

## RIKA Biofuels (Fridays, UK)

### A short introduction to RIKA Biofuels

Rika Biofuels (UK) develops large scale anaerobic digestion (AD) projects in Europe and is specialized in manure treatment from intensive livestock production.

Rika Biofuels, partnered with DVO (supplier of the digester), has initiated the construction of AD plants in the Netherlands (Wijster) and United Kingdom (Fridays). Fridays will be operated with 100% poultry manure and a treatment capacity of 40 kton per year.

Table 1. Technical information of the biogas plant.

Characteristics	
Date of construction	2019
Size (MWe)	1.8
Volume (m <sup>3</sup> )	14 000
Digester type	Mesophilic digestion

### Drivers for Nutrient Recycling

To date, poultry manure is often incinerated because of the high organic matter content and low water content. The energy production during incineration is high, however, it causes valuable nitrogen and carbon loss as N<sub>2</sub> and CO<sub>2</sub> in addition to greenhouse gas emissions.

Rika Biofuels wants to generate value from manure via AD and provide solutions to farmers whose manure is a liability to their business rather than an asset. The company realized that nutrient recovery (nitrogen separation) could improve the efficiency of the AD by reducing the requirement for water to dilute high nitrogen containing feedstocks (e.g. poultry manure). As a consequence, higher biomass yield and a more stable digestion process is achieved.

Fridays will demonstrate that chicken manure can be treated in a sustainable way while recycling nitrogen (N) and phosphorous (P), reducing GHG emissions and reducing manure disposal costs.

### Feedstocks

Every year the digestion plant will treat 40 kt of poultry manure (Table 2) diluted with 134 kt of recycled water coming from the nutrient recovery plant.

Table 2. Origin of Fridays feedstock.

Type	Origin	Mass
Manure	Poultry manure	40 kt

### Biogas production

The installation will produce around 4.6 Mm<sup>3</sup>/y of biogas (Table 3) which will be turned into 24000 MWh of heat and 3300 MWh of electricity. The expected biogas composition is reported in Table 2.

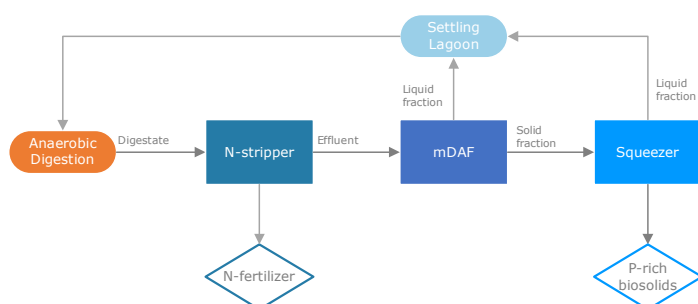
Table 3. Yearly biogas production and average composition before purification.

Component	
CH <sub>4</sub> (%)	55
CO <sub>2</sub> (%)	43.8
H <sub>2</sub> S (ppm)	500
O <sub>2</sub> (%)	0,7
Total biogas production (Mm <sup>3</sup> )	4.6
Biogas per tonne of feedstock (m <sup>3</sup> /t)	114

### Nutrient Recovery and Reuse (NRR) Technologies

The anaerobic digester is a two-step, mesophilic mixed plug-flow system with a retention time around 20 days. The first step takes place in an acidification chamber, while the second occurs in a methanogenic chamber, allowing separation of bacteria for acid and methane formation. The waste flows through a channel as follows: as fresh manure enters one end, digestate is pushed out of the other end, continuously mixed with biogas circulation. The gradual increase of pH in the methanogenic chamber to 8.5 provides optimal conditions for subsequent ammonia stripping.

N is recovered as a valuable ammonium sulphate (AS) since during the process ammonia is stripped by adding acid ( $H_2SO_4$ ). Up to 90% of P is recovered from digestate through a modified Dissolved Air Flotation step (mDAF) and subsequent squeezing. The investment for the AD plant and the N stripping system amounted to 12.8 M€.



### Products and market

Pathogen reduction by 90-99% of faecal coliforms and streptococcus is ensured by the mixed plug-flow digester. The solids obtained with 20% of dry matter (DM) will be exported to Germany and neighbouring countries. By mixing biosolids with AS 40% solution, Rika is planning to produce marketable NPK-fertilizers.

Rika Biofuels is also exploring the option of crystallising AS solution. This can be achieved at a cost of about 60 € per tonne of crystal for which the market is thought to be in excess of 120 € per tonne.

### Economic benefits

The economic advantages of reusing recovered products are listed below:

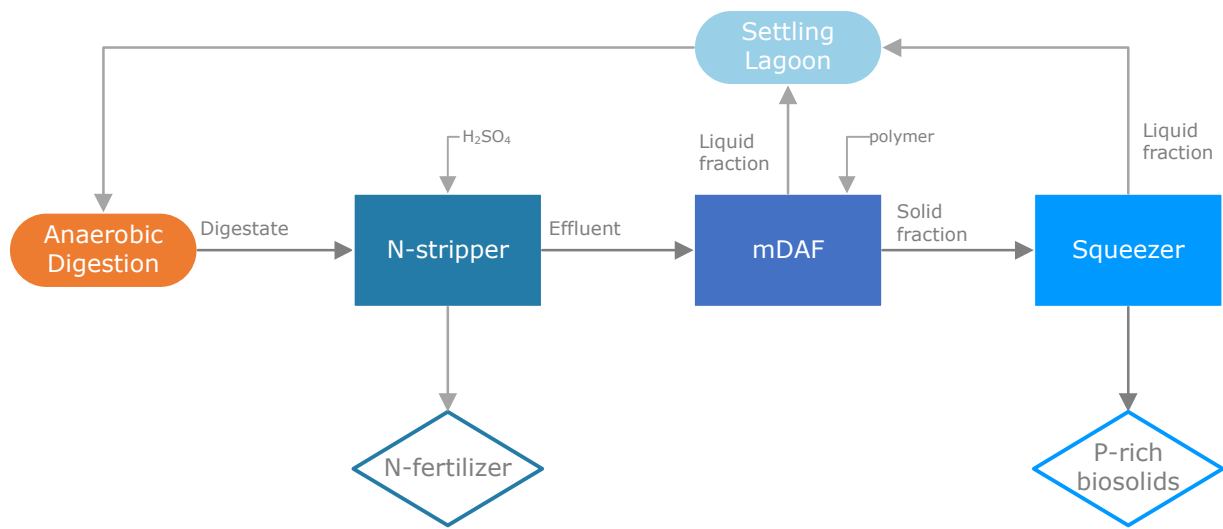
- Cost efficient production of biosolids and mineral organic fertilizers.
- The final liquid fraction with low nutrient concentration is suitable for direct recycling (e.g. feedstock dilution for AD).

### Sustainability goals

Rika Biofuels is committed to reach the following targets:

- Improving the sustainability of livestock farming through the production of renewable energy from the mono/digestion of manures and wastes from the agriculture sector.
- Achieving a GHG saving of at least 70% compared to fossil fuel alternative in Rika's facilities for the production of renewable energy.

#### Annex 4: Rika Biofuels Demonstration installation – Fridays (UK)



Envisaged process

Technical specifications:

Name	Type	Treatment capacity	Power consumption (kW)	Heat requirement (kW)
N-Stripper	Stripping	5-7 t AS/h	122	284
mDAF	Mechanical separation	13 m³/h	4.5	-
Squeezer	Mechanical separation	-	4.5*	-

\*estimated data