

1. BIOGAS PRODUCTION IN THE WALLOON REGION (BELGIUM)

1.1. Anaerobic digestion of cattle effluents (2006 data)

Part of the research in the field of biomethanation in Benelux is dedicated to development of biogas technology in the agricultural sector. Because of recent Common Agricultural Policy reforms orientated to Rural development and also in the view of the entry of new member states to the European Union where cereals and oilseeds production is important and agricultural sector is highly competitive, agricultural sector in Western Europe needs to diversify productions and to find other income sources. Energy crops now allowed to be grown on set-aside lands can make substantial capital gain. Needs for redeployment encourage farmers to move over production and supply of renewable energy through anaerobic digestion of agricultural products.

Research also focuses on other concerns as sanitary problematic, odour control of biowaste or pathogen reduction in organic residues...

In Flanders special attention is paid to manure management and treatment. With intensive husbandry in the Northern part of Benelux, the Flemish has to tackle with the management of huge amount of manure produced each year. As AD of biomass is a way for green energy production, the fate of AD-sludge remains an essential issue as the volume of the digestate must be treated and reduced in order to spread or export it more easily. Several research projects are studying technical and economical feasibility of AD sludge treatment.

In Wallonia there are 4 agricultural biogas plants (decentralised farm plants). 2 farms are in the eastern part of Belgian near the German border. One farm uses mainly pig manure with grass and a few residues from a local chocolate factory. The second treats cattle effluents (cow manure) mixed with grass and little amount of waste from food-industry. The third one uses cow manure with energy crops (maize) and by-products from a chocolate factory. The last one, operating since June 2006, uses a mix of pig and cow manure with energy crops (grass silage + maize).

There is also a 'pilote-unit' in an agricultural research centre using cow manure in 3 little digesters (10m³ capacity). Biogas produced is used as fuel in a biogas boiler that provides heat to greenhouses.

Table 1 : Characteristics of agricultural biogas facilities in Wallonia (Source: Centre wallon de Recherches Agronomiques CRA-W, 2006)

Biogas plant	Co-substrate (ton/y)	Digester volume (m ³)	Biogas production (m ³ /y)	Electric capacity (kW _{el.})	Electricity production (kWh _{el.} /y)	Heat production (kWh _{th.} /y)
Wallonia						
1. Ferme Kessler (Town: Attert)	Cattle manure: solid: 2650 slurry: 2250	2 x 750	1 330 000	390	2 260 000	3 100 000
Since 2003	Energy crops: maize + grass: 1150 Food industry wastes (fruits, chocolate, potatoes): 7000					

2. Suzénergie (Surice) Since June 2006	Cattle manure: solid: 2400 slurry: 500 Energy crops (maize + grass): 800	1 500	300 000	104	530 000	750 000
3. Ferme Lenges (Recht) Since 1999	Cattle manure: Slurry: 4 700 m ³ Solid: 650 t Energy crops: grass: 350 Food industry wastes: chocolate 250, vegetables: 120 Sludge: 1000	600 + 1800	950 000	360	1 700 000	8 500 000
4.. Ferme Heck (Nidrum) Since 2001	Cattle manure: Slurry: 2000 m ³ Solid: 1400 Energy crops: Grass: 750 Food industry wastes: 700	1 800	360 000	100	605 000	1 200 000

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Currently there are several biogas projects in the agricultural sector. Several cooperatives of farmers have initiated feasibility studies. Most of the projects are involving a few farms and planned to use manure as main substrate with a mix of energy crops (grass + corn). They also try to find local food-industries willing to treat their by-products by AD. However, partnerships between industrial and agricultural sectors need to develop in order to maximize efficiency of biogas production and rise profitability of the sector.

1.2. Anaerobic digestion of industrial waste or by-products (2004 data)

Some industries, especially food-industries, have chosen biomethanation to treat a part of their effluents or by-products. Most of them are sugar beet industries (sugar beet grating or sugar refinery).

Table 2: Energy production from anaerobic digestion of sugar industry in Wallonia, (Source: ICEDD, 2004)

Biogas production	Primary production	Crude Electricity	Net Electricity	Steam produced on-site
1 912 000 m ³	14 926 MWh	809 MWh _{el}	770 MWh _{el}	5 234 MWh

There is also a jam factory equipped with 2 digesters (200m³ each) using fluidized beds with biolite producing 1000m³ of biogas per day.

