

**CPRE Seminar  
on Food, Farming and the  
Countryside**

**On-Farm Anaerobic Digesters**

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21 November 2015

# Anaerobic Digestion

- Anaerobic digestion (AD) is a biological process in which microbes, in the absence of oxygen, and at about 40°C, produce biogas from waste organic matter.
- The biogas is methane and carbon dioxide.
- The methane may be injected into the gas grid or burnt in a CHP unit to produce electricity which may be exported to the local network.
- An AD plant is a chemical plant plus a power station.
- The waste may take the form of sewage sludge, animal by-products, municipal waste or farm waste (manure, slurry etc).
- Liquid digestate is left over and is used as a fertiliser.
- Need a large renewable energy subsidy to be economically viable.

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•Anaerobic digestion is a complex process involving hydrolysis, acid fermentation, acetogenesis, and methanogenesis. The process at about 40°C is known as mesophilic, whereas at higher temperatures it is known as thermophilic. In neither case is the temperature high enough to destroy pathogens present in the waste.

•The digestate is classed as waste and an EA permit is required for its use.

•The subsidy paid to an AD plant ranges from about three times the wholesale price of electricity for a large plant (>500kW) to about four times the price for a small plant (<250kW).

## On-Farm AD plants

- The waste is manure, slurry, chicken litter.
- However the waste contains very little energy.
- Fodder crops have to be added (maize silage, grass silage, wheat, rye, beet).
- Use of maize is hugely controversial.
- Concerns are impacts on the landscape, traffic, pollution, odour, safety, land prices, food and energy prices and on surrounding farms.
- On-farm or centralised AD?

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•Fodder crops are needed to obtain a better mix of material for the anaerobic process to work properly.

•The growing of maize is hugely controversial. Its cultivation leads to soil compaction, soil erosion and water run-off. It is harvested in October and November and in wetter parts of the country, such as Devon, there are problems with mud on the roads.

•Obviously large AD plants are industrial developments and do not fit in with a rural landscape typical of Devon. Being complex plants handling large quantities of a flammable gas, safety is a serious concern.

•An on-farm AD plant would source all the waste and fodder crops from within the farm or neighbouring farms and dispose of the digestate on the same farms, whereas a centralised AD plant would produce little of the waste and crops but would bring most of the feedstocks from a wide radius and dispose of most of the digestate over the same area.

## Typical On-Farm AD Plant

- 500kW electricity
- 3,000te/year of manure
- 7,000te/year of fodder crops
- 10,000te/year of liquid digestate (waste)

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- A typical on-farm AD would have a capacity of no more than 500kW, for which a large mixed animal and arable farm is needed. Much smaller on-farm AD plants can be built on small farms.
- The amount of waste, crops and digestate are typical round numbers.

## AD Plants in Mid Devon

- Menchine Farm, Nomansland; operational.
- Edgeworthy Farm, Nomansland; under construction.
- Hartnoll Farm, Halberton; under construction.
- Willand; under construction (2MW, not on-farm).

Total feedstock:

38,000tonne/yr waste

42,000tonne/yr fodder crops

Same developer.

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These four plants are being developed by Greener for Life (GFL), a company operating widely in the west Country. It has ongoing AD developments in Mid Devon, North Devon, East Devon, Cornwall, Somerset and Dorset. Most of the developments are highly controversial.

- Menchine Farm AD plant has a capacity of 500kW and has been operational for about a year.
- The Edgeworthy AD plant has a capacity of 200kW and is under construction about a mile from the Menchine Farm AD at the other side of the hamlet of Nomansland.
- The Hartnoll Farm AD plant, has a capacity of 500kW and is being built adjacent to the Grand Western Canal, about two miles to the east of Tiverton.
- The Willand AD plant is not an on-farm AD plant, its waste being in the form of abattoir and chicken processing waste. It has a capacity of 2MW and is under construction.

The four plants will between them use over 100tonnes of crops a day.

# Menchine Farm AD Plant



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The first application for an AD plant was in 2010 and was for a waste facility, handling animal by-products. This was refused by DCC and after a public inquiry the appeal was dismissed by an Inspector, mainly due to its unacceptable impact on the landscape and the traffic.

A subsequent smaller “on-farm” AD plant of capacity 500kW was refused by MDDC, but was allowed by an Inspector after a hearing on the basis that all transport would be within 6km of the plant and would be by tractor and trailer/tanker. The design of the AD plant has subsequently been changed and an application to double the output to 1MW has gone to appeal and will be decided by an Inspector after a hearing in January 2016. A further application to add another processor building awaits a decision. This creeping increased development after initial planning approval seems to be standard practice.

The Menchine Farm AD plant has been operational for a year. At the top are six of the seven chicken sheds. Below are the original farm buildings and the farm house. The AD plant is the large L-shaped development, the silage clamps being on the left. The land slopes down to the river Dalch on the right. There has been one incident of pollution of the river so far, which the EA is investigating.

There is a current application for five more massive chicken sheds to the left of the silage clamps. Note the farm currently only provides about 5% of the total feedstock. The development area at the farm is currently larger than the adjacent hamlet of Nomansland.

# Menchine Farm AD Plant



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At the bottom left is the digester tank. At the right is the intake building and at the top is the digestate lagoon. This has a capacity to store all the digestate produced during the nitrate vulnerable zone closed period (October 15 to January 31) plus the contents of the digestate tank in the event of digestate tank failure. The lagoon is supposed to be covered, but this does not appear to be the case. Just above the digestate tank is a dryer used to dry fibre separated from the liquid digestate. Just above the intake building are two CHP units, one for use and one as a spare. The structure at the bottom right is believed to be a gas flare, but this is not shown on the plans, which shows a belt of trees.

