



Minutes - Peer Learning Workshop (PWS3)

Advanced biogas applications

| Hengelo (gld) and Beltrum, The Netherlands
29-11-2017

TARGETS AND WORKSHOP DESIGN

Project partners will be able to learn from each other through peer learning activities and thus strengthen their capacities required for the implementation of the collaboration models.

*The workshop focused on one of the three competence areas proposed by project partners for peer learning activities: Institutional building, business models and financial tools, **advanced biogas/biomethane applications**.*

*PWS3 was organized by **Berry de Jong from CCS** in close coordination with RAEE (WPL) and other experienced partners.*

The peer learning workshop provides concrete examples and testimonies from experienced partners, it highlighted local initiatives and needs, it provides information about the tools and methodologies available and it allows project partners to share success factors and transferability conditions based on concrete experiences.



Introduction and welcome:

3rd peer learning workshop dedicated to Advanced biogas/biomethane applications

Advanced biogas/biomethane applications are widely sought after in the Netherlands, as the business case of conventional biogas CHP is at stake due to lowering feed-in premium levels. We thought the subject would be best covered with a combined excursion to some best examples of such advanced biogas applications. Therefore the workshop was integrated with an excursion to two biogas plants using advanced biogas applications.

This peer learning workshop aims at:

- providing insight in the different biogas application technologies,
- learn about farm scale digestion, energy production and consumption,
- providing information about different nutrient recovery technologies,
- seeing the different biogas application technologies and nutrient recovery technologies in practice .

1. Visit to experimental farm De Marke

Zwier van der Vegte, farm manager at Wageningen University and Research

Zwier gave a short introduction about the research carried out at De Marke, an experimental farm of Wageningen University and Research located at the sandy soils in the east of the Netherlands. De Marke is a Dairy farm with approximately 90-100 milking cows, a typical herd size in the Netherlands. The main focus area of De Marke is research and demonstrate clean and profitable dairy farming with the aim to reduce the environmental impact. De Marke has an operational micro-scale digester since 2003 and is monitoring the effect of using digestate ever since.

After the introduction, farm manager Zwier took us on a tour at the farm, showing the stables, digester, manure treatment and biomethane installation with grid injection. Since 2012, De Marke is experimenting with several types of nutrient recovery systems for livestock manure, such as nitrogen stripping and phosphate recovery through struvite production. Heat from the biogas installations is used in the process of treating the digestate. Zwier explained that these processes give De Marke unique fertilization possibilities, because they now have all



sorts of products to use on the soils to meet the nutrient requirements during the year: fresh manure, digestate (better N availability), solid fraction (high P), liquid fraction (high N), stripped liquid fraction (low N & P), ammonium sulphate (N fertilizer made from digestate) and struvite (slow release P).

The small scale biogas upgrading system (Bio-Up) was added in 2014 to replace the CHP. This small scale plant, with a capacity of approx. 20 m³/hr, is based on amine scrubbing to remove the CO₂ from the biogas.

With the combination of small scale biomethane production and grid injection and nutrient recovery, De Marke is a good example of advanced biogas/biomethane applications.

2. Berry de Jong, CCS Energie-Advies

Small scale biogas utilization techniques: ..more than CHP

Berry presented the different biogas utilization techniques available for biogas installations.

- Mismatch of energy use on farms and energy potential of mono manure digestion
 - Only sow farmers have a biogas potential that does not exceed their demand
 - Energy from biogas installations has to be sold
- Multiple techniques are available,
 - Traditional CHP, sell of electricity
 - Heat delivery to (industrial) end-user
 - Biogas delivery to (industrial) end-user
 - Biomethane (grid injection)
 - Creating heat use on the farm e.g. with digestate treatment or nutrient recovery
- Geographical details important in choice of technique
- There is more (and better) than CHP
- Details will make or break the case
- Sometimes subsidy schemes have to be adapted
- Farm scale digestion has a huge potential, and it is our job to help farmers (and other stakeholders) recognizing that!



