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INNOVATIVE AGRO-ENVIRONMENTAL Technologies

FOR SUSTAINABLE FOOD PRODUCTION IN THE BALTIC SEA REGION

From discussion about technologies at meeting in Lithuania

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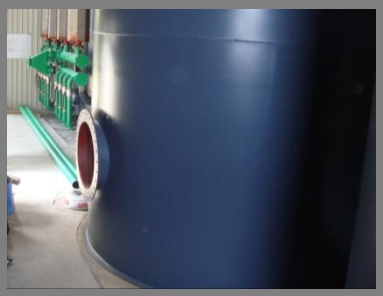

Lower part of the settling tank.

Sludge bed of the pilot installation, with cover/lit removed.

Knowledge Sharing

Efficiency of Gosmer Bioseparation for separation of digested pig slurry

By Thorkild Q. Frandsen, AgroTech, Denmark

AgroTech A/S and the Specialist Advisory Services on Biogas and Slurry Separation within the Danish Agricultural Advisory Services (DLBR) have followed Gosmer Biogas A/S' plant for separation of digested pig slurry over a period of 6 weeks. The purpose of this study was to assess how effective the plant is to separate the nitrogen, phosphorus and dry matter into the solid/fibre fraction.

The plant structure and function

The Gosmer Bioseparation is specially developed for separation of digested slurry and the facility must be established in connection with a biogas plant. The Gosmer Bioseparation works without the use of chemical additives. The system function is based on flotation and sedimentation and the separation is partly caused by remaining gas in the digested slurry.

The plant is designed with the objective of minimizing energy consumption and, at the same time, to collect and use methane formed during the separation process. The tested system is a prototype plant with a capacity of 4 tons of digested slurry a day.

Results from the study

The main purpose of the slurry separation is to reduce the content of dry matter, phosphorus and organic nitrogen in the liquid fraction, which subsequently is spread as fertilizer on fields. Table 1 below shows the dry matter and nutrient content in the digested slurry, the liquid fraction and the fibre fraction after separation with Gosmer Bioseparation.

It is especially relevant to separate pig slurry.

Table 1: Concentrations of nitrogen, phosphorus and dry matter.

Analysis parameter	Digested slurry	Liquid fraction	Fibre fraction
Nitrogen (kg/t)	3.77	3.15	8.72
Ammoniac nitrogen (kg/t)	3.12	2.76	4.81
Organic nitrogen (kg/t)	0.65	0.39	3.91
Phosphorus (kg/t)	0.58	0.14	8.20
Dry matter, DM (%)	1.89	1.11	16.71

Among other things, table 1 shows that Gosmer Bioseparation is able to produce a liquid fraction where the concentration of phosphorus is reduced to approx. 24% compared to the digested slurry. Moreover, the fibre fraction with a dry matter content of almost 17% is relatively wet compared to other separation plants.

Table 2 shows the distribution of the digested slurry nutrients on the liquid fraction and fibre fraction, respectively. It lies outside the scope of the investigation to make a proper mass balance. Therefore, the results must be considered as indicative of the effectiveness of a full scale plant.

Table 2: Distribution of the digested slurry nitrogen and phosphorus in liquid and fibre fraction.

Parameter	Liquid fraction	Fibre fraction
Quantity (%)	92	8
Nitrogen (%)	81	19
Phosphorus (%)	17	83

A shorter process time results in a wetter fibre fraction with a higher proportion of digested slurry nitrogen. With a dry matter content of 9.75% in the fibre fraction the proportion of the nitrogen and phosphorus in the fibre fraction is calculated to 24% and 84%, respectively.

Since this is a prototype facility for developing and assessing the concept and since the plant has partly been operated by manual filling and evacuation, the study does not include an assessment of the plant's operational stability.

The demonstration is supported by the European Agricultural Fund for Rural Development and the Danish Ministry of Food, Agriculture and Fisheries, the Danish Food Industry Agency.

