

TRAINING MATERIAL

Title:

The use of **ammonium nitrate/sulphate** as fertilizer

Training:

Main features of the subcategory

Ammonium nitrate/sulphate refers to ammonium nitrate/sulphate solution recovered from stripping/evaporation + scrubbing process by nitric/sulphuric acid as scrubber. It is a liquid N (and S) fertilizer.

Input material

Liquid fraction of pig manure, poultry manure, digestate

Sulfuric acid or nitric acid

How to produce?

The stripping is performed by blowing air through N-rich waste streams while increasing temperature or pH (e.g. with CaOH) which will gasify the mineral nitrogen (NH_3). This is considered a pre-treatment needed before the scrubbing N recovery process where the NH_3 -filled air will be washed with acidified (HNO_3 or H_2SO_4) water (scrubbing) to capture the ammonium in liquid form (ammonium sulphate from H_2SO_4 or ammonium nitrate from HNO_3).

Typical nutrient content and availability for plants

The typical N concentration in ammonium sulphate is around 7-9%; in ammonium nitrate this is about 17%. Ammonium sulphate can also serve as a sulphur fertilizer, with concentrations varying from 7% up to 25%. Other nutrients (P and K) are not or only very limited present in these products.

Examples of ammonium nitrate/sulphate products available on the NUTRIMAN Farmer Platform

- https://nutriman.net/farmer-platform/product/id_266 (The Netherlands)
- https://nutriman.net/farmer-platform/product/id_281 (The Netherlands)
- https://nutriman.net/farmer-platform/product/id_274 (Belgium)
- https://nutriman.net/farmer-platform/product/id_295 (Belgium)
- https://nutriman.net/farmer-platform/product/id_454 (The Netherlands)
- https://nutriman.net/farmer-platform/product/id_596 (Belgium)
- https://nutriman.net/farmer-platform/product/id_1529 (The Netherlands)
- https://nutriman.net/farmer-platform/product/id_667 (Germany)



Figure 1: Ammonium sulphate/nitrate from Circular Values process (ID 266)



Figure 2: Ammonium sulphate/nitrate by POUL-AR technology (ID 281)



Figure 3: Ammonium sulphate by Biogas Bree process (ID 274)



Figure 4: Ammonium sulphate by on-farm scrubbing (ID 596)



Figure 5: Ammonium sulphate by VP-Hobe Manure Valorisation system (ID 1529)



Figure 6: Ammonium sulphate by BENAS process (ID 667)

Fields of application in agriculture: crop, dosages, application method and practical recommendations.

Ammonium nitrate and ammonium sulphate can be used in conventional farming in almost all crops in open field and greenhouse farming, especially those who are nitrogen (and sulphur in the case of ammonium sulphate) demanding. The application dose is depending on N%, N-vulnerability of the region, type of soil, crop, ... (e.g. the application dose of ID 295 is 0.5-1 t/ha).

The product is liquid and has to be applied as other chemical fertilizers, by adapted machinery for applying small doses of fertilizers. The application is by preference before or at the moment of seeding/planting. Spraying these products can give leaf damage, so therefore it is recommended to inject it directly into the soil.

Products derived from stripping & scrubbing are considered as livestock manure, and are therefore limited to max 170 kg N/ha.

Benefits for farmers

Ammonium sulphate and ammonium nitrate are odorless and suitable for replacing mineral fertilizers in agriculture. By stripping & scrubbing, it is possible to produce locally a pure nitrogen fertilizer without other nutrients. These products are potential RENURE fertilizers, meaning that they are listed as high priority products to be applied above the Nitrate Directive. In Flanders, ammonium sulphate coming from chemical air washers (e.g. ID 274 and ID 295), is already recognized as mineral fertilizer. Another advantage of this ammonium sulphate is that it is providing sulphur as added value to meet the specific requirements of some crops.

Bottlenecks of application. Potential risk or limitation.

The main bottleneck is that the composition of ammonium nitrate and sulphate may vary throughout the production process and between different installations. Therefore, it is important to know exactly the composition before fertilization. Another risk is that spraying of these products can give leaf damage. Therefore it is recommended to inject it directly into the soil.

Also, under the current regulations, ammonium sulphate/nitrate derived from stripping/scrubbing is treated as livestock manure and need to follow the limit of max 170 kg total N per hectare (230-250 kg N/ha for derogation farms in NL).

Legal framework for using

Ammonium nitrate and sulphate derived from stripping/scrubbing are up to date considered as livestock manure, and are therefore limited to max 170 kg N/ha as prescribed in the Nitrates Directive

Economic evaluation of the application of the products

Ammonium sulphate and nitrate derived from stripping/scrubbing will cost approximately 0.65-0.75 €/kg N (ID 295). Ammonium sulphate derived from on-farm scrubbing will cost approximately 10 €/ton (ID 596).

Best management practice guideline, taking into account of specific conditions of the given territory, for the use of the product to the specific applications (soil improvers, growing media, organic fertilisers etc.).

The application doses of ID 266, ID 454, ID 1529 and ID 667 is in general depending on the N%, N-vulnerability of the region, the type of soil, crop.

Ammonium sulphate/nitrate from poultry manure by Poul-AR technology (ID 281) and digestate by Biogas Bree process (ID 274) is about 1 m³/ha, but this is also depending on soil, season, crop.

Ammonium nitrate from Detricon process (ID 295) should be applied at 0.5-1 t/ha.

Ammonium sulphate from pig manure by on-farm scrubbing (ID 596) should be applied at 1-1.5 t/ha, but this is also depending on crop demand and soil fertility.

In general, it can be said that the application doses depends on the crop demand and soil status. Products derived from stripping/scrubbing are however limited to max 170 kg N/ha as livestock manure due to the Nitrates Directive.

How to store, apply to land, machinery needs.

The liquid product needs to be stored in closed tanks and can be applied to the field by adapted machinery, able to withstand a lower pH. It is recommended to inject these products directly into the soil using machinery like Knife injection, Sweep injection, Disk or Coulter injection systems, etc.

For more information:

- https://nutriman.net/farmer-platform/product/id_266 (The Netherlands)
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- https://nutriman.net/farmer-platform/product/id_274 (Belgium)
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