Digestate Strategy

For the proposed Anaerobic Digestion Plant

At Hartley Park Farm, Selborne, Hampshire

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1.0 Introduction

This document has been produced in support of the Planning Application for an Anaerobic Digestion Plant at Hartley Park Farm, nr Alton, Hampshire.

Anaerobic Digestion is the process of breaking down of organic matter into its constituent molecular parts to produce methane gas by natural biological action using naturally occurring bacterial organisms commonly found in the gut of animals or people.

2.0 What is Digestate ?

The By-product of Anaerobic Digestion is aqueous organic slurry of specific gravity close to water, it is virtually odourless and prior to any further treatment, it has approximately 6%-8% dry matter contained within the solution. It is balanced with regard to the plant nutrients of Potassium, Nitrogen & Phosphorus and hence contains valuable nutrients for the farming business, as such it has a value to farms in reducing the reliance on fossil fuel based fertilizers and will enable the reduction of fossil fuel derived fertilizers which are subject to market forces in the oil industry.

3.0 Odour & Digestate

Almost all odour producing components are broken down in the Anaerobic Digestion Process, the remainder is very little and soon disappears when spread onto fields, typically within the first 4 hours.

Digestate is quite benign from the odour perspective because of the time that organic material is under digestion conditions (20 days to 70 days), dependent on what you are feeding, the components that make up the most odourous compounds are broken down within the first 3 days of digestion.

Some people mistakenly think that cow slurry or pig slurry (both very pungent) are the same as Digestate, this is a common misconception and the reason that Cow & Pig slurry are very odorous is that the food that they eat only stays within their digestive system for up to 3 days, this accounts for the smell on release.

4.0 PAS 110 & the Quality Protocol

Digestate when produced by a Barfoots AD Plant is certified to the PAS 110 national certification program and is produced in accordance with the Quality Protocol issued by WRAP (Waste Resources Action Program) which subject to a validation procedure involving many tests. Once certified it is termed Bio-Fertilizer,in this context it is no longer a waste but is recognised as a product with definite value. This certification recognises the plant nutrient quality of Bio-Fertilizer and its value to sustainable farming practice.

5.0 The Economic Case for Bio-Fertilizer

The nutrient value of bio-fertilizer is well documented in many professional and government backed study papers it can be directly compared with a fossil fuel derived fertilizer where it will deliver about 50% of the required nutrient loading for a typical farm application.

However it is not just about saving money on the outline costs, Bio- Fertilizer, has been shown to be taken up much quicker by growing crops and is less susceptible to run off into ground waters as it quickly drains into the ground. (Fertilizer chips can take many days to start breaking down) and quite often are swept away by inclement weather, for this reason many farmers over apply the rate to account for losses. When applied correctly in the right conditions Bio-Fertilizer is a much safer and totally organic alternative.

6.0 The Storage of Bio-Fertilizer

The safest method for the storage of Bio-Fertilizer is in lagoons constructed by conventional civil engineering practice the same method used for farm water irrigation lagoons.

Lagoons are completely lined with a purpose designed impermeable material made of High Density Polyethylene which will resist UV and other weather debilitating effects for many decades before requiring replacement, the modern method of lining and joining of liners ensures that seams are double welded on

construction and are tested under an industry recognised air test procedure to guarantee quality of construction and leak prevention.

By virtue of the construction method most lagoons are sunk into the local topography and as well as being safer (80% of the holding capacity will be below ground level) they are easily disguised for visual amenity and fenced to prevent access by children and animals.

7.0 The distribution of Bio-fertilizer at Hartley Park Farm

Bio-Fertilizer at Hartley Park Farm will be distributed via an existing underground irrigation main, this is perfectly safe and avoids the aspect of moving it around the local land bank by tanker.

The irrigation main is represented on drawing N0. 0128-SP01 (Bio-Fertilizer and Storage), this main will be fed via a pump operated by the farm spreading supervisor via new technology, this ensures that the pump will not start until the individual calls for it using mobile telephone technology.

The system has many safety procedures and has been successfully used for many years on water irrigation systems throughout the farming industry.

8.0 The Strategy for Bio-Fertilizer application at HPF.

At Hartley Park Farm the underground pipework system will enable access to most of the 400 hectares of land directly on Hartley Park Farm and with some relatively short extensions will enable supply to another 300 hectares of adjacent land.