Need for standard values for livestock manure in the Baltic Sea region

By Henning Lyngsø Foged, Agro Business Park, Denmark

It is widely accepted that agriculture counts for more than half of the N and P sources reaching the Baltic Sea, and additionally that these losses mainly originate from livestock manure. The legal framework established by EU and its Member States, such as the Nitrates Directive, the Water Framework Directive and the Directive on Industrial Emissions (follower of the IPPC Directive) can principally not be effectively implemented without official standard values for livestock manure, but only three countries in the Baltic Sea Region have enforced the use of such standards. Moreover, farmers' incentives to invest in agro-environmental technology like biogas production, manure separation and SCIEN[1] drainage technologies are severely hampered if they are not credited for the environmental benefits of such investments, and investment calculations concerning environmental technology projects are basically dependent on precise manure values.

Standard values are necessary for precise use of livestock manure as fertilizer.

Definition of standard values for livestock manure

Standard values for livestock manure is basically a table with information of the following type:

Animal type, for instance heifers from 12-24 months age	**Feed intensity** / productivity intensity, for instance 5,000 kg milk produced per year	**Housing system**, for instance partly slotted floors	**Bedding type**, for instance chopped straw	**Ton per year per animal place or per produced animal**, for instance 0.6 ton per produced fattener	**Dry matter content**, for instance 5.5 %	**Total nitrogen content**, for instance 4.8 kg/ton	**NH_4^+-N**, for instance 3.1 kg/ton	**P content**, for instance 2.3 kg/ton (can also be expressed as P_2O_5)	**K content**, for instance 3.4 kg/ton (can also be expressed as K_2O)

The standard values shall of course be described for all/relevant animal types, feed intensities, housing systems and bedding types. There would therefore typically be at least 30 datasets / rows in the table.

Methodology for preparation of the standards

Correct prepared standard values are prepared following a mass balance methodology, i.e. where N and P going into the production via feed and bedding material are deducted amounts leaving with products (meat, milk, etc.) and ventilation air.

The standards are defined as to ex animal, ex housing and ex storage, since there are considerable differences in manure qualities and amounts at these stages; it is for instance typical that 20-60% of the nitrogen disappears from ex animal to ex storage.

EU's Nitrates Directive concerns the manure qualities and amounts ex storage (i.e. what is available for fertilising of field crops).

Manure standards can therefore not be established via analyses, because one of the key parameters, the amount produced per animal place or per produced animal, logically cannot be determined by analyses. Another reason is that representative sampling of livestock manure is almost impossible, at least for the solid types, wherefore a sufficient statistical certainty of analysis results typically requires that several hundred samples are

[1] SCIEN is an acronym for sustainable, controlled, intelligent, environmental friendly and nutrient loss mitigating

Slurry is the most common livestock manure type in the Baltic Sea area, but qualities varies a lot, for instance with dry matter content from around 1% to around 12%.

analysed, and determination of the figures ex storage is impossible if the storage as normally is a mixture of manures from several animal types.

Standard values for livestock manure are expensive to develop, and they require frequent updating along with the development in stable systems, productivity levels, etc. It has earlier been said that each country needs their own standards because productivity levels and production systems differ from country to country. However, with and increasing harmonisation of agricultural production systems and practices in the Baltic Sea Region there are today the best possibility ever to share at least a part of the complex scientific work among countries in the region.

Existence of official and sufficient standard values for livestock manure

Like in Latvia and Lithuania the recent National Roundtable meeting in Poland, held under auspices of Baltic COMPASS, concluded that official manure standards do not exist, but farmers and their advisers and anyone else have to deal with some more or less incomplete recommendations; in Poland a statistics of manure analyses is available, but without indication of the amount of livestock manure from different animal types, kept under different conditions of housing systems, bedding types and feed intensity. Latvia has some unofficial figures that were developed in several steps with heavy influence of manure analysis results, but this has been criticised by farmers for not corresponding with reality. Lithuania has some similar insufficient figures in the Code of Good Agricultural Practices from 2001. Estonia and Finland have some figures, but these are not considered trustworthy even by the ministries who use them. Only three out of ten countries in the region, namely Sweden, Denmark and Germany, have official and trustworthy manure figures.

SCIEN Drainage

By Henning Lyngsø Foged, Agro Business Park, Denmark

SCIEN drainage stands for sustainable, controlled, intelligent, environmental friendly and nutrient loss mitigating, i.e. a term that combines conventional and controlled drainage with other innovative technologies to ensure a maximal recirculation of plant nutrients. It transforms the drainage concept from mere being a way to get rid of excess water into being a concept for intelligent managing of the water turnover for field crop production.