3. Rene Cornelissen, CCS Energie-Advies

Bio-Up Small scale biogas upgrading system

Rene presented the Bio-Up installation, a small scale (65 m³/hr) biogas upgrading system, developed by CCS as an answer to lowering feed-in tariffs and change of focus from large scale co-digestion towards small scale mono manure digestion.



- Biomethane:
 - higher energy efficiency than CHP
 - makes small scale digestion interesting for new group of farmers
 - with subsequent benefits of reduced methane emissions
- Bio-Up small scale biomethane production
 - Designed for small scale
 - All functions in 1 installations
 - Low CAPEX & OPEX compared with membranes

4. Groot Zevent Vergisting

Roel Beuk, plant operator of the biogas plant and green minerals plant at Groot Zevent Vergisting

Roel, operator at Groot Zevent Vergisting, told us that the company was founded in 1958 as an agricultural service supply agency. 3 Generations have built the family owned company to what it is today, a leading agricultural contracting business with a large biogas plant, currently building the green minerals plant, to recover nutrients from the digestate and upgrade them to artificial fertilizers.

During a tour around the plant, Roel explained that the biogas plant, comprising of 8 digesters, operates on 100.000 ton of pig manure a year, supplements with several cosubstrates from the animal feed and food industry. This way, Groot Zevent offers the local farmers a responsible and affordable solution for the export of their manure since 2004.



The produced biogas is used in the on-site CHP plant, but also 1000 m³/hr is transported in a dedicated biogas pipeline to a nearby (7km) located dairy plant of Royal Friesland Campina, who uses the biogas for steam production. With a price of 0.35 €/m³ of biogas, this is both profitable for Groot Zevert as well as the dairy plant. Before the biogas is put in the pipeline, the biogas is desulphurized and dried. The



H₂S content of the biogas is, due to the used substrate at Groot Zevert, too high (2000-4000ppm) for direct use in the dairy plant. Desulphurization is done in 3 steps, first with air injection in the digester (lowering to 2000-3000ppm), secondly with a microbiological desulphurization (S&H/PlanET, lowering to 500-1000ppm), and thirdly with a physical scrubber (Frames,

lowering to 50ppm, and serves as backup if earlier steps fail). The scrubbing liquid is regenerated with heat.

The green minerals plant uses digestate and heat from the CHP to recover minerals. The installations will recover nitrogen and potassium with the GENIAAL-concept of Nijhuis Industries. The recovery of phosphates is done with a Re-P-eat technology, developed by Wangeningen-UR. The large-scale treatment of manure with these technologies is unique and gives a large saving on artificial fertilizer use.

With the combination of CHP, direct biogas delivery and nutrient recovery, Groot Zevert is a good example of advanced biogas applications.

List of Participants

No	Participant organisation name	Name of delegate(s)
1	EC Network (ECNet)	Nils Daugaard
2	European Biogas Association (EBA)	Jan Stambasky
		Arthur Wellinger
		Stefanie Königsberger
		Yasmine Mertens
3	Danish Technology Centre for Biogas (DFFB)	Jakob Knud Bro Lorenzen
4	Auvergne Rhône-Alp Énergie-Environnement (AURA-EE)	Patrick Biard
		Valérie Borroni
5	Cornelissen Consulting Services (CCS)	Rene Cornelissen
		Jan Willem Bijnagte
		Berry de Jong
		Thomas van Leeuwen
		Marcin Sońta
6	IBBK	Achim Kaiser
7	Fedarene	Filip Dumitriu
8	Ekodoma	Agris Kamenders
		Anda Jekabsone
9	Czech Biogas Association (CzBA)	Lada Uskobová
10	ENERGY INSTITUTE HRVOJE POZAR (EIHP)	Matko Perovic
11	Severn Wye Energy Agency (SWEA)	Andy Bull
12	AILE	Simone Hruschka
13	Energy Agency for Southeast Sweden (ESS)	Hannele Johansson