The recognised application rate of fertiliser to farm land is governed by the following criteria,

- *To comply with directives produced by the DEFRA to limit the spread of Nitrates into ground and river waters (known as the Nitrate Pollution Prevention Regulations 2008). (An upper limit of 250kg per hectare of Organic Manure where an NVZ derogation is held).*

- *Guidance on complying with the rules for Nitrate Vulnerable Zones in England 2013 – 2016 (published June 2013).*

- *To apply the correct amount of nutrient required for the type of crop being grown as directed in the DEFRA publication the Code of Good Agricultural practice and the recently issued guidance detailed above.*

- *To apply nutrient in good weather and at the right time in the crop cycle, the use of low broadcast techniques to apply fertiliser.*

A Nitrate Vulnerable Zone (NVZ) is designated on all land draining to and contributing to the nitrate pollution in “polluted” waters. Polluted waters include:

- *Surface or ground waters that contain at least 50mg per litre (mg/l) nitrate*
- *Surface or ground waters that are likely to contain at least 50mg/l nitrate if no action is taken*
- *Waters which are eutrophic, or are likely to become eutrophic if no action is taken*

(A water is eutrophic if it contains levels of nitrogen compounds that cause excessive plant growth resulting in “an undesirable disturbance to the balance of organisms present in the water and to the quality of the water”).

Extracts from DEFRA Publication RB209 ref spreading of Organic Slurries.

Timing
Achieving the right timing of nutrient application is as important as applying the correct amount. Crop demand varies throughout the season and is greatest when a crop is growing quickly. Rapid development

of leaves and roots during the early stages of plant growth is crucial to reach the optimum yield at harvest, and an adequate supply of all nutrients must be available during this time.

Nitrogen for field crops
Most agricultural soils contain too little, naturally occurring plant-available nitrogen to meet the needs of a crop throughout the growing season. Consequently, supplementary nitrogen applications have to be made each year. Applying the correct amount of nitrogen at the correct time is an essential feature of good crop management.

Reduction of Ammonia Emissions
There are strong pressures within the EU to reduce ammonia emissions from agriculture; the most effective means of reducing ammonia emissions from fertiliser spreading are to:

• *Apply slurries with an injector or band-spreader (trailing hose or trailing shoe)*
These 'low emission' spreading techniques reduce ammonia emissions typically by 30-70% compared to conventional 'broadcast' spreading.

Storage; Distribution & Spreading of Bio-Fertilizer

The proposed storage & existing distribution system at HPF of bio-fertiliser and the ease of transport to point of use will greatly assist the farming team to comply with all of the recommendations of DEFRA Publications RB 209 & the Code of Good Agricultural Practice (AGCP) while getting the best yield possible out of growing arable crops in a sustainable manner.

In general terms an AD Plant of 1.2 Mega-watt will consume feedstock to produce approx. 20,000m3 of bio-fertiliser per year for use on the farm land.
HPF has 400 hectares available with an additional 300 hectares close by subject to local agreements and contracts, hence a potential spreading land bank of 700 Hectares.

At the absolute maximum field application rate recommended by the ACGP of 250kg per Hectare of Nitrogen, HPF has in theory a spreading capacity of 175,000kg of Nitrogen (700 hectares x 250kg N).

Spreading Calculation.

The nominal level of Nitrogen (N) found in Bio-Fertilizer varies between 2.5kg – 4.0kg / m3 or tonne. (see appendix 1.0).
The annual capacity of the Bio-Fertilizer production was stated at 20,000m3 per mega-watt of plant size therefore the available area to spread the annual Bio-Fertiliser for 1.0 Mega-watt is

20,000 m3 /700 hectares = 28.57m3 per hectare, the concentration of N in Bio-Fertilizer is given as 4.0kg / tonne (or m3) therefore the actual real application rate is 28.57 x 4.0 = 114.28kg / Hectare (less than half the AGCP max recommended).

If the actual farm owned land bank of 400 hectares only is used thence the equation becomes

20,000/400 = 50m3 per hectare, therefore 50 x 4.0 = 200 kg N per Hectare still only 4/5 of the recommended maximum by the ACGP Guide.

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