Digestate Treatment System GNS

award-winning process[1]

Gesellschaft für Nachhaltige Stoffnutzung mbH

Proven Method for the Removal of Ammonia Nitrogen from Digestate since 2008

- Modified stripping process, wherein the ammonium nitrogen is removed from digestates by using only exhaust heat from the CHP **without the use of bases, acids or external stripping media**.

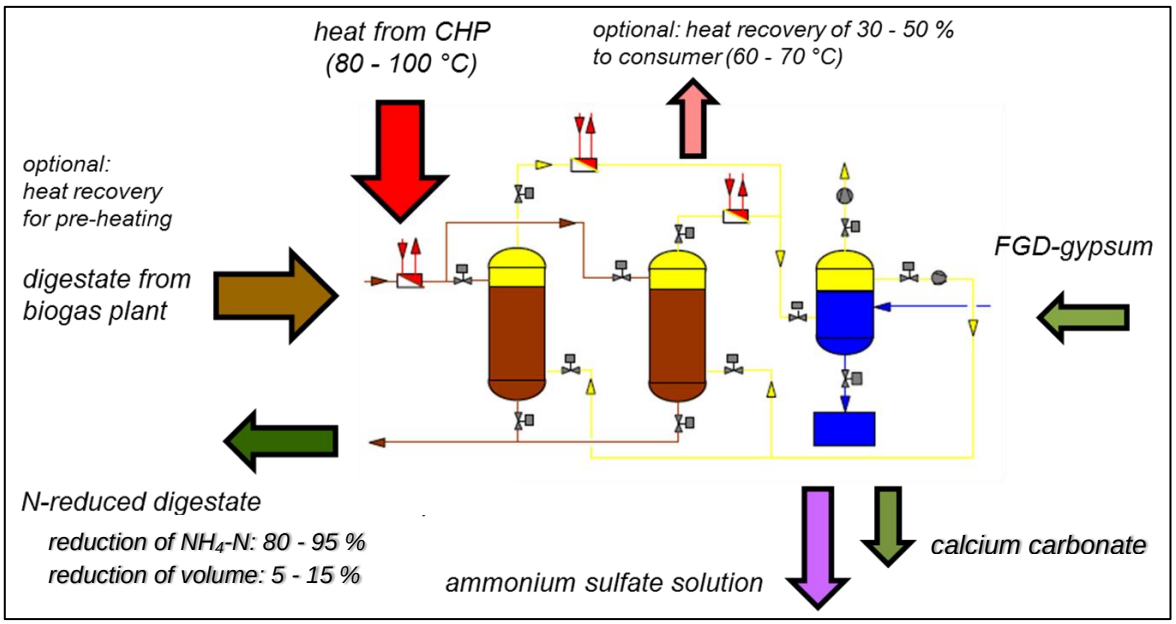
specific heat consumption (basic, 100 °C / 80 °C)	120 kWh/m³
specific heat consumption (with recovery from digestate)	93 kWh/m³
specific heat consumption (optimized heat consumption)	70 kWh/m³
with heat recovery for external users (60 - 70 °C)	30 kWh/m³

- Binding of ammonia preferred with cheap FGD gypsum to produce a concentrated marketable ammonium sulfate solution and solid calcium carbonate fertilizer.

ammonium sulfate solution, 25 %	5 % N, 6 % S ± 0.5 %
calcium carbonate ($CaCO_3$) 70 % DM	40 % CaO in DM, 1.5 % N, 3 % S
FGD gypsum consumption (dry)	6.1 kg/kg N removed

Achievable:

- ⇨ Reduction of emissions (ammonia), loads of groundwater (nitrate) and losses of nitrogen a fertilizer from digestate.
- ⇨ Reduction of transportation costs and costs for storage of the digestate.
- ⇨ High potential to increase the yield and to reduce the costs for biogas concepts with nitrogen-rich substrate (e.g. chicken dung).
- ⇨ Important step for a total treatment to a pure water and for closing fertilizer loops.



Flow diagram from the Digestate Treatment System GNS as example of a system with 2 stripping reactors

[1] GNS won the 3rd prize for the process at the award ceremony in December 2014 in the category of resources.

GNS - Gesellschaft für Nachhaltige Stoffnutzung mbH
Weinbergweg 23, DE-06120 Halle, Tel./Fax: +49 345 5583-754/-706, www.GNS-Halle.de

Digestate Treatment System GNS

award-winning process[1]

Gesellschaft für Nachhaltige Stoffnutzung mbH

Operating Practice – Fully Automatically and Safe

Digestate Treatment "FiberPlus" at the Biogas Plant Ottersberg (near Bremen)

Realization (2007/2008): Operator BENAS

Technical Information:

Digestate input [m³/h]	10 - 25
NH_4-N [g/l]	3 - 5
DM [%]	7 - 7.5
Strip efficiency [%]	80 - 85
Heat consumption [MW]	1 - 2.5
Gypsum consumption [t/d]	4 - 16
Ammonium sulfate output [t/d]	10 - 40
Calcium carbonate output [t/d]	3 - 14

What is achieved with the plant?

- *Recirculation of the stripped digestate into the **biogas plant (5 MW_{el})** since 2011.*
- *Operating mainly with corn silage and dry chicken dung (about 25 %) since 2011.*
- *Saving field application areas, costs of fertilizer and costs of substrate.*

Digestate Treatment System GNS at the Biogas Plant Röblingen (Saxony-Anhalt)

Realization (2011/2012): AIM Technical Solutions GmbH

Technical Information:

Digestate input [m³/h]	5.5 - 12.6
NH_4-N [g/l]	3 - 6
DM [%]	5.5 - 6
Strip efficiency [%]	80 - 85
Heat consumption [kW]	370 - 820
Heat delivery [kW]	160 - 400
Gypsum consumption [t/d]	5 - 10
Ammonium sulfate output [t/d]	13 - 27
Calcium carbonate output [t/d]	4 - 8

What is achieved with the plant?

- *Up to 70 % of the nitrogen in the **biogas plant (3 MW_{el})** is contributed by the dry chicken dung (ca. 20,000 t/a) from the adjacent chicken farm.*
- *The stripping plant removes 80 - 85 % of the NH_4-N from the liquid digestate.*
- *Recirculation of N-reduced digestate into the biogas plant about 70 %.*
- *Producing of mineral fertilizer with ca. 65 % of the whole Total N-Input.*
- *Producing an organic solid fertilizer with ca. 28 % of the whole Total N-Input.*

GNS - Gesellschaft für Nachhaltige Stoffnutzung mbH
Weinbergweg 23, DE-06120 Halle, Tel./Fax: +49 345 5583-754/-706, www.GNS-Halle.de

Advantages of the GNS Technology compared with Conventional Stripping or Evaporation Processes

- ⇨ Removal of NH_4-N from a roughly separated liquid digestate (TS 5 - 7 %) without fine separation.
- ⇨ Secure control of foaming behavior.
- ⇨ No use of acids and bases in the digestate.
- ⇨ Combined removal of CO_2 and NH_3 and combined chemical bond with FGD gypsum.
- ⇨ Halved salinity and retained pH buffering ability after treatment (digestate will be not alkaline).
- ⇨ At > 70 °C sanitizing effect and additional disintegration effect.

- ✓ **chemical-free, robust, low operating costs**
- ✓ **primary stage for the total treatment of digestate (to indirectly or directly dischargeable water)**
- ✓ **suitability as nitrogen reduced recycling water**
- ✓ **„FiberPlus“ process:**
  - – **treatment of roughly separated as well as unseparated digestate**
  - – **option: sale of ammonia-free fibers for use in wood composites**