TRAINING MATERIAL

Title:

Technology for N recovery as dried digestate and ammonium sulphate from solid fraction digestate with "Biogas Bree" chemical scrubbing of exhaust air during drying process (ID: 273)

Training:

What is the technology?

Co-digestion + digestate posttreatments including drying and air scrubbing with H_2SO_4. Technological elements of the nitrogen recuperation in liquid form at the Biogas Bree site are: dryer - chemical air scrubber - biobed – silo

Who is the vendor of the product/technology?

Biogas Bree (https://biogasbree.be/)

Which other technologies are provided by the vendor?

See above-mentioned websites of Biogas Bree.

Which are the advantages of the technology and the problems addressed?

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 posttreatment) – drying allows lowering transport costs of manure/digestate. - Ammonium sulphate is a high value N and S fertiliser issued from a chemical air scrubber joined at the (solid) digestate drying proces - 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 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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How does the technology work?

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 The end product of the co-digestion and drying of the digestate is dried digestate and exhaust air. This 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.

How/where to use the technology?

It is a closed process implying no further emissions occur. As it removes the ammonium the NH3 emission for the digestate or manure is indeed negligible. This technology offers solutions for intensive husbandry and manure/substrate drying in any EU region. Furthermore the high quality fertilizer can replace the production and/or use of artificial fertilizers in such regions where local availability of nitrogen fertilisers is valued.

Authority permits?

At least an environmental license/permit for installing this technology will have to be asked & obtained from the local authorities. This legislation and authority depends on the specific EU region. For example in Flanders an 'omgevingsvergunning' will be required from the Department of Environment, taking into account BAT (best available technologies) guidelines and recommendations of other advisory bodies. One important requirement for obtaining the permit (for chemical air scrubber) is the ammonia removal of min 70% from the exhaust air.

How much does it cost?

CAPEX: Dryer 1.200 000 € - Chemical air scrubber 120 000 € - Biobed 100 000 € - Silo ammonium sulphate 10 000 €. Totalling: 7€ cost/ton (waste) (economic industrial scale);

OPEX: Dryer 3,5 € electricity cost/ton - Chemical air scrubber: sulfuric acid-cost of 1,5 euro /ton digestate - Biobed: changing biomass (root wood) every 3 years: 12.000 euro. Totalling 3,5 à 4€ cost/ton (waste)(economic industrial scale)

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For more information: https://nutriman.net/farmer-platform/technology/id_273

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