

Green Technology for

A new technology exists to sterilize manure, make welding safer and faster, and to lower emissions from coal-burning utility plants.

by *Linda Robbins*, assistant editor

“Our company was founded for the purpose of taking nature’s best sterilizer — heat — and making nature’s best fertilizer — manure — safe again,” says Ermanno Santilli, CEO of MagneGas Corp. Santilli says it’s a relatively simple process that uses anything — anything — that is pumpable, such as manures, sewage or sludges. The unit subjects the waste to a 10,000°-12,000° F electric arc using a patented system, Venturi™ technology. The flash of electricity, heat and ultraviolet light kills just about everything, he says. The process can be used for agricultural, municipal or industrial waste to create irrigation water or fertilizer.

The waste must be in a flowable state containing up to 10% solids by weight or less. In its testing of raw pig manure at a large Indiana hog farm during a 30-day demonstration of the company’s sterilization system, the raw manure contained 1,600 cfu (colony-forming units) per 100 milliliters (mL). After going through the MagneGas system, the coliform (*E. coli*) level was undetectable per the Environmental Protection Agency (EPA) requirements.

The system turns the Class B manure to Class A under Rule 503.32 Alternative 1 time and temperature method, Santilli added.

According to the press release announcing

the demonstration, the hog farm was established in 1996 and raises more than 40,000 pigs per year. It has a minimum of 18,000 pigs on hand at any given time, with future expansion planned. Following the demonstration, the hog farm committed to buy a sterilization system and become an exclusive distributor for the company’s products in the agricultural industry in Indiana, Ohio and Michigan.

The owner of the hog farm commented that the demonstration unit produced a high-quality fertilizer that was nearly odorless, and, he said, the use of the sterilization unit would help the farm be good stewards of the land and leave it better than they found it. The hog farm will also be available as a demonstration center for the agricultural sector for this new process.

The units come in a range of sizes and throughput capacities capable of processing different volumes of waste. They can be purchased or leased from the company. Units are available that process 1,500 gallons (gal.) per hour to 4,500 gal. per hour and can be

built to fit flatbed trailers, Santilli explained. The technology can sterilize blood, manure, sewage, sludge, landfill leachate and more, making the resulting liquid in some cases ideal for irrigation, especially where water is in short supply.

The units have two operating modes, Santilli explains, sterilization and gasification. With sterilization, if 100,000 gal. of manure are pumped through the unit, there will be 100,000 gal. of sterilized manure, Santilli says. In sterilization mode, the volume of what is being treated doesn’t change much, though the sterilized manure will be granulated or made into microscopic

pieces so it can be more easily absorbed by added microbiology, soils or crops. Santilli says there is a gas produced in sterilization mode that can be co-combusted with lower-temperature fuels like natural gas or propane and used on the farm or ranch to maximize the positive environmental effect and further reduce costs.

“Larger agricultural operations would certainly be able to use the system, but smaller operations clustered in areas that are focused on organic farming could benefit from a portable unit,” Santilli says. “A portable unit would be sufficient to pull the liquids from manure ponds or lagoons and sterilize it so it could be used for land application and [to] keep the organic ‘virtuous circle’ intact.”

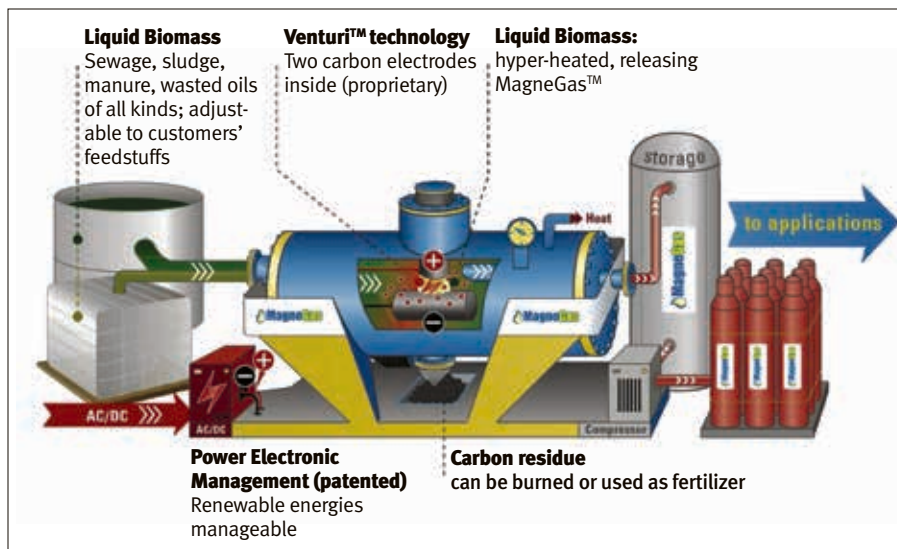
Gasification

In gasification mode all the liquid is cooked off so that all that is left is gas and, in some cases, a residue. It is used when trying to get a specific gas or when the object is to eliminate the liquid due to its hazardous nature, such as used oil-based wastes, Santilli says. The gas produced in gasification mode is a hydrogen-based gas more on par with acetylene, he adds. It can be used for metal cutting, cooking, heating or powering gas bi-fuel automobiles.