Conventional drainage is often done with this type of pipes.

Alone in Denmark, an amount in the area of 18,000 - 25,000 ton nitrogen and 400 ton phosphorus pour out through field drainage every year. A SCIEN drainage method that can help to reduce this emission is the set-up of drainage filters. In the light of foreign experiences, senior researcher Charlotte Kjaergaard from Aarhus University, Denmark argues that cleansing of drainage water can act as a means of reducing the nitrogen emission:

- If 30-80 per cent of the nitrogen in the draining pipes is removed, the nitrogen emission to the water environment will be reduced between 5,000 and 20,000 ton per year, as well as up to 300 ton phosphorus, alone for Denmark.

Otherwise unutilized grass vegetation in wetlands near the Danish Nørreå is harvested in a research project, in order to re-circulate the plant nutrients via a biogas plant. Photo: Lisbeth Nielsen, Natlan.

Baltic COMPASS (http://www.balticcompass.org) has committed itself to work for the dissemination of SCIEN drainage technologies due to the considerable positive effects they could have on both the aquatic environment in the region as well as on the profitability in the field crop production. A full implementation of SCIEN drainage technologies in the entire region could reduce losses of plant nutrients to the aquatic environment with up to 77,000 ton nitrogen and 15,000 ton phosphorus and as well reduce the crop productions' dependency on the precipitation, here under droughts.

A way to reduce the emission from the field drains is via drain filters, which for example can be mini wetlands, where drainage water runs through and can settle the nutrients. Charlotte Kjaergaard argues that these mini wetlands can be profitable, and although the calculations in relation to this are not exactly settled yet, she states:

- An estimate will be that the costs will be between DKK 5 and 100 per kg nitrogen (€ 0.7 to 13.5). This is based on the assumption that between 500 and 2,000 kg N disappears from a drainage hinterland, and that a mini wetland can be established for DKK 150,000-300,000 (€ 20,000 to 40,000).

Charlotte Kjaergaard leads two new, large projects about SCIEN drainage technologies, namely the SUPREME_TECH (www.supremetech.dk) project, and a project about drain filter technologies.

Colophon

This electronic newsletter is sent out quarterly with the purpose to support innovation and investments within agro-environmental technology in the Baltic Sea Region by publishing relevant knowledge about the field to the Baltic Compass Network.

To read more about the project please go to:

http://www.balticcompass.org

We encourage everyone to contribute with content to this newsletter by contacting the editors.

For subscription or un-subscription, please notify one of the editors via e-mail.

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BALTIC COMPASS

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Upcoming events

Meeting: Danish National Roundtable Meeting

Venue:	Meeting room 2184 at Ministry of Food, Agriculture and Fisheries, Slotsholmsgade 12, Copenhagen
Date:	1 September, 2011
The event:	This meeting is aiming at direct consultations with key stakeholders, here under Danish representatives from the relevant ministries and agencies, as well as representatives from related projects. The overall purpose is to secure synergies between the various work packages in Baltic COMPASS and the efforts in the Danish administration and projects that are related with Baltic COMPASS.
More info:	Personal invitations with agenda will in early July be send directly to you, who receive this newsletter, and you may already now reserve the date.

Conference: "Aquarius – The Farmer as Water Manager

Venue:	Fuglsoecentret, near Aarhus, Denmark
Date:	12-13 October, 2011
The event:	The conference marks the end of the project: "AQUARIUS – The Farmer as Water Manager" and different stakeholders will get the chance to discuss the results and experiences from AQUARIUS and other related projects at this event.
More info:	http://www.inbiom.dk/dk/20110614_01.htm

Conference: A Greener Agriculture for a Bluer Baltic Sea 2011

Venue:	Sånga-Säby, near Stockholm, Sweden
Date:	2-3 November, 2011
The event:	The event is a must for all those who work with agro-environmental issues in the Baltic Sea Region. The event is the major forum for networking and exchange of knowledge, experiences and ideas.
More info:	http://www.inbiom.dk/dk/20110614_02.htm