Since 1986 a industry processing potatoes (Van den Broeke-Lutosa) treats its effluents by anaerobic digestion. End of November 2002 this industry in partnership with an electricity provider has inaugurated the biggest CHP installation in Belgium. The plant is equipped with 2 engines with a total power of 2.5 MWeI. providing heat (2 MWth power) and steam at a rate of 2 t/hour.

Table 3: Energy production from anaerobic digestion of industrial waste (sugar industry not included) in Wallonia, (Source: ICEDD, 2004)

Biogas production	Primary production	Crude Electricity	Net Electricity	Steam produced on-site
1 611 000 m ³	10 311 MWh	3 816 MWh _{el}	3 656 MWh _{el}	4 507MWh

1.3. Anaerobic digestion of municipal household wastes

In Belgium, biogas results mainly from landfills but also from anaerobic treatment of urban and industrial waste. Several waste treatment units in Belgium use the Belgian DRANCO process to treat organic waste from households, (food-) industries or catering. DRANCO (Dry Anaerobic Composting) system was developed by OWS firm to digest organic waste with high dry matter content. The anaerobic digestion is followed by an aerobic composting step. The final products are biogas that can be energetically converted, and compost called Humotex.

In 2000, a biogas plant treating municipal household organic waste was inaugurated in Havré, near the town of Mons. This plant is run by a intermunicipal operator.

The installation is planned to treat 54 000 tonnes of household waste injected into 2 digesters (3 800m³ each) with a retention time of 3 weeks.

The plant is equipped with 4 engines of a power of 459 KW_{el} each and 4 boilers of a thermic power of 1 350 KW_{th} each.

At the beginning the biogas plant was not functioning at full capacity and biogas production was not significant. In 2004 2.4 millions Nm³ of biogas were used to produce 4 448 MWh electricity and heat that was used to heat organic waste before the AD process.

Table 4: Energy production from anaerobic digestion of household organic waste in Wallonia, site of Havré. (Source: Cwape, 2005)

Primary energy production	Crude Electricity	Net Electricity	Heat produced on-site
16 934 MWh	4 448MWh _{el}	4 068MWh _{el}	2 778MWh _{th}

1.4. Anaerobic digestion of sewage sludge (waste water treatment) (2004 data)

In the Walloon Region there are 7 urban sewage purification plants producing biogas that amounts to 789 000 m³ of biogas produced (for 5 000 equivalent-inhabitant). The biogas is used for pre-heating sludge and for heating buildings.

Table 5: Energy production from anaerobic digestion of urban sewage sludge in Wallonia (source: Enquête ICEDD asbl, 2004)

Biogas production	Primary production	Crude Electricity	Net Electricity	Heat produced on-site
789 000 m ³	5 347 MWh	607.4 MWh _{el}	592.5 MWh _{el}	736 MWh _{th}

Table 6: Use of the heat recovered from urban sewage purification plants (source: Enquête ICEDD asbl, 2004)

Sewage sludge facilities	Equivalent -inhabitants	Use of gas/heat
Bastogne	17 500	Heating of digester & buildings
Herve	18 000	Heating of digester & buildings + gas burned off in flares
Hodeigne	9 100	Heating of digester & buildings + gas burned off in flares
Leuze	10 800	Heating of digester & buildings
Marche-en-Famenne	24 400	Heating of digester & buildings
Seneffe	Non communicated	Heating of digester & buildings
Wasmuël	400 000	Heating sewage sludge for AD process
Waterloo	20 000	Heating sewage sludge for AD process

1.5. Landfill gas recovery (2004 data)

As previously biogas escaping from landfill was mainly burned off in gas flares, biogas is now more and more recovered and used to produce energy (heat or electricity & heat by CHP process). With the Green Certificate system (for Green electricity market) electricity production from biogas recovery constitutes a interesting source of income for the landfill operators.

Table 7: Energy production from landfill gas recovery in Wallonia (source: Enquête ICEDD asbl, 2004)

Biogas exploited	Primary production	Crude Electricity	Net Electricity	Heat produced on-site
76 411 000 m ³	364.4 GWh	105.9 GWh _{el}	99.9 GWh _{el}	13.6 GWh _{th}

In 2005, landfill biogas was exploited on 10 sites in Wallonia.