Note the massive size of the plant can be seen from the vehicles visible.

## Menchine Farm AD Plant

“This farm looks more like something from the set of a James Bond film. I have lived on farms for all my life and I always thought the end product of farming was food; here the end product is energy. I am not sure why it is viewed as an agricultural site, it should be classed as an industrial site”.

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This is a quote from a member of the MDDC planning committee after a site visit.

Should such complex plants be operated by farmers?

# Edgeworthy Farm AD Plant



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This AD plant is under construction at the other side of Nomansland. It is smaller than that at Menchine Farm and is of a different design. The green dome is the gas holder. The buildings to the left of the dome are not on the approved plan. The two digestate tanks will be constructed in the lagoon just below the dome.

There is a current application for five massive chicken sheds in the field to the right.

# Hartnoll Farm AD Plant



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This AD plant is under construction about two miles east of Tiveron and adjacent to the Grand Western Canal. The Digestate tank is the same as at Menchine Farm. Until the cattle sheds were put up this was a just a field.

Why this very controversial development was permitted at this location is a mystery.

# Hartnoll Farm AD Plant



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The digester tank is not being constructed according to the approved plans. The digestate tank and the digestate storage tank above it are in the wrong location, as are the silage clamp and the smaller ancillary buildings. A retrospective planning application has been submitted to change the approved plan to match the as-built plant and to add another building.

Construction of the AD plant not in accordance with the approved plans seems to be standard practice.

# Willand AD Plant



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This industrial AD plant is being constructed at a sensible location. It is on an industrial estate on the site of an old abattoir, between the sewage works and the 2Sisters Food Group's abattoir and chicken processing plant. It has good communications, being close to the M5. All the abattoir and chicken waste (about 500te/week) will come directly from the processing plant, saving it from being taken a long way to be rendered and made safe. The down side to the AD plant is that it will consume about 500te/week of crops.

# Duoliner

26m<sup>3</sup> liquid plus 50m<sup>3</sup> solid.



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Although the Menchine Farm AD plant was approved on the basis of local transport by tractor and trailer/tanker, these vehicles have also been used. This is a massive German vehicle capable of carrying both solids and liquids.

## Pichon – 52te, 30m<sup>3</sup>



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This is a massive French tanker designed to take slurry or digestate for spreading on fields. This photo is from a garden in Nomansland.

# Pichon



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The same tanker heading out from Nomansland. Note there are no pavements in Nomansland.

Both Duoliners and Pichons have been transporting material from over 20 miles away.

# Transport Impacts



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This is the sort of damage that the massive vehicles have been causing to the single track lanes around Nomansland. Banks are being destroyed, as are the lane edges and verges.

# Transport Impacts



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It is not illegal to drive these massive vehicles along the lanes. Local residents are intimidated by such vehicles and feel unable to walk, cycle, horse-ride or even drive their cars along the lanes in case they meet one coming the other way.

# Outcome

- Farmer gets big subsidy for renewable energy.
- Some local farmers get higher price for crops.
- Other local farmers cannot get feedstock.
- Damage to roads.
- Impact on local residents – noise, smell, traffic, safety.
- Pollution incidents.
- Impact on tourism.
- Increased food and fuel poverty.

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- Farmers generally do not have AD plants to get rid of their manure, but to obtain the massive subsidy for producing renewable energy.
- Because of the subsidy the farmer is able to pay a higher price for the crops.
- There is a massive knock-on effect in that other farmers have to source fodder crops from further away and have to pay higher prices. Most farmers in the neighbourhood of the Menchine Farm AD plant consider that it gives the farming industry a bad reputation.
- We have seen the damage that is caused if the AD plant is not located where there is a good road network.
- Local residents find that once the AD plant is in operation there are numerous downsides. This is especially the case where there are no footpaths and an inadequate road network.
- There has already been one incident of pollution of the local river at Menchine Farm.
- A badly sited AD plant can harm local tourism, which is the mainstay of the local economy in many small hamlets such as Nomansland. If tourists stay away, then local employment falls and the village pub becomes in danger of closing.
- The subsidy paid for producing energy is added to consumers' bills, whilst the removal of crops from the farming chain will increase food prices.

## Concluding Remarks

- Location, location, location
- Policy, Renewable energy, Food
- Planning Policy
- Sustainable?
- Subsidies?

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•The key to a good on-farm AD plant is its location. Ideally it should either be a small self-sufficient AD plant or on a large farm with good communications. A large AD plant should not be located where there are poor road communications, where the land is mostly pastoral and it should not be located in a Nitrate Vulnerable Zone.

•Renewable Energy Policy favours the production of energy over food, for which there is no policy.

•The National Planning Policy Framework and the National Policy Statement for Renewable Energy promote a “presumption in favour of sustainable development”, which is how renewable energy is characterised. Thus the planning system is biased in favour of AD developments, regardless of location, and a very strong case is needed for an AD plant to be refused. Local Planning Authorities (LPAs) are reluctant to refuse planning permission because a developer will appeal which will place a financial burden on the LPA.

•Questions are being raised by the Government about whether AD plants are sustainable. This is because the energy produced as electricity may exceed the energy spent producing that electricity. For example, the diesel energy used to plant, grow, harvest and transport the maize may exceed the usable energy extracted from the maize in the AD plant.

•Although the subsidies for onshore wind and solar have been slashed, the subsidies for AD plants have not yet been reduced. This is despite the fact that the projected deployment for 2020 has already been reached. A consultation on reducing the subsidies for AD plants is promised.