Based on lab results performed by the Edison Welding Institute in Columbus, Ohio, MagneGas burns at a higher temperature

The system turns the Class B manure to Class A under Rule 503.32 Alternative 1 time and temperature method.

Fig. 1: How the MagneGas system works.



Source: MagneGas Corp.

Manure and More

than acetylene, is made of a renewable source, cuts 38% faster and cleaner, releases less smoke, and is much more stable than acetylene, which is inherently unstable. The high flame temperature of MagneGas was independently verified by the City College of New York at 10,500° F, while acetylene, which is generally considered to be the highest flame temperature of commonly available gases, has a flame temperature of 6,250° F.

The company is already replacing acetylene with MagneGas via direct retail in the Florida area and through distribution to Michigan and New York. It was just recently awarded a prestigious place in the New York Fire Department's arsenal of tools. The company's testing shows there is little to no slag with MagneGas, no top-edge rollover, little soot, minimal noxious or other harmful fumes, and lower hazard if leaked since the new gas is lighter than air. Usable gas in the cylinder with acetylene is 80%, compared with MagneGas at 100%.

As part of the company's ongoing testing of MagneGas fuel with the U.S. Navy, the company received a request to deploy fuel for testing from one of the Navy's largest shipyards and industrial complexes in the United States. Officials from the shipyard viewed a live demonstration in late 2014 and requested on-site testing. The testing is expected to start in the first quarter of 2015.

"Acetylene has a chemical make-up which is inherently unstable, so if you're a fireman running into a burning building with a tank of acetylene on your back, you will have to be very careful of a physical shock or



PHOTO COURTESY OF MAGNEGAS CORP.

sudden temperature change," Santilli says. "MagneGas is inherently stable and much safer in that type of situation."

Business background

Santilli was named CEO of the company in 2012, he explains, "to take the company to the next level." MagneGas was founded in Italy in 2007 by Ruggero Santilli, a scientist and inventor who was schooled at the Massachusetts Institute of Technology (MIT). He later taught there, at Harvard and at Boston University. His father is still chief scientist and chairman of the board.

Having received a bachelor's degree from the Boston College Carroll School of Management and a master of business administration (MBA) degree from the

Indiana Kelley School of Business, Santilli spent more than 15 years with Fortune 500 companies such as Club Car, Bobcat, Thermo King and Trane at Ingersoll Rand Co. During the three years prior to being named CEO, Santilli founded MagneGas Europe, where he became an expert in the company business model and applications.

"Since I've come to Florida, we've been focusing on independently certifying our claims to build confidence in our products, commercializing the business lines and helping the company grow. So far we have succeeded on all objectives. The swine manure sterilization opportunity has been very exciting," commented Santilli.



Other potential markets

In addition to sterilization of agricultural and industrial wastes, MagneGas CEO Ermanno Santilli says the company has had two wastewater-treatment contracts in Italy since 2009 and has conducted tests in Europe, Australia and the United States. In Italy, Santilli says, the company has cut sewage-treatment costs in half.

In gasification mode, Santilli says there is potential for the technology to be co-combusted with coal, oil and other gases. Due to the high flame temperature of MagneGas, it burns existing fuels cleaner, and some testing has been conducted with large utility companies to reduce emissions from coal plants.

Santilli says the environmental advantages of co-combustion with MagneGas include reducing carbon dioxide (CO₂) by 30%-40%, increasing heat by 50%-100%, reducing mononitrogen oxide and carbon monoxide by 50%-90%, and almost eliminating particulates. The company believes the high flame temperature of MagneGas, when utilized in the co-combustion vertical, unlocks greater energy creation potential with fewer emissions from hydrocarbon fuels. In addition to the environmental benefits, Santilli says, MagneGas conversion would be much less expensive than current "scrubber"

technology, which has yet to lower emissions enough to meet the new stricter federal emissions standards.

"Co-combustion with MagneGas technology can save utility companies money and lower emissions, meeting federal emissions standards," Santilli says.

Testing is under way with a regional utility, Santilli adds, and the company has signed contracts with a leading technical university working with Pratt & Whitney, GE and Siemens. Santilli says co-combustion makes sense because coal is the most abundant energy source in the world, and diesel co-combustion systems are already established in the transportation industry. Since coal and diesel supply chains are well established, the MagneGas technology can be used in concert with existing plants.

"Higher combustion temperatures result in higher efficiency," Santilli says, "and higher efficiency results in lower emissions."

Santilli says he would welcome inquiries about the sterilization or gasification units for agricultural or industrial wastes. Contact him at ermannosantilli@magnegas.com.