

Welcome

BIOGAS2

FREE ONLINE WEBINAR

Digestate Nutrient Recovery Technical Symposium

UNDERSTANDING
THE FATE OF
PROJECT NITROGEN,
PHOSPHOROUS,
POTASSIUM AND
DISSOLVED SALTS
CAN MAKE
OR BREAK A
BIOGAS PROJECT



Paul Greene
HOST

- Algae
- Ammonia stripping
- Membrane bioreactors
- Shortcut nitrogen removal systems
- Reverse osmosis filtration
- Evaporation
- Thermal drying
- Dentrification filters
- Creation of both conventional and organic fertilizers

January 25, 2024 | 1:00-3:00 pm Eastern

Technical content in the spirit of education

G
GREENETEC

Agenda

- Digested Organics
 - Sedron
 - Fluence Corp
 - Global Water & Energy
 - Gross Wen Technologies
-
- Slides are available for download from www.greene-tec.com/events

Digestate Nutrient Recovery

- Drivers
 - Direct discharge to surface water
 - Water quality impairment
 - Eutrophication
 - Sewer regulations.
 - Groundwater regulations
 - Land spreading CAFO Nutrient Management plans
 - Farm needs for fertilizers



Typical Digestate – Food Waste Digester

Physical Characteristics	Unit	
Total Solids	%	2.4
VS of TS	%	62.5
COD	mg/L	13,134.4
TSS	mg/L	11,131.0
TDS	mg/L	12,960.0
Nutrients		
Short Chain Fatty Acids	Unit	
Formic Acid	ppm	15.8
Acetic Acid	ppm	3,926.7
Propionic Acid	ppm	4,476.2
Isobutyric Acid	ppm	94.1
Butyric Acid	ppm	1,003.4
Isovaleric Acid	ppm	809.2
Valeric Acid	ppm	316.7
Caproic Acid	ppm	ND
Total VFA	ppm	10,642.2



Non-metals	Unit	
Total Nitrogen	ppm	2,575.0
Phosphate	ppm	101.1
Chloride	ppm	1,150.3
Minerals	Unit	
Chromium	ppm	ND
Lead	ppm	0.0
Potassium	ppm	109.0
Selenium	ppm	0.0
Sodium	ppm	39.7
Calcium	ppm	21.3
Nickel	ppm	0.0
Boron	ppm	0.1
Aluminum	ppm	3.0
Arsenic	ppm	ND
Cadmium	ppm	ND
Cobalt	ppm	ND
Copper	ppm	0.0
Iron	ppm	5.0
Manganese	ppm	0.1
Magnesium	ppm	5.1
Barium	ppm	0.1
Molybdenum	ppm	0.0
Zinc	ppm	2.9



Common mistake on RNG projects

- Don't forget the nutrients

Feedstock

- Carbon
- Nitrogen
- Phosphorous
- Salts



Carbon converts to make RNG

Nutrients stay behind in digestate

Nutrient Treatment vs Recovery

- Treatment
 - Many technologies are available that come out of the wastewater treatment industry
- Recovery
 - Recover and capture in a way that creates a value-added fertilizer that the crop growing community finds to be valuable
- Issues
 - Price volatility of Opex chemicals and recovered fertilizers
 - Long term offtaker on recovered fertilizer for a secured price
 - Material handling and storage
 - Projects make digestate 24/7
 - Fertilizers are only required a few times per year



USDA Organic

- No addition of synthetic chemicals allowed
- Liquids and solids
 - Aqua Ammonia
 - Recovered solid pellets and crumble
- Can sell for a 5x price premium vs conventional



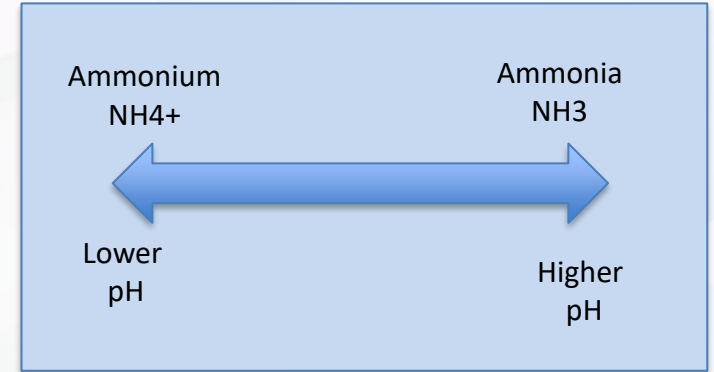
Applying fertilizers

- Apply to soil
- Apply to plant
- Making sure it's all "Plant Available".



Forms of Ammonia

- Ammonia vs Ammonium
 - Ammonia is unstable (high pH)
 - Ammonium is more stable (low pH)
- Ammonia Stripping and capture
- Digestate ammonia is about 0.3% N
 - Need to get it to over 5% to be a legitimate fertilizer (12x concentration)
- Fertilizer
 - Aqua Ammonia – 5-16%N
 - Stabilize with Organic Citric Acid?
 - Ammonium Sulfate 8-20% N
 - Organic Ammonium



Biogas Book (www.biogasbook.com)

- Rallying point for the industry
- Technical discussions – Looking for more SME's
- Video case studies – Looking for project sites
- Directory
- Partner / Sponsors

- Download the app on the app store

- 2024 is a build out year.



Industry Education – Biogas TV

- Videos:
 - Project Case Studies
 - Webinars like this.
- www.biogas.tv

The logo for Biogas TV features the word "BIOGAS" in a bold, blue, sans-serif font. The letter "O" is replaced by a stylized flame icon with a green and yellow gradient. To the right of "BIOGAS" is the word "TV" in a dark blue, bold, sans-serif font.

BIOGAS TV

Thanks for attending

Paul Greene
518 951 5766
paul@greene-tec.com

