

Peacehill Farm - Anaerobic Digestion (Gas to Grid), Biomass and Solar



Peacehill Farm

Wormit

Fife

DD6 8PJ

Date of visit: 8th December 2015

Ross Forster has developed an AD plant that supplies bio-methane gas directly to the National Gas Grid. He has also installed 1,500MW of biomass boilers for their broiler sheds and 370kW of Solar PV.

Background

Peacehill Farm is one of four farms that make up the family business of T D Forster & Sons. Collectively the four farms total 1,500 acres. The farm traditionally produces a mix of vegetable, potatoes and cereal crops as well as eleven poultry sheds producing over two million chickens per year. The rejected crops will be used in the AD plant as well as chicken litter from the poultry sheds although, the majority of the feedstock will be from crop feedstocks.

In addition to the AD plant, Ross Forster has already invested in four biomass boilers to heat their poultry sheds these consist of a single 900kW system and three 199kW systems. In addition to this they have also invested in three rooftop solar systems totalling 370kW.

The AD scheme (equivalent to 2MW_e)

The AD scheme was conceived with two main objectives:

- To generate bio-methane and digestate from vegetable/ cereal matter grown at Peacehill Farm.
- To ensure that the movement of feedstock and digestate were integrated into the operation of the farm as seamlessly as possible.

Bio-methane injection into the National Gas Grid was chosen in preference to electricity generation due to the proximity of the local gas network pipeline which passed under the farm access road. There is a 250kW CHP engine on site, but this is primarily to provide heat and power to the AD unit. Securing the

grid connection for the CHP unit from Scottish Power Energy Networks has been one of the biggest challenges on the project due to a "Section 37" issue.

The present expected output of the plant can be described as approximately 368m³ of bio-methane per hour. Running at 100% output the capacity of the biogas plant at Peacehill is broadly equivalent to a 2MW_e (electrical) biogas plant.

There is capacity in the biogas plant for future expansion of bio-methane output by approx. 25%, but further investment would be required in the gas upgrading plant to cope with the extra throughput.

The feedstocks used are the off-cuts broccoli and cauliflower as well as wheat, potatoes rye, maize and energy beat. To grow this amount of feedstock requires 1,750 acres of land, 1,500 acres of which is owned by T D Forster & Sons and 250 acres of which is rented. 600 acres of rye growing agreements have also been put in place with neighbours to allow the farm to carry on its' traditional cropping rotation.

The scheme consists of:

- Two 28x8m digester tanks
- 34x8m digestate storage tank
- 200m³ liquefier tank
- Separator
- Two 60 tonne feeders
- Pasteurisation System
- 330x90m silage pits

The scheme in total cost approx. £8million. 90% of the funding has been provided by Ingenious Investments with Ross Forster and his father owning 10% of the scheme. In year four of the project the Forster's will have an option to buy the full plant.

The Gas Market

The key parties in selling gas onto the grid are:

- **Producers** – are responsible for producing the gas. The gas must meet the quality requirements set out in the gas safety (management regulations GS(M)R1996).
- **Gas Shippers** – convey the gas in the pipeline network by contracting with gas transporter.
- **Gas Transporters** – own and operate the gas distribution network.
- **Suppliers** - are responsible for customer interaction and provide an interface for consumers to purchase their gas

Biomass Boilers

There are four biomass boilers in total that supply heat to the eleven broiler sheds on site. There is also a gas back up boiler. Energy Innovations from Herefordshire was selected to install these schemes in 2013 as they had undertaken similar projects.

The largest, a 900kW Gillies boiler, supplies heat to six of the broilers sheds. It has a walking floor fuel supply system. There is 200 tonnes of wood fuel storage for this boiler.

For the other five broiler sheds there are three 199kW boilers that are also Gillies. These are supplied with wood fuel from a 90 tonne store that feeds the boilers via an auger and agitator. The square design of the store means the corners have to be cleaned by hand. The ash is also removed by hand, which the Forster's say is a messy job. These boilers do not have any thermal storage due to the lack of space on site. Ross Forster thinks this may have been a mistake as it reduces the efficiency and amount of control they have over the system.

