



USDA and Renewable Nutrients partner to improve nitrogen recovery from livestock waste

Researchers from the US Department of Agriculture (USDA) Agricultural Research Service Southeast Area (ARS SEA) have developed a new way to recover nitrogen from livestock wastes, which has been commercialized by Pinehurst, North Carolina-based Renewable Nutrients. The estimated potential value of implementing this nutrient recovery system in dairy farms alone is about \$1.3 billion.

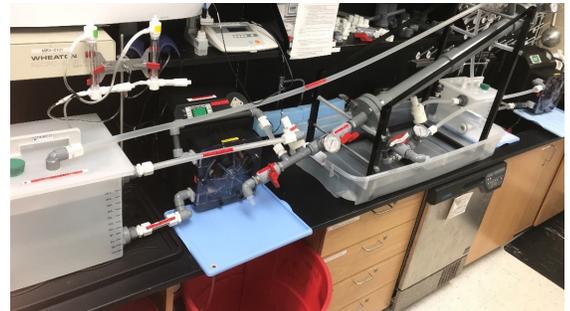
Conservation and recovery of nitrogen from livestock, industrial and municipal wastes is important for economic and environmental reasons. In the United States, the largest source of ammonia emissions—and the distinctive odor they generate—is livestock farming. The nitrogen components of ammonia are useful as a fertilizer, but many areas in the U.S. produce more manure-generated nutrients than the available cropland can assimilate. Therefore, the removal and recovery of ammonia is a desirable feature for new treatment technology for livestock waste because the nutrients can be exported off the farm. This could solve the problems of nitrogen surpluses in concentrated livestock production, provide a substitute for commercial fertilizers, and create new businesses.

The new technology recovers ammonia-nitrogen from wastes using gas-permeable membranes. The process involves passing ammonia through micro-porous hydrophobic membranes and concentrating it in a clear solution. The process can be used for removing and recovering nitrogen from two types of livestock waste: liquid manures in storage tanks and the air of poultry and animal barns. It can recover 98% of the nitrogen.

Renewable Nutrients, a small business with experience recovering phosphorus from wastes, was the recipient of the ammonia trapping technology through two exclusive licenses granted by USDA. Cooperation of the federal laboratory with licensee through a CRADA helped test a company-developed pilot unit to determine its suitability for municipal wastes and helped the company select the best membrane material composition for development of their commercial units. The technology is commercialized under the name "QUICK WASH Nitrogen Removal & Ammonia Recovery."

Other technology transfer mechanisms and activities included:

- Five U.S. patents covering the ammonia capture technology using gas-permeable membranes developed by ARS for both liquid and air applications.



Above: A prototype N recovery module developed by Renewable Nutrients was tested at USDA-ARS laboratory in Florence, South Carolina, using a CRADA to evaluate performance in municipal wastewater from the city of Chapel Hill, North Carolina.

- Three on-farm demonstrations by ARS scientists for universities and research centers. At the University of Maryland Eastern Shore, in chicken houses fitted with the ammonia recovery system, the ammonia decreased 46% in the air and 45% in the litter compared with standard processes, and bird mortality was reduced 47%.
- A pilot ICorps@ARS program for customer discovery and feedback of research needs by livestock industry that broadened the impact of the research.
- Webinars and training on the new technology presented by scientists to the USDA Natural Resources Conservation Service and the Environmental Protection Agency.
- Outreach resulting in 12 high-impact scientific publications, more than 20 conference presentations, and numerous popular press articles describing the technology.

The technology transfer advanced the laboratory's mission "to conduct research and transfer solutions that improve agricultural production, protect the environment, and enhance conservation of natural resources - all within an efficient and profitable agriculture". Implementing the new technology in municipal plants could have global positive impacts, increasing nitrogen recycling and reducing greenhouse gas emissions.

For Renewable Nutrients, adding an ammonia recovery component to its portfolio made the company more competitive for total nutrient recovery (nitrogen and phosphorus) from the side-stream effluent of municipal plants that contains high concentrations of both phosphorus and nitrogen. ☺