

## TECHNOLOGY FOR N RECOVERY AS DRIED DIGESTATE AND AMMONIUM SULPHATE FROM SOLID FRACTION DIGESTATE WITH "BIOGAS BREE" CHEMICAL SCRUBBING OF EXHAUST AIR DURING



**Keywords:** • digestion • hygienisation • nutrient recuperation • air scrubber • ammonium sulphate

### Key facts:

- **Technology category:** co-digestion + digestate post-treatments : drying and air scrubbing
- **Input material:** animal manure, organic waste (conform Vlarema and positive list FOD), energy maize
- **Output products:** post-treated digestates including dried digestate and ammonium sulphate
- **Capacity:** production of solid fraction (5.000 t/y) – non animal manure status –, liquid fraction digestate (45.000 t/y) – non animal manure status –, dried digestate (1.500 t/y) – manure status –, ammoniumsulphate (700-900 t/y)
- **Focusing geographical areas:** EU28
- **Technology status:** TRL9
- **EC/MS Authority permits:** 'Omgevingsvergunning'



### Summary of the technology:

Technological elements of the recuperation proces at Biogas Bree site are:

- Dryer
- Chemical air scrubber
- Biobed
- Silo (for ammonium sulphate)
- For application of ammonium sulphate (UNIR project)
  - o Sprayer system (from contract labourer) was transformed to drag hose system
  - o Spoked wheel fertiliser (Duport)

The digestate coming from the manure-input line is submitted to a drying process (with heat from a biogas fueled CHP more particularly a belt dryer (Dorset) (cfr <https://www.vlaco.be/sites/default/files/generated/files/page/technische-fiche-banddroger-10-11-16.pdf>). The end product is dried digestate. Throughout 2019-2020 a new dryer, type fluidised bed dryer will be installed for greater capacity (3,5 MWth/h or 32.000 ton liquid fraction/y) (<https://www.vlaco.be/sites/default/files/generated/files/page/technische-fiche-wervelbeddroger-10-11-2016.pdf>). The exhaust air is saturated with ammonia which is being captured by a chemical air scrubber. In a chemical scrubber, acid is added to the washing water to remove the ammonia and a part of the odour compounds from the exhaust air. Water, acidified with sulphuric acid (96 % or 98 %), flows continuously over the filter package. This humidifies the filter. The acidic washing water reacts with the ammonia in the air. A salt (ammonium sulphate) is formed. That salt remains in the washing water which means that the outgoing air contains less ammonia.



Per kilogram recuperated ammonia 1,5 litres of sulphuric acid is needed. When the washing water is saturated with ammonium sulphate, no more ammonia can be converted and the ammonium sulphate-loaded washing water is discharged (making room for new water+acid to form new washing water). About 30 litres of ammonium sulphate is produced/discharged per kilogram of ammonia that is recuperated from the exhaust air. The specific model Biogas Bree handles was a modified scrubber with before and after the acidic water washing respectively a dust washer and an additional air washer (de-acidifying air).

### Competitive position and advantages:

- Anaerobic digestion leads to energetic recuperation in the form of biogas (for CHP-based production of green electricity and heat) and digestate (usually for further post-treatment)
- Ammonium sulphate is a high value N and S fertiliser issued from a chemical air scrubber joined at the (solid) digestate drying process
- The air scrubbing allows to comply with industrial/environmental exhaust norms while recuperating in liquid form the N (ammonia) from the digestate drying (or extracted air from pig stables)
- The ammonium sulphate from a chemical scrubber is a mineral NS fertiliser that is considered a fertiliser in Flanders. Raw material declaration, inspections, FPS exemption and manure marketing documents are not required.
- Due to a historical decrease of the acidification problems and acid rain, the space for S-fertilisation has also increased again in recent years, especially since there are mainly sulphur shortages on Flemish fields and meadows. These shortages in the soil can in turn lead to too low N utilisation in the plant (and yellowing).
- optimised row fertilisation via towing hoses (drag hose system) or via a spoked wheel fertilisation - allowing efficient application without soil damage nor 'burning' of the crop, and/or preventing evaporation of the ammonia.

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