

## **Fre-energy**

#### Lodge Farm Biogas

#### **Richard Tomlinson**





#### Farm Details

- Lower Park / Lodge 460 acres
- Organic since June
- Total acres farmed
- Milking cows
- Young Stock
- Milk sold
- Milk buyer

June 2000 1100 acres 650 450 4,000,000 L Calon Wen

(organic milk co-operative)







#### **Digester details**

- Lodge Farm digester 1000m<sup>3</sup>
- Inputs

Slurry 30 tonnes/day Chicken litter 4 tonnes/day

Outputs

Liquid digestate 26 tonnes/day Separated solids 4 tonnes/day

Generation

2 x 80kW generators = 160kWh/day

Heat to house and offices



#### Deciding to buy a digester

- Do I want to change my farming business to accommodate a digester?
- Do I want a digester that compliments my farming business?
- Do I want to grow crops to feed a digester?
- Do I want to produce energy from farm wastes?

## Crop Digester or Waste Digester?

#### Crop Digester

 designed to digest clean, uncontaminated, consistent feedstocks

#### • Waste Digester

 designed to digest unclean, contaminated, inconsistent feedstocks



#### What is the difference?

#### Grit & Foam!

- Grit such as sand, ash, stones, soil, metal and glass will sink to the bottom of the digester slowly reducing tank capacity, gas yield and ultimately "Income"!
- Digesters that are fed high calorific value feeds intermittently are very susceptible to foaming "Foam will kill an engine"



#### Fre-energy ADG (auto de-gritting system)









#### Materials available for AD

#### The UK produces 110 million tonnes of organic waste.

- 90 m tonnes of agricultural waste such as manure and slurry.
- 18 m tonnes food waste.
- 2 m tonnes Sewage sludge.

DEFRA-DTI-DfT (2007) AND Enviros (2008)

•This could produce approximately 5% of UK energy demand.

•The resultant material will displace energy hungry artificial fertiliser. 30% of the carbon footprint of food is down to artificial fertiliser.

•82% of the inputs are farm generated, 100% of the outputs must be returned to farm land.























#### 3 Years Ash Bedding





## Digging it out





#### **Broiler litter**





## Sizing your digester

- 1. What do you intend to feed it?
- 2. How much material do you have available?
- 3. Do you have sufficient land available to grow and spread?
- 4. What is the potential gas yield of the feedstock?
- 5. Is your grid connection adequate for the export?



#### Benefits to agriculture

- The nutrients in digestate are more available to the plant and the nitrogen is fixed, so is not released to the atmosphere (does not smell).
- By adding chicken litter or food waste you are importing nutrients to the farm reducing the need to purchase chemical fertilisers.
- Reduced pollution risk (BOD reduced by 90%)
- The AD process kills most weed seeds plus foot & mouth and TB.

# Bangor University field trial

35 Cumulative T1-3 30 Crop yield (g w.w. pot 25 20 15 10 5 FS NPK LD Ν Co Fertiliser



#### RHI

**Renewable Heat Incentive** 

- For 'renewable' Heat used.
- Eligible for 6.5p / kWh (thermal) up to 250 kW
- A 160 kW generator will produce 240 kW of heat.
- The plant will use 40 kW.
- Balance 200 kW x 6.5p = £ 100,000

# Hot water to heat the house





#### **Electrical Income**

- FIT (feed in tariff) on renewable power generated. Up to 250 kW = 14.7 p per kWh
- LEC (levy exemption certificate)
  On renewable power to grid = 0.45p per kWh
- Typical sale price for electricity
- Total income
- 80 kW CHP running at 85% O&M costs of running plant
- Total net income

= **4.85**p per kWh

- = 20.00p per kWh
- = £120k year
- = £20k
- = £100k year.



#### 80kW Fre-energy plant in Devon





#### Income 80 kW

- Capital cost £580k
- Electrical income £100k
- Heat income RHI £40k
- Return on capital 24%

- 150 cow slurry 7.5 tonnes
- Chicken muck 4.0 tonnes



#### Lodge Farm Digester 160kW plant in Wrexham





## 160 kW digester

- Capital cost £750K
- Electrical income £200k
- Heat income RHI £80k
- Return on capital 37%

- 235 cows slurry 12.0 tonnes
- Chicken muck 8.0 tonnes







## 240 kW Digester

- Capital cast £940k
- Electricle income £300k
- Heat income RHI £80k
- Return on capital 40%

- 350 cows slurry 17.5 tonnes
- Chicken muck 12.0 tonnes



# **QUESTIONS ?**