

DEN EELDER FARM

Small farm scale mono-digestion of
dairy slurry for energy independence and
reduction in greenhouse gas emissions



MISSION AND VISION

The Den Eelder farm's website proudly boasts that 'our cows poo electricity and heat!' Thanks to a closed circuit mono-digestion system, the farm actually runs on green energy produced from its own manure. However, owner Ernst van der Schans warns not to expect farm biogas to make you wealthy. In the early 1980s, Mr van der Schans started farming near Well-Ammerzoden, in the province of Gelderland, in the Netherlands. In 1990, he branched out to dairy processing, a rather energy-intensive process. He now has a relatively large dairy farm, with around 500 cows. The concept of producing biogas from cattle manure was of great interest to him. This was not just about using this renewable energy on the Den Eelder farm, but also to reduce methane emissions.

THE BIOGAS SYSTEM

The decision to use mono- or co-digestion

In the beginning, he was not sure if he should use mono-digestion (where only manure is converted to biogas) or co-digestion, in which other feedstocks are also fed into the digester. In 2012, Ernst van der Schans finally decided to invest in a Microferm mono-digestion system, with a 66 kW cogeneration unit. "There were several reasons for this", says Mr van der Schans. "We didn't have to add a cost item to our books for the supply of co-products. We did not have to produce any additional manure for the digester, and we just wanted a simple, small-scale installation. So we started small, with 7,000 tons of manure every year." Ernst van der Schans is happy that he opted for mono-digestion. "It suits our farm. We like using a closed-cycle system. In addition, we prefer not to have any external products or animals on our site. We also wanted a simple logistical process."

The digester system

The first-phase mono-digestion installation processed 7,000 tons of fresh manure per year. This yielded 250,000 cubic metres of biogas. The combined heat and power (CHP) generator produced 500,000 kWh of electricity and 1 million kWh of heat every year. The heat is used to raise the temperature of the manure before it goes into the digester and to heat the digesters. The electricity is used on the farm. The Den Eelder farm recently expanded its capacity by adding an extra digester. The additional digester can hold up to 1,500 cubic metres of manure and store a thousand cubic metres of gas. A biogas heater (700 kW) is used to heat water to 110°C. This addition increased the overall capacity to 15,000 tons of fresh manure per year.

The installation (photo 1) now yields 1.5 million kWh of heat per year for the Den Eelder farm's own dairy produce operation. "We now produce more than enough to meet our farm's energy demand, except at peak times. The remaining energy that we require will come from the solar panels that we are installing on the roofs of the animal enclosures, which means that we will have zero energy importation." According to Mr van der Schans, the installation is quite basic. "But I like basic. The digester stirs the manure and heats it to 40°C. This yields 30 to 40 cubic metres of biogas, with a 60% methane content, per ton of manure."



Photo 1:
Den Eelder biogas system



Photo 2:
Manure shovels in stables

LESSONS LEARNED

Commissioning pains

The completed project was very pioneering. In the beginning, biogas production left something to be desired. According to Mr van der Schans, “We had to adjust the initial design in order to reduce the moisture content and sulphur level in the biogas, so that the gas engine could run more smoothly. Since then, things have been going well and the installation only requires limited daily maintenance.”

Fresh manure input to the digester increases gas yield and reduces emissions

The other parts of the farm, such as the animal enclosures, have also been revamped for the purposes of biogas production (photo 2). “Our stable floors are level”, says Ernst van der Schans. “We use manure shovels once an hour to remove manure from the animal enclosures. A small amount of this fresh manure is pumped into the digesters every five minutes. This is important. The fresher the manure, the more methane and gas is produced. By using fresh manure we also reduce methane emissions from the manure storage facilities, allowing us to make an additional contribution to climate policy.”

THE FUTURE

The Den Eelder farm invested roughly €800,000 and saves over € 80,000 in gas and electricity costs per year. The farm receives financial support from the SDE+ (Sustainable Energy Production Incentive). Mr van der Schans states “It’s still a struggle to make it all work financially. Giving farms with mono-digesters a little extra scope for development would be a way for the Government to encourage mono-digestion at no extra cost. I am an advocate of small-scale renewable energy generation.” Ernst van der Schans concludes, “It suits our dairy farm. However, mono-digestion has to be widely applied. It also makes dairy farming much more sustainable.”

Specifications of digester system at Den Eelder farm

- Technique: mono-digestion
- Input (per year): 15,000 tons of fresh cow manure
- Capacity: 66 kW electricity / 700 kW heat
- Net output (per year): 500,000 kWh of electricity and 1.5 million kWh of heat



IEA Bioenergy task 37
"Energy from Biogas"
<http://task37.ieabioenergy.com>

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Further Information

IEA Bioenergy Task 37:
 Energy from biogas

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IEA Bioenergy Task 37



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