit them like a glove, and not only horse farms, but also poultry producers," Lindgren said. "When you do the math on the investment versus the cost of heating and paying for disposal of manure, this really looks good."

Gasification

Gasification is a controlled, self-contained method of oxidizing organic material at stable, controlled temperatures. Widely used in the U.S. during the late 1800s, gasification went out of vogue in the last half of the 1900s due to the popularity of oil and natural gas, although the technology has been steadily used in China and

South Africa.

With more than 35,000 Thoroughbreds alone in Marion County, Ocala has been trying to come up with a realistic solution to equine waste disposal. Add in horses from other breeds that call the county home, and you're looking at some 500,000 tons of muck produced each year.

The Florida Thoroughbred Breeders' and Owners' Association (FTBOA) recently announced it would partner with Texas-based MaxWest Environmental Systems Inc. (www.maxwestenergy.com) to convert waste into green energy. It is estimated that the facility will produce approximately 7.2 megawatts of exportable energy each day, enough to power more than 1,400 homes. Plans are for the facility to be operating by the end of 2009.

"This green energy is becoming more and more a part of what communities are doing to clean up the atmosphere," said Richard Hancock, executive vice president of FTBOA, which is based in Ocala.

"We have been working on this process for over a decade now, and we're very excited about it," Hancock said. "I think this will really take care of the equine waste issues here in Marion County and a lot of other issues with wood waste and other materials. It will take a load off the landfill."

MaxWest utilizes gasification technology to produce renewable thermal energy, which then can be used to produce green electrical power for sale to the power grid. Non-organic substances pass through the system and exit as residual ash that is safe to use and handle and can be utilized as an aggregate for asphalt, concrete, or commercial fertilizer. The volume of ash produced is only about 10% to 20% of the original waste amount.

The MaxWest system also captures methane that otherwise would be released into the atmosphere. The process produces no smoke, odors, or pollutants. MaxWest systems currently are operating at wastewater treatment plants and also are used to convert wood, cow, and poultry waste.

In March 2008, Sanford, Florida, became the first municipality in North America to adopt the MaxWest gasification system to dispose of wastewater sludge, also known as biosolids, the end product of a sewage treatment plant.

These biosolids are gasified in an enclosed system to produce synthetic gas, which is then oxidized in an enclosed thermal oxidizer to produce renewable thermal energy. The Sanford plant intends to use this thermal energy to replace natural gas

and power a dryer. Compared with using natural gas, the plant is estimated to save the municipality approximately $9-million over the course of a 20-year contract by using the MaxWest system.

Dry fermentation

Based in Gainesville, Florida, Sigarca Inc. (www.sigarca.com) utilizes a patented technology known as dry fermentation to transform biodegradable waste and materials into energy resources without polluting the environment. The company recently received a $499,500 grant from the state of Florida for its research and demonstration project designed to turn equine waste into renewable energy.

The two-year project is currently under way and should be complete by the end of 2008. The 3,000-square-foot bioenergy demonstration plant will operate at the Southeastern Livestock Pavilion, a busy horse show and sale facility in Ocala.

"We're providing the site for [Sigarca] to do their work," said David Holmes, Marion County extension director. "Our interest in this as an extension office is thinking about how farms can affordably convert horse manure into a useful product that won't damage the environment. We have a lot of horse owners that come here from all over the Southeast. If this works like it's supposed to and is affordable, we'd like this to be technology they can use on their farms."

The process of dry fermentation is similar to composting, but it takes place in a controlled, enclosed, heated environment and requires much less time. During the process, all pathogens in the muck are destroyed, and no odor is emitted because the contents are completely contained. The technology complies with the most stringent environmental laws and regulations, is hygienic, and produces no noise, runoff, or noxious odors.

Muck composed of manure, urine, and used bedding is placed in the bioreactor containers, and within approximately three weeks it is reduced to biogas that can be used as a fuel, for heating, or for producing electricity. This energy could even be used to power the plant itself. In addition to energy, other byproducts are fertilizers such as organic soil, a product comparable to peat moss, and soil tonic, which is used to enhance root growth and to reduce the need for pesticides.

"This transforms a problem into renewable energy," said Sigarca's Jose Sifontes, Ph.D., who was part of the team at the University of Florida that developed sequential batch anaerobic compositing (SEBAC) in the mid-1980s. "It can help us in our quest for independence from foreign oil.

"Some countries are already using vehicles functioning on biogas, and I think that's a very good move. Biogas is the most efficient and clean fuel after hydrogen for vehicles and has a historical, proven record. The standard engine can easily be converted, and the kits are available everywhere. With biogas, the engines last longer and the biogas is very efficient.

"Every community produces animal and agricultural waste and wastewater; all of that can be used in this technology and produce a significant amount of biogas."

Sifontes is enthusiastic about the technology, which can use any biodegradable material.

"The reason behind this is to really show the community a different way of handling the problems," he said. "We need a sense of community that proactively integrates the management of problems such as energy, waste, and agriculture. You always have to have a combination of technologies, not just one."

Cynthia McFarland is Florida-based Thoroughbred Times correspondent