Table 8: Landfills exploiting biogas in Wallonia (source: Cwape, Specific Annual Report for 2005 on the Evolution of the Green Certificate Market, June 2006)

Locality	into service from	Power (MW)
Hallembaye	January 1996	0.928
Mont-St-Guibert	1997	7 * 0.720
Engis	1998	2.960
Braine-le-Château	October 1998	3.270
Anton	October 1999	0.470
Montzen	December 1999	0.732
Tenneville	November 2003	0.693
Froidchapelle	2004	0.249
Les Isnes	2005	0.049
Happe-Chapois	2005	0.260

2. CONTEXT FOR THE DEVELOPMENT OF BIOGAS PRODUCTION IN WALLONIA

The backwardness of the AD development in agricultural sector can be explained by several factors:

- **Green Certificates mechanism for green electricity production:** in order to finance additional cost of green electricity production and to ensure a definite quota of green electricity is generated, transferable certificates (GC) are issued to producers for a number of kWh corresponding to a MWh divided by the CO₂ saving rate. GC are market based instruments with a minimum price guaranteed at 65€/GC. GC poses a higher risk for investors as long-term investments, as biogas facilities. Further more, in the case of co-

digestion, transportation of external substrates or energy consumption used for growing energy crops are taken into account and penalize the profitability of the biogas plant, reducing the number of GC obtained. However, in May 2006 in order to take into account the real specificities of the AD sector and to stimulate the development of new projects of biogas plants in Walloon Region, the Walloon Minister in charge of the Energy policy has announced some changes in the Green Certificates mechanism.

Previously the minimum price of the GC was guaranteed for a 10-year period, that may cause a higher risk for investors as AD is currently based on long-term, high cost technologies. Now for biogas units, entitlement to the issuance of green certificates is guaranteed for 15 years as of the date of notification of acceptance by the Walloon Commission for Energy. Moreover, a moderating margin on the length of the issuance of GC is normally based on the profitability of the technology used to generate Renewable Energy. However this reduction will not be applied for biogas generation from AD, insuring the maximum guaranteed value of the CV all 15 years long. These measures would raise some uncertainty about confidence to the CV market and support new biogas projects that are facing a long period of return on investments.

- **Setting up:** it is possible to build a plant *in agricultural area* only for an individual plant in on its own fields or farm lands, or if it is recognized as being beneficial to the general public. For all other cases the biogas plant has to be in industrial or habit areas with no inconvenience for residents.

- **Digestate utilisation as a fertiliser:** there exists a vagueness in the legal status of the digestate. AD sludge is considered as non-treated manure if it results from digestion of cattle effluents from one single farm and it can be spread on agricultural lands following agricultural good practices and Nitrate Directive. As soon as manure is mixed with a co-substrate external to the farm it is considered as a waste. In that case, authorisation for spreading, controls and analyses are required which are expensive and time consuming.

- **Lack of know-how and experience:** few Belgian companies or consultancy agencies have experience in biogas. Expertise, materials and installations are often provided by foreign companies (from Germany or Luxembourg). As there is little competition on Belgian biogas market tariff and prices remain very high. Maintenance costs are also very high and reduce profitability.

- **Availability of good quality substrates:** in order to increase methane yield from digester it is more profitable to mix manure with other co-substrate as energy crops or organic wastes from food industries as starch, oils, whey, etc. Unfortunately collaboration and partnership between farms and (food)- industries are not frequent. Most of biogas projects are worked out without consultation between different sectors. Interesting sources of potential co-substrates could be ignored at local scale. The concept of centralised co-digestion is not developed yet in Belgium.

- **Poor awareness of the benefits of AD:** Many positive externalities linked to biogas production as improved fertilisation efficiency of AD sludge, reduction of obnoxious smell and pathogen through sanitation, reduction of greenhouse gas emission, recycling of waste or by-products, diversification for agricultural sector and benefits for the whole community are difficult to assess and to monetize. These aspects should be studied in order to be integrated at an economic level.

- **Lack of collaboration and information between the different parts involved in a project:** (cooperative of) farmers, local authorities, local industries, local population. Residents are often reluctant to biogas plant in their neighbourhood fearing odours, noise, traffic or impact on the landscape.

