

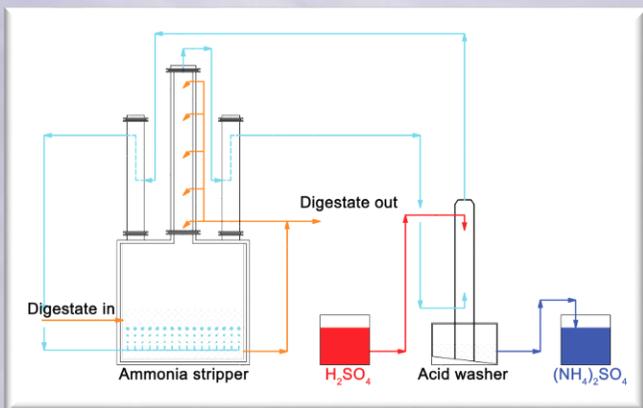
# AMFER®

## Removal of ammonia from digestate & waste water

### Application . . . . .

#### Nitrogen removal from ammonia containing water / sludge / digestate and the production of (artificial) fertiliser <sup>1)</sup>

During the fermentation of manure and other organic substrates the organic nitrogen present is largely transformed into ammonia (NH<sub>4</sub>) nitrogen. The high nitrogen content constitutes a limiting factor for field application of the digestate (as a result of European Nitrate directive). Current digestate treatment is making use of biological pathways to convert NH<sub>4</sub>-N into nitrogen gas. These techniques require considerable amounts of energy and result in the loss of nitrogen as nutrient. The AMFER® technology can be applied to produce ammoniumsulphate, which can be used as an (artificial) fertiliser.



Schematic representation of the AMFER® process

Via a batchwise or continuous operation the ammonia is liberated and removed. For this purpose the digestate is simultaneously heated and aerated. The process is executed at a temperature of around 60°C and there is no need to add chemicals. The thermal energy required can be obtained from the existing CHP installation.

### Process . . . . .

As a result of the raise of both temperature and pH the ammonia (NH<sub>3</sub>) is liberated and effectively removed via aeration. The stripping air is transferred from the stripping tank into the washing column. In this column the air stream is brought into contact with an acid washing fluid (H<sub>2</sub>SO<sub>4</sub>), whereby the NH<sub>3</sub> is fixated under formation of ammonium sulphate ((NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>). The cleaned air is reintroduced in the process for aeration or purged to the outside.

### Results . . . . .

The operational costs (OPEX) of the AMFER® installation are very attractive in comparison to other nitrogen removal technologies. They consist of costs for the maintenance, the electrical energy for the pumps, the aeration and the purchase of the acid.

Technique for removal of nitrogen	Removal yield (%)
Nitrification / Denitrification <sup>2)</sup>	> 95
CANON, DEMON, SHARON, ANAMMOX <sup>2)</sup>	up to 75
NAS®	> 95
AMFER®	up to 80

This is largely compensated however by the revenue from the commercialisation of the ammonium sulphate fertiliser. The fertiliser (NPK = 9-0-0-26(SO<sub>3</sub>)) can be directly applied in liquid form or can be used as a raw material in fertiliser production <sup>3)</sup>.

<sup>1)</sup> Patent nr. : NL 2 007 855

<sup>2)</sup> Source : publication in H<sub>2</sub>O, issue 10, 2009

<sup>3)</sup> Revenue up to € 90 – 120 / ton ammonium sulphate solution

EN-2015