

Flush toilet, fill up tank, drive away

GOTEBORG, Sweden

Taking a road trip? Remember to visit the toilet first. This city is among dozens of municipalities in Sweden with facilities that transform sewage waste into enough biogas to run thousands of cars and buses.

Cars using biogas created a stir when they began to be rolled out on a large scale at the start of the decade. The tailpipe emissions are virtually odorless, the fuel is less costly than gasoline and diesel, and the idea of recovering energy from toilet waste appealed to green-minded Swedes.

"When you're in the bathroom in the morning and you can see something good come of that, it's easy to be taken in by the idea — it's like a utopia," said Andreas Kask, a business consultant who drives a taxi in Goteborg. "But it hasn't worked out that well in reality."

Drivers complained that there were too few filling stations and that cars only held enough biogas for two or three hours of driving. Some also said early models of biogas cars performed poorly on steep climbs, were sluggish on damp mornings and had reduced trunk room because of bulky tanks.

Critics also question the sustainability of the technology because some of the systems use pipelines that carry natural gas to reach consumers, thereby mixing the two fuels together.

Two years ago, Volvo, which is owned by Ford Motor, announced that it would stop production of biogas cars and instead focus on making environmentally friendly vehicles powered by ethanol blended with gasoline.

"We didn't sell enough cars," said Maria Bohlin, a spokeswoman for Volvo, referring to biogas models. "We might consider making biogas cars again, although we're not there at the moment."

Since Volvo's decision to stop using the biogas technology, ethanol has made deeper inroads into the Swedish market, despite criticism that it contributes to deforestation and raises food prices. Made from cereal and sugar crops, ethanol also sells for slightly less than biogas in Goteborg, although proponents of biogas say that their fuel is far more efficient per kilometer.

Goran Varmby, an official at Business Region Goteborg, a nonprofit company that promotes trade and industry in the region, said he hoped that Volvo would resume production of biogas cars.

"But there are a lot of big economic interests behind ethanol," Varmby said. He was alluding to the generous subsidies farmers and biofuels producers in Europe and the United States earn for growing and processing crop fuels.

Chemically, biogas is the same as natural gas from fossil fuels, but its manufacture relies on a process where bacteria feed on fecal waste for about three weeks in an oxygen-free chamber. The result is two-thirds methane and one-third carbon dioxide, as well as a nutrient-rich residue that can be used as soil or construction material.

Once the methane is purified, it is pumped through Goteborg's network of gas pipelines to specialized filling stations, where it is pressurized for delivery. Any car with an engine and tank configured for compressed natural gas can use biogas.

After each fill-up, the corresponding amount of biogas is injected into the natural gas grid as an offset, said Bo Ramberg, chief executive of FordonsGas, which is based in Goteborg and operates the largest chain of biogas filling stations in Scandinavia.

The idea is that the amount of gas used by vehicles is offset by the gas produced by organic waste.

Ramberg, formerly an executive at Volvo, said he left the company about a decade ago to start FordonsGas when he spotted an opportunity to promote the infrastructure needed to deliver biogas to drivers.

"We're looking to certify the emissions from the entire life cycle of biogas production and use," Ramberg said.

"But we already strongly believe that biogas is the best fuel for lower emissions — no discussion about it," he said.

FordonsGas, which is half-owned by Dong Energy, a Danish company, makes a small profit and is continuing to invest in new biogas filling stations, Ramberg said.

Biogas promoters acknowledge

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that the decision by Volvo to halt production of biogas cars had dealt the technology a serious blow.

But they said decisions by Mercedes and Volkswagen to introduce a new models of biogas cars in Sweden this year, and rebates and tax breaks for drivers, could still invigorate sales of the cars and fuel.

Biogas as a vehicle fuel is also available in Switzerland, France, Germany and Austria, but Sweden is the leading user in Europe, said Irmgard Herold, an analyst at New Energy Finance in London.

Many people in Goteborg remain optimistic about the virtuous link they have created between waste and secure energy supplies.

Ola Fredriksson, an engineer at Gryaab, the sewage facility in Goteborg, said that what an average person flushed down the toilet each year created enough biogas to drive 120 kilometers, or 75 miles.

"If the oil price keeps on going up, and people are prepared to pay more for renewable energy, then it will make our company interested in producing more biogas," he said. "We have the capacity."