

Highland Farming Efficiency Network: Visit to Mid Coul Farms

HiFEN
Climate Change Focus Farms

Notes from a group meeting
on 6th July 2017

This was a farm visit for the HiFEN (Highland Farming Efficiency Network) Climate Change Focus Farm discussion group . The group learned how a sizeable local vegetable farm had diversified into renewables to help improve the overall efficiency of the business.

Key points:

- AD plants can provide a source of utilizable heat, and/or electricity and a useful digestate by-product.
- The use of digestate as a fertiliser in place of synthetic fertilisers made from natural gas will reduce your carbon footprint.
- Nutrients available within digestate will vary according to the material fed to the plant; it is a pre-determined mixture that cannot be altered.
- Obtain a nutritional analysis prior to use to know what it is you are applying.

Anaerobic Digestion

The HiFEN farm group met for a renewable energy day. The event was hosted by William Rose at 'Midcoul Farms' & consisted of a visit and tour of two Anaerobic Digestion (AD) plants operational on the farm. The first AD plant has been operational for 2 years and the second will soon be operational. Jim Campbell of SAC Environment & Design team was also in attendance to provide advice and answer any questions.

'Mid Coul Farms' is a large organic enterprise growing vegetables and other organic crops. The farm is reliant on having significant amounts of grass in the rotation to maintain fertility. It was difficult to carry enough stock to utilise this grass, for this reason the AD plant was a logical solution. William has found the increased grass in the rotation and the digestate to be of a great benefit to yields across the wider farm.



Operation of the plant

The basics of how the plant operates was explained in a very understandable way. Essentially it is a similar process to that of a cow's stomach. Bacteria in the digester break down the mixed feed stock. This generates methane which is then burned in two large chambers. The energy from this is used to generate electricity.

The plant which is under construction at 'Kerrowaird' differs from the existing plant in that it is a direct 'gas to grid' plant rather than electricity being generated on site. This plant is significantly bigger than the previous one. The older AD plant is 1 mega watt and the new one is equivalent to 2.4 mega watt. The gas to grid is more favourable with the current subsidy schemes. The function of the digester itself is essentially the same as the first one. The difference being that the new installation features a two stage digester. This means it operates a hydrolysing pre-chamber, where the digestate enters prior to the main digester chamber. The hydrolysing chamber runs at a temperature of 55 °C compared to 42°C in the main chamber. This process can increase the speed of gas yield from the feedstock.



Feedstocks



There is a variety of different feedstocks used to feed the AD plants at MidCoul. The bulk is a mix of grass and rye silage. This consists of 16,000t first cut silage grass and 12,000t second cut. The harvest of winter rye yields approximately 24,000t. Fodder beet is also used as a feed stock over the winter.

AD plants can be fed any biodegradable non-wood based material. This can include animal products including slurry and farm yard waste.

Regardless of what is used, a reliable and consistent supply is required to maintain the plant runs efficiently.

Digestate

Digestate is a by product from the AD plant. It can be used as a fertiliser or a soil conditioner. Approximately 90-95% of the volume of material added to the plant is produced as digestate. The material also retains the same nitrogen, phosphorus and potash values as it had prior to entering the AD plant. The nutrients are much more readily available to the plant than those found in slurry or farm yard manure.

Digestate can be utilised in three forms—whole(raw) liquid or fibre. The raw digestate that comes from the digestion plant can be spread onto land using a tanker or umbilical system. The separated liquid form can be spread more easily on already growing crops. The fibrous form can be used more like a soil conditioner, improving the overall soil organic content and biological health whilst also aiding water and nutrient retention.

At Midcoul Farms, the digestate is put through a separator, leaving a meal like substance with a DM of 30%. Since the ground around Midcoul Farm comprises of a sandy, mineral soil type, incorporation of the fibrous digestate has been very valuable to the organic vegetable growing side of the business. Looking forwards, the business will look at the possibility of selling digestate to other producers.

Potential benefits of digestate use	Potential negative impacts from digestate use
A good source of crop available N, particularly for use during the spring/summer growing season.	There can be an increased leaching risk if digestate is applied outwith the plant growing season.
Digestate can be a good source of potash, phosphate and sulphur.	There can be a risk of ammonium volatilisation/nitrous oxide loss when applied but not incorporated into the soil.
The fibrous particles within the digestate can help improve soil organic content. This can give an overall improvement in soil physical properties.	There is a risk of odour problems, particularly if spread using trajectory methods and not quickly/fully incorporated into the soil.
Reduced reliance on synthetically produced fertilisers can help reduce the carbon footprint.	The liquid portion of digestate has a very high Biological Oxygen Demand and needs careful management and handling to prevent water pollution.

Heat



The farm has several uses for the heat which is produced by the digester.

An 'Alvan Blanche' grain dryer has been installed on site. It is used to dry cereals and sometimes woodchips.

The heat is also used to heat a number of cottages which are nearby to the plant, which allows qualification for the Rural Heat Incentive scheme.

Carbon Footprint

Ways in which Midcoul Farms have reduced their carbon footprint:

- Grassland is required to maintain soil fertility within the organic vegetable rotation. The AD plant was installed to utilise the grass more efficiently than the farm was able to achieve with livestock. Output from grass has now been increased, with additional benefits—see below.
- Utilising the digestate from the plant has improved the soil fertility and health which helps increase crop production.
- By using the heat from the plant, the farm is less reliant on electricity/petroleum, thereby reducing the carbon footprint both within the business and the residential properties which it sustains.



There are nine climate change focus farms in Scotland. Keep up to date with their activities at



www.farmingforabetterclimate.org

Meetings are free to attend and all farmers are welcome.

For Hifen meetings, contact farm facilitator Derek Hanton on 01463 233266 or via email at derek.hanton@sac.co.uk for more information.

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