

Activities

In 2020, Joint Research Centre proposed the "RENURE" criteria to allow the safe use of recovered nitrogen from manure as replacement for synthetic nitrogen fertilizers. Ammonium salts recovered from manure through stripping and scrubbing process are proposed as a priority of RENURE products. Within this operational group, ammonium salts were recovered at on-farm stripping-scrubbing installations and were tested at field trials for the agronomic performance. An infosheet was created to guide the ammonium salt producers in optimizing the operation of nutrient recovery installations to ensure consistent and effective production of ammonium salts.

A meta-analysis was conducted to evaluate the impact of implementing ammonium salts (derived via stripping-scrubbing) within the Flemish agricultural sector. The study assessed economic viability, revealing that the profitability of ammonia strippers is highly dependent on the type of farm operation.

Further details



Total budget: € 75.000,00

Total financed: € 75.000,00

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RENURE

Production of manure-derived ammonium salts through stripping and scrubbing process



Objectives

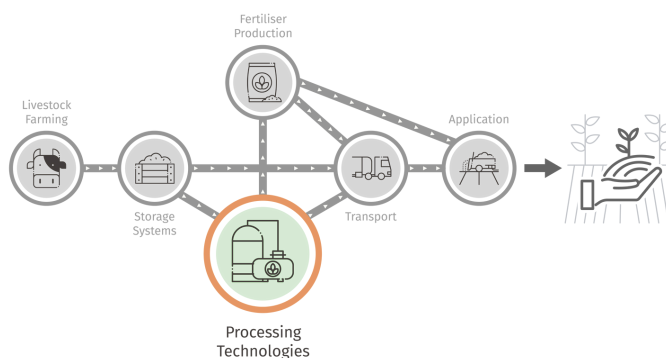
There is a nutrient surplus from livestock industries in Flanders while additional nutrients are supplied in the form of artificial fertilizer.

Stripping-scrubbing is a technology that makes it possible to upgrade manure to RENURE fertilisers such as ammonium salts.

However, these fertilisers are considered as animal manure and must therefore comply with the Nitrates Directive.

The OG RENURE aims to prepare agriculture and horticulture for the rollout of the RENURE criteria on Flemish agriculture, with knowledge and experience of the production and application of these ammonium salts.

Location in the Nutri-Know value chain



Results

Ammonium salts (including ammonium sulphate and ammonium nitrate) are recovered from animal manure through ammonia stripping and scrubbing process.

The process consists of two steps: in the stripping step, air is blown into the first compartment to remove the gaseous ammonia that is released from the thin fraction of manure or digestate due to increased pH and/or temperature; in the successive scrubbing step, the ammonia-rich air is sprayed with a strongly acidic solution, such as sulfuric acid or nitric acid, to form ammonium sulphate or nitrate, respectively.

The economic viability of implementing an ammonia stripper is highly dependent on the business type under study.

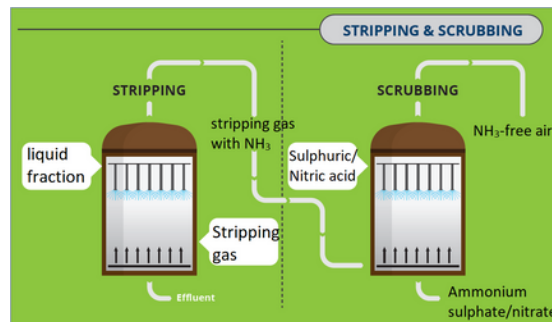
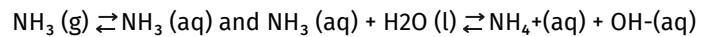
The most important criteria that influence the economic result are manure type, the existing processing path, the scale, and the manure pressure at specific region.

The estimated price of the operational installation is approximately €100-150/m³ (in June 2023).

It requires an annual manure processing capacity of at least approximately 20,000 tons to achieve a desired economies viability.

Context

In a nitrogen-rich waste stream, such as the thin fraction of manure or digestate, the nitrogen is mainly in the form of ammonium (NH₄⁺) in equilibrium with ammonia (NH₃) according to the following formula:



Accordingly, a stripping-scrubbing installation to recover ammonium salts from manure consists of two compartments where ammonia is first volatilized in the air (stripping) and then washed with acid (scrubbing).

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Since the process depends on temperature increase, it is usually coupled with an anaerobic digester to make use of the excess heat. The pH is increased by adding slaked lime (Ca(OH)₂) or sodium hydroxide (NaOH). Stripping.

However, mixing CO₂ from the input stream with Ca(OH)₂ can also increase the pH and promote the formation of CaCO₃ - prevent precipitates in the stripper.

A stripping-scrubbing installation can work well with either sulfuric acid or nitric acid. The choice of acids can be determined by the price and purpose of the ammonium salts. Ammonium nitrate (when using nitric acid) contains more nitrogen, but ammonium sulphate (when using sulfuric acid) provides an extra sulphur dose that can be interesting for certain crops.



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