



ARP and AgroArp

Nutrient Recovery for Industrial, Agricultural and Municipal Centrate, Filtrate and Digestate Streams



37,000 LPD ARP System

ThermoEnergy's ARP and AgroARP nutrient recovery systems are today's most cost-effective and sustainable solutions for removing nutrients from wastewater streams. At biogas-to-energy plants, AgroARP can improve project economics by producing additional revenue streams and increasing ROI.

ARP can reduce the cost of removing nitrogen from municipal centrate and filtrate wastewater streams. At Industrial plants and electric power plants, ARP can remove ammonia from wastewater and recover it as a high-grade, concentrated, ammonium hydroxide that can be reused as process chemistry.

ThermoEnergy ARP – A Great Combination of Efficiency and Sustainability

In less than 25 minutes, ThermoEnergy can remove 90% or more of the nitrogen (ammonia) in your plant's industrial process water, centrate, filtrate or digestate and recycle it into concentrated (>8%) ammonium hydroxide or ammonium sulfate/citrate/nitrate fertilizers. The fast ARP ammonia removal and recovery rate allows a small footprint that is easily retrofitted into your plant.

For a coal fired power plant, ThermoEnergy's ARP system reduced ammonia concentration in a 17,500 GPD pH adjustment stream from a maximum 4,000 mg/l of ammonia to 7.5 mg/l and recovered 12% ammonium hydroxide stream with a system footprint of 20 feet by 40 feet. The recovered ammonium hydroxide offsets the cost of operation of the pH adjustment systems at the plant.

ThermoEnergy AgroARP

Specifically designed for biogas-to-energy plants, AgroARP converts ammonia in digestate to ammonium fertilizers such as ammonium sulfate/nitrate/citrate. The process is approved by the Organic Materials Review Institute for the production of organic fertilizer. AgroARP will work on digestate from any manure or food waste digester. On poultry waste, AgroARP can produce a liquid 6-0-5 fertilizer and a 3-8-5 soil amendment/fertilizer from recovered solids.

AgroARP can improve the project economics of any biogas digester by adding revenue streams from fertilizer sales. Table 1 illustrates the significant impact that AgroARP can have on biogas-to-energy project. In this project example, AgroARP can generate over \$16 million in additional revenue. AgroARP also represents only 7% of the capital costs of the project and has a payback of 0.27 years.

Both ARP and Agro ARP have the economic and environmental advantage of recovery nutrients as fertilizer and not releasing it to the air thereby reducing greenhouse gases.

Biogas-to-Energy Project Economics with AgroARP		
Parameter	Units	Value
Digestate influent	GPD	100,000
Concentrated Digestate Fertilizer	GPD	5,642
Soil Conditioner	Gallons/day	19,117
Granular Fertilizer (3-8-5)	Tons/year	1,116
Annual Fertilizer Revenue		\$14,992,302
Annual Electrical Revenue		\$811,253
Annual Operating Costs		\$3,098,729
Biogas Plant Capital Costs		\$50,000,000
AgroARP Capital Costs		\$3,500,000
AgroARP Payback		0.27

Thermo Energy ARP and Thermo ARP systems offer huge advantages over other ammonia-removal processes:

- Easy to operate and maintain
- Has a small footprint
- Cost of operation per pound of Ammonia removed is the lowest in the industry
- Uses less energy than competing technologies
- Produces significantly less greenhouse gases than biological systems
- Creates valuable fertilizer

Take Advantage of Our Great Pilot Programs

ThermoEnergy understands the importance and the utility of pilot programs. That's why we've developed pilot systems that meet or exceed the demands of our diverse client base.

Our Worcester, Massachusetts Research and Development facility can replicate your operating environment and provide quick reliable results at no cost to the client. On-site pilot testing is also available. Each on-site pilot unit is self-contained and mounted on a corrosion resistant portable skid, pre-wired, pre-piped and configured for easy installation. It can be operated individually or interconnected with multiple units to simulate a specific treatment train.

A Tradition of Service and Support

ThermoEnergy's commitment does not end at system startup. We offer a broad range of services to ensure peace of mind that your system is always operating at optimum performance levels. ThermoEnergy's field-support group stands ready to assist you with: extended warranty programs; preventative maintenance programs; repair services; spare parts; retrofits, upgrades and rebuilds; and used equipment consignment sales.



Learn more why the ThermoEnergy ARP and AgroARP are your best choices for ammonia removal. You will find more information on ThermoEnergy ARP in our technical library at www.thermoenergy.com, including a BioWin analysis, greenhouse gases analysis, and pilot study reports. You can also email us at info@thermoenergy.com or call 1-508-854-1628, ext. 305.