- Manure Treatment Innovations in the Netherlands

Written by

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Background

This study tour of “ReUse Waste” project in the Netherlands was organized by our colleagues in Wageningen UR, Netherlands on 16th of October, 2013. The theme of the field excursion
was “innovative manure treatment techniques in the Netherlands”, with the aim to give an inside look how these manure treatment techniques are implemented and operated in practice; what are initial reasons to set up these manure treatment plants/companies; and what are actual obstacles to manage such treatment techniques, etc.

Excursion details

Departure at 8:30 AM

All participants, in total ~30 persons from ReUseWaste network and also some guests, met in front of the hotel of Hof van Wageningen at 8:30 am.

Destination 1 (9:00-10:30 am):
Visit to veal calve manure treatment plant SMG/KGBI in Ede (http://www.smg.nl)

We received very warm welcome from the manager of SMG/KGBI plant (with a central aerobic treatment facility). The visit began with a presentation given by the manager to generally introduce the history and background of the plant and information on treatment processing. Afterwards, the manager and a colleagues guided us through looking at each step of manure treatment and management, starting from slurry transported into the plant, via mechanical pre-separation, nitrification-denitrification, post-precipitation, and in the end effluent storage and discharge to the public sewage system. During the visit, all of us were amazed by the clear and clean surroundings in the plant, and we could barely smell any obnoxious odour, partly because of well-managed slurry transport among processing steps (e.g., above/underground pipelines). Key messages are the following:

- The first pilot plant was built in 1976, in order to meet the first law on protection surface water announced in 1975. Until now, there are four such plants in total in the Netherlands, placed in areas with high veal calve manure surplus.
- Veal-calve slurry is the main source used in treatment, and is special considering the relatively low dry matter content (<3%).
- Total capacity is 660,000 ton liquid waste/year (for all four plants), with three main end products, including dry manure solids (separated), waste water (to be processed further in the local household sewage cleaning plant) and fertilizer (struvite).
- Nitrogen gas emissions during nitrification-denitrification include only 0.005% of N as NH₃, whilst 77% as N₂ losses, the remainder being discharged with the effluent. However, questioned about the N₂O emissions, the manager said they did not want to know 😊 - however Melse & Timmermann report that N₂O emission may be up to 9% of total input N, so a potentially huge global warming impact.
- The largest energy and financial cost comes from the nitrification processes (to blow air in the aeration tanks).
- Farmers pay around 10 €/ton for processing, including discharge levy to the sewage treatment.

More background information:
Picture 1: The study tour in calve manure aerobic treatment plant (SMG/KGBI).
**Destination 2 (12:00-13:30 am):**

*Visit to pig manure treatment plant (separation/RO) at Gebr. Verkooyen in Langeweg (http://www.verkooyen.nl)*

The Gebr. Verkooyen plant not only operates a pig manure treatment, but also offers services related to manure transportation and field application as a contractor. Nationwide, every year, 750,000 truckloads of slurry are transported throughout the Netherlands. See movies on:

- transport and injection: http://www.youtube.com/watch?v=y2ASuvv4wh8
- injection only: http://www.youtube.com/watch?v=b6qVTjY64Ds

Treatment techniques at this plant mainly include separation (belt press separation and sedimentation separation) and membrane filtration (reverse osmosis). We also saw many farming machines/vehicles, such as a mobile manure separator, low-ammonia-emission slurry application machines (injection, trailing shoe/hose) and machines with combined seeding and fertilization. On a mass basis, the treatment of 1 unit pig slurry (say 1 m\(^3\) or about 1000 kg), results in 50% clean water that is discharged to water ditches with a quality that meets the regulatory limits, 25% is processed into so-called nitrogen concentrate (liquid) and 25% comes out as a solid fraction with about 30% dry matter.

For more info on the manure treatment installation:

- attached congress paper by Hoeksma et al., 2012; the location similar to plant "B"
- YouTube movie: http://www.youtube.com/watch?v=B-3xOYOmbrA (in Dutch).
Destination 3 (14:00-16:00 am):
Visit to poultry manure incineration plant BMC in Moerdijk
(http://www.bmcmoerdijk.nl/en/home.htm)

BMC is the biggest poultry manure incineration plant in Europe. For most of us, it is the first time to look so closely at such incineration plant with huge treatment capacity and combined highly advanced technology. In the first hour, we stayed in a bright meeting room and listened to the manager and technician who gave a detailed introduction about the incineration processes in BMC. After that, we were divided into 4 subgroups to take a tour, and employees gave further explanations on the system. Because of concerns on safety, all of us had to wear helmet and protection clothing during this excursion. Obviously, management rules in BMC have to be strictly followed by any employee and employers. Key messages are as follows:

- Annually, 440.000 ton of dry poultry manure (average 55% dry matter content) is transported to and incinerated by BMC (60-65 trucks per day), which amounts to one third of the total amount of poultry manure produced in the Netherlands.
- High productivities: electricity gross production of 285 MWh, and 60.000 t ash.
- All ash products are exported to outside the Netherlands (UK, Belgium, France and Germany), to follow the local / national law.
- Poultry manure coming to BMC has to be measured from each truck, in order to ensure quality of feedstock. If poultry manure has very good quality, the supplier (farmer) may get part of money back as award.
- Properties of poultry feedstock, on average: 55% dry matter, 7.3 MJ/kg on average, and high minerals (ash)
- In storage silos, rolling bridge cranes transfer the poultry manure from the reception to the storage bunker, and is then mixed automatically. All of this takes place in a closed system, in order to avoid emissions of odour and NH3, and without direct staff contact for work safety reasons.
- The poultry manure is incinerated in a fluidized (sand-based) bed furnace after removal of any iron, with a bed temperature of 750 °C and consequently the flue gas is combusted at 1000 °C.
- The incineration produces heat and flue gas. The flue gas is cleaned intensively in four stages before it is discharged via the stack (electrostatic filter, turbosorp, bag house filter and DeNox catalyst)
- The release of flue gas has to be measured continuously (CO, CO2, H2O, NOx, O2, SO2, TOC and NH3 etc.)

Other available information (attached):
- leaflet of Biomass Plant Moerdijk
- 2 slides from presentation
- section 2.4 of journal paper Melse & Timmerman, 2009
Picture 3: The study tour in a poultry manure incineration plant (BMC) in Moerdijk