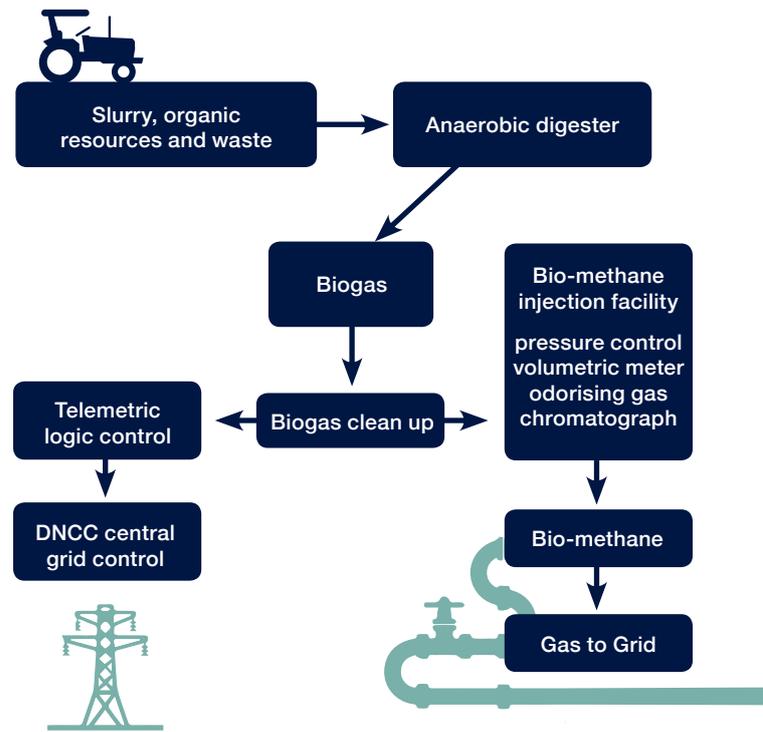
The housing for the smaller boilers has taken advantage of the contours of the land by being sunk below ground level. This allows the wood fuel to be easily delivered into a top loading silo.

The wood fuel is purchased as small round wood at £28 to £32 per tonne, chipping costs approx. £7 per tonne and the movement of chip is approx. £2 per tonne, making a total cost of wood fuel at approx. £40 per tonne not taking into account weight loss.

The Forster's report that the biomass system is better than kerosene for the broiler sheds as they release less CO₂ into the shed and reduces the humidity problems they used to have. This boosts the survival rate of the chickens, improves the feed conversion rate of the chickens and also helps maintain better litter conditions.

Sources: Information was primarily gathered from site visits. Other sources include: Nation Grid Gas (<http://www2.nationalgrid.com/UK/Our-company/Gas/Sustainable-Gas/>) and Ofgem (<https://www.ofgem.gov.uk/environmental-programmes/non-domestic-renewable-heat-incentive-rhi/tariffs-apply-non-domestic-rhi-great-britain>)

Bio-methane Process



RHI

The government has announced that it will continue supporting renewable heat generation until 2021. Although in 2016/17 it is likely to go through 'radical' changes.

RHI for the small commercial biomass and for bio-methane injection will be reduced by 10% on 1st January 2016.

Currently the RHI tariffs for the small commercial biomass tariff is lower than the medium biomass

Dated 4th December 2015

Solar PV

In total there is 370kW of solar PV installed at Peacehill Farm. There are three separate rooftop schemes, two 150kW installed by Discovery Solar who have since been dissolved and a 70kW system installed by Forster Group.

Where the electricity is used on the cool stores 92% of the power is used, while on the poultry sheds 81% is used. This lower rate is due to the poultry sheds being empty for one week in every six.



The biggest challenges with the AD project have been funding the project and securing the electrical grid connection.

Ross Forster, December 2015