- **Complicated administrative and legislative aspects:** as some aspects depend on federal/regional competence or on different ministries the whole procedure to build a biogas unit takes very long time and requires investments.

Some incentives may help stakeholders for biogas project:

- "facilitator Biomethanation" who ensures promotion of biogas production and utilization, negotiates with administrative and political authorities, carries out a pre-feasibility study free of charge, informs stakeholders about subsidies, grant, licences or permits, calculates number of Green Certificates to be obtained, estimates the potential resources...;
- Different types of subsidies: FIA, FEADER, for cooperative of farmers/ private companies...;
- Subsidies for feasibility study;
- Period for guaranteed value of Green Certificates has been extended to 15 years for biogas project.

3. AIDS FROM PUBLIC AUTHORITIES

3.1. Aid for economic development: grants for investments in a biogas plant located in the Walloon Region (grants from the Ministry of the Walloon Region- General Direction of Economy & Employment)

Who is concerned?

- natural person
- legal entity : small or medium Firm or company established in Wallonia
 - small company: < 50 people employed, turnover < 7 millions €
 - medium company: <250 people employed, turnover < 27 millions €

Amount of the grant:

A grant of maximum 15% of investment programme (specific for renewable energy production).

The sums of the aid are adjusted according the size of the company and according the location of the plant site (economic activity zone or outside activity zone)

Conditions:

- eligible investments: land, buildings, new equipment, purchase of licences or patents
- minimum sum to invest:
 - 43 400 € (for a family firm < than 21 people employed)
 - 125 000 € (for a small company employing < than 50 people)
 - 250 000 € (employing between 50 and 100 people)
 - 375 000 € (employing between 100 and 150 people)
 - 500 000 € (employing between 150 and 250 people)
- a minimum of 25% of the investment have to be made by the company applying for the grant

3. 2. Fiscal aids

3.2.1. Tax exemption on withholdings on real estates

For 5 years for a SME, for 3 to 5 years for other companies (depending on increase in employment)

3.2.2. Possibilities for paying bigger capital allowances (expeditious paying off) during 3 successive years.

3.3. Aid for consultancy

Who is concerned?

- consultant have to be registered (authorized) by the Walloon Region
- natural person or legal entity based in the Walloon Region (exception for non-profit-making association)
- + conditions on financial status of the entity.

Amount of the aid: aid is maximum 75% of consultant fees (with a maximum limit of 12 500€ and consultant fees of maximum 620€ per day)

Conditions:

- aid for pre-feasibility study in order to analyse general situation and the relevance of such a project
- aid for technical advise
- aid not applicable for an audit

3.4. Aids for farming sector in the case of the installation of a biogas plant in the Walloon Region (Agricultural Investment Fund)

Who is concerned?

- Natural person or legal entity having activities in the farming sector (crop production, animal breeding). The applicant must be established in the Walloon Region.
- a cooperative having activity of processing and selling farm products

Form of the aid (3 possibilities):

- interest-rate subsidies: interest rate on investment amounts to 1% (with a maximum rate of 5%)
- Public guarantee for paying off on capital investment or interest. (the total guarantee can not exceed 75% of the capital borrowed)
- Grant for capital if the farmer does not apply for a loan.

Conditions:

- minimum amount of the loans: 6 197.4 €
- + other conditions

3.5. Subsidies from the Walloon Region to carry out a study of a project of production & use of energy from wet biomass

Amount: 50% of the feasibility study with a maximum amount of 2500 € for the project of biogas plant treating wet biomass as substrates and maximum power capacity installed of 10 MWth.

4. ENERGY TARIFF STRUCTURE

Prices for electricity and heat sales varies according the total power capacity of the installations.

In the case of agricultural biogas plant:

- Price of electricity sold to the grid: around 25-30 €/ MWh_{el}.
- Price of electricity sold to a private buyer or self-consumer : varies a lot from 20 to 50 €/ MWh_{el}
- Price for heat : around 30-35 €/Mwth but varies according prices of other fuels.

These low prices are partly compensated by the financial gains from Green certificates.

Currently the value of GC on the green electricity market is **92€/GC**.

For further details on tariff structure in the Walloon Region, see the Commission wallonne pour l'Energie:

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