



NEWTRIENT SNAPSHOT

N2 Applied

Nitrogen Fixation Technology by Plasma Injection

N2 — Applied **GEA**

BUSINESS OVERVIEW

N2 Applied, an internationally based company from Norway, seeks to advance sustainable fertilization by converting organic material, such as manure, into a valuable low-emission fertilizer through innovative plasma technology. Challenging the fossil fuel-based fertilizer industry and traditional Haber-Bosch process, N2 offers a sustainable, circular, and scalable fertilizer production process aimed at direct distribution to farmers, bypassing lengthy and costly commercial fertilizer value chains. In 2022, GEA and N2 Applied formed a strategic partnership to expand N2's plasma technology to U.S. dairies through the GEA ProManure E2950.

PROJECT

TECHNOLOGY OVERVIEW

N2 Applied uses plasma treatment and absorption to enrich manure slurry with nitrogen. The technology utilizes electricity to split atmospheric nitrogen (N₂) and oxygen (O₂) molecules to produce reactive nitrogen oxides (NO_x) gas. This NO_x is injected into the slurry where it is absorbed into the liquid phase of the organic material, converted to plant available nitrogen, and acidifies the solution. By carefully controlling the reactive nitrogen gas production rate, the desired pH, typically targeted at 5.0, is obtained and results in a stable nitrogen-enriched organic product, known as NEO.

PROJECT SIZE

The expected processing capacity of a U.S. N2 Applied demonstration unit is 3,560 gallons/day of liquid manure, roughly equivalent to 200 lactating cows. A commercial GEA ProManure E2950 in operation uses 30-69 kW of power, with a supply voltage of 400 V, 3-phase, 50 Hz.

REQUIREMENTS

The N2 Applied system is typically installed between animal housing and existing manure storage. Farmers should allocate space for the N2 Applied unit (the size of a standard shipping container), a solids removal system, and adequate storage for both manure solids and liquids. For a GEA ProManure E2950 it is recommended to reduce solids to under 3 mm with a 6% maximum dry matter content and operate in temperatures between -15 to 30° C. Access to a reliable power supply and feedstock source, such as liquid manure, is essential. Effective system management, including regulatory compliance, monitoring, maintenance, record keeping, and personnel training, is crucial for seamless treatment.

KEY CALL-OUTS



Nitrogen Enrichment: System typically boosts nitrogen levels in the waste stream by 70-80%.



Reduced Nitrogen Loss: NEO contains concentrated levels of plant-available nitrogen, minimizing losses through leaching and runoff into waterways.



GHG Mitigation: pH acidification of liquid manure inhibits microbial methane production.



Circularity: On-farm production of nitrogen-rich organic fertilizer fosters a closed-loop sustainability approach.

Findings are based on an evaluation funded by the New York Farm Viability Institute (NYFVI) and an NRCS Conservation Innovation Grant (CIG) awarded to Newtrient. To view a more detailed description of these results, visit the N2 Applied plasma technology Evaluation Summary on the [Newtrient website](#).

FINANCIAL OVERVIEW



CAPITAL INVESTMENT

Due to the absence of a commercialized N2 Applied unit in the U.S., the initial capital investment costs are undetermined. As of 2024, projected annual electricity costs of the demonstration unit are approximately \$26,840. It is important to note costs may vary due to project specifics, scale, and market conditions.



DOWNSTREAM BENEFITS

Producing a stable and nitrogen-rich organic fertilizer from manure directly on the farm reduces the reliance on commercial fertilizer to offset lost nutrients, most notably nitrogen, from volatilization during surface land application, leaching, or runoff from precipitation events. The circular and scalable nature of the N2 Applied system decreases input costs related to the need for commercial fertilizer.

ENVIRONMENTAL IMPACT

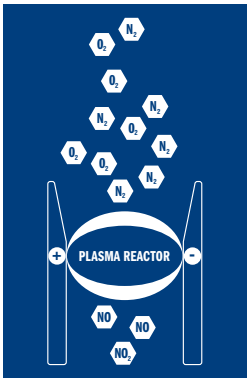
WATER QUALITY

The NEO product generated from the N2 Applied system is an acidified and stabilized organic fertilizer enriched with readily available nitrogen for crops. This nutrient availability decreases the risk of excessive nitrogen leaching or runoff into surface and groundwater during storage, field application, rain events, or snow melts, thereby protecting local waterways.

REDUCED GHG EMISSIONS

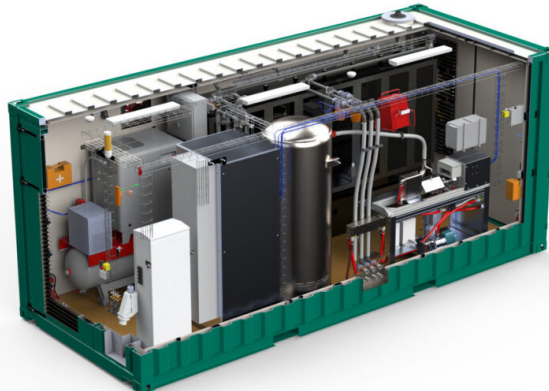
By acidifying the liquid manure, the N2 Applied system suppresses the microbial production of methane (CH₄) and encourages the formation of ammonium (NH₄⁺), which is less volatile than ammonia (NH₃). This shift mitigates greenhouse gas (GHG) emissions and enhances nutrient utilization efficiency in manure. In addition, with less reliance on commercial fertilizer, GHGs associated with transporting fertilizer to the farm are reduced.

PLASMA TREATMENT



Source: <https://n2applied.com/the-technology/>

N2 APPLIED SYSTEM



Source: <https://n2applied.com/the-technology/>

NEWTRIENT'S 9-POINT TECHNOLOGY SCORING

For N2 Applied Nitrogen Fixation Technology by Plasma Injection

Visit the **N2 Applied** page in Newtrient's Solutions Catalog.



Each solution can earn up to nine points, one for each criterion. Colored numbers indicate fulfilled criteria.

- 1 | Operational History
- 2 | Operational Reliability
- 3 | Market Penetration
- 4 | Capital Cost
- 5 | Operations & Maintenance Cost
- 6 | Value Proposition
- 7 | Vendor Information Sharing
- 8 | Case Study
- 9 | Funding Availability

Discover Newtrient's technology evaluation process: [Learn more about Newtrient's 9-Point Technology Scoring System.](#)



Newtrient's mission is to reduce the environmental footprint of dairy while making it economically viable to do so.

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