Power to The Poop: One Colorado City Is Using Human Waste to Run Its Vehicles

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Dump trucks refuel with renewable natural gas made from human poop at the Persigo Wastewater Treatment Plant in Grand Junction. Photograph: City of Grand Junction

Renewable natural gas is a growing industry for fuel, electricity and heat, but advocates says it's a largely untapped market in the US

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No matter how you spin it, the business of raw sewage isn't sexy. But in Colorado, the city of Grand Junction is making huge strides to reinvent their wastewater industry – and the result is like finding a diamond in the sludge.

The Persigo Wastewater Treatment Plant is processing 8m gallons of Grand Junction's human waste into renewable natural gas (RNG), also known as biomethane. The RNG is then used to fuel about 40 fleet vehicles, including garbage trucks, street sweepers, dump trucks and transit buses.

It's possible through a process called anaerobic digestion, which breaks down organic matter into something called raw biogas. The biogas is then collected and upgraded to RNG – at pipeline quality – and can be used as electricity, heat or transportation fuel.

Turning wastewater into biogas is not new in the US. For decades, biogas has been used for heating or to power generators and micro-turbines to produce electricity.

“But as far as we know, we are the only municipal wastewater facility in the nation producing biogas used as vehicle fuel,” said Dan Tonello, wastewater services manager for Grand Junction.

Tonello said their old method involved simply flaring off the raw gas into the atmosphere.

“Now, instead of letting it go to the flare, it goes to conditioning equipment that scrubs and cleans the gas and puts it into a pipeline,” Tonello said.

The environmental benefits are abundant for Grand Junction. According to Bret Guillory, utility engineer for the city, “we may be reducing greenhouse gases by as much as 60% to 80% … This is compared to the old process of flaring off the raw gas at the plant, and burning diesel and gasoline in some of our larger fleet equipment.”

Developed over 10 years, the project is worth $2.8m. The cost to produce and compress the RNG is around 80 cents per GGE, while it’s sold to the fleet department for $1.50 per GGE.

“The project will pay for itself in around seven years,” Guillory said. “Not a bad return on the investment.”

The underground pipeline is nearly six miles long and carries the RNG (in compressed form, not liquid) from the wastewater plant to the city’s fueling station. Fleet vehicles fill their tanks with RNG during the night – and by morning they’re ready to go.

Grand Junction had installed a compressed natural gas fueling station in 2011. So the infrastructure was already there, they just switched the natural gas to RNG.

Approximately 460 gasoline gallon equivalents (GGEs) are produced on-site daily.

Vehicles wait to refuel at the Persigo Wastewater Treatment Plant in Colorado. Photograph: City of Grand Junction

Human poop, however, is not the only waste that produces RNG. Other renewable resources like landfills, food waste and animal manure can also be used.

Regardless of the source and use, greenhouse gas emissions decrease when fossil fuels (like natural gas) are replaced by RNG, says the Environmental Protection Agency (EPA). As well, methane from rotting waste that otherwise would have been absorbed into the atmosphere is now used as a renewable energy source.

RNG is practical because it can fuel anything that runs on natural gas. And according to the EPA, it's also produced, transported and used in accordance with all the same rules as fossil natural gas.

The EPA has also qualified waste-derived RNG as an low-carbon cellulosic biofuel under its Renewable Fuel Standard (RFS) program, which has led to some successful growth in the biogas sector.

Yet the market is still limited. There are hundreds of US projects that produce biogas that could be upgraded to RNG. It's this untapped potential that concerns renewable energy advocates.

Energy Vision – an NGO that promotes sustainable transportation practices – has identified 8,000 large farms and dairies, 17,000 wastewater facilities, and 1,750 landfills as candidates for RNG production.

But there are still fewer than 20 US pipeline-quality RNG operations – this means RNG that can flow through existing natural gas infrastructure, allowing it to move in any direction through the grid.

By comparison, the European Union has been a leader in RNG, with Germany leading in production, followed by Sweden.

According to the European Biogas Association (EBA), RNG is produced in 15 European countries, and in most of them is injected into the natural gas grid. There are 282 RNG plants across Europe, with a total production of 1.375bn cubic meters.

In Europe, RNG is primarily used for heat and power, but the transportation fuel market is on the rise. In 2013, the number of RNG filling stations doubled, increasing the share of RNG used in transport to 10%.

So what is roadblocking RNG from flowing freely in the US?

Jeremy Kranowitz, executive director at Sustainable America, said it has a lot to do with infrastructure. In order to get RNG facilities up and running, they need a dedicated supply of waste, which means long-term contracts and sometimes murky financing.

“The other thing is, people don’t really want to finance shit,” Kranowitz said. It’s no surprise that waste is disgusting, and harder to convince stakeholders of, many of whom are less familiar with RNG than they are of fossil natural gas.

In the transportation sector, proximity of vehicles to fueling stations and facilities to pipelines is also key. For instance, farms that could produce RNG through animal manure “automatically don’t qualify because they’re just too far away”, Kranowitz said.

When it comes to electricity, the disparity in rates is an issue. “In some states the price of electricity is higher, so RNG can better compete. But in low electricity states, it doesn’t pencil out,” he said.

And while food waste might be the most viable RNG source – Energy Vision calculates 66.5m tons of food waste per year could be used – as Kranowitz reminds us, “You need a lot of food waste, and food waste is wet and heavy, and the farther you have to ship it, it quickly becomes uneconomical.”

This is where Colorado steps in, again.

In northern Weld County, the Heartland Biogas facility is the largest co-digestion anaerobic digester project in the world, using six 1.7m-gallon tanks filled with food scraps and dairy manure.

Heartland’s partner, A1 Organics, is in charge of collecting food waste from Colorado restaurants, grocery stores, and distribution companies, as well as spoiled, expired and recalled food.

“We are tasked with supplying around 140,000 gallons per day of the food scrap slurry to the plant,” said Bob Yost, vice-president at A1 Organics.

Heartland has been producing a small quantity of RNG since April 2014. But in a matter of months, Heartland will be piping its product to California to provide electricity to Sacramento County.

James Potter, president of AgEnergy USA, the developer behind Heartland, said that while RNG is pricier than fossil natural gas, “RNG can provide highly competitive pricing versus other forms of renewable energy. It’s also produced 24 hours per day and is not influenced by sun or wind conditions. This is a major benefit to the energy industry.”

Energy Vision trumps those benefits with figures that say transforming waste to RNG would replace 7bn gallons of diesel used in transportation annually. This would be like removing 4m cars from the road, and potentially generating 70,000 new jobs.