



# Food Waste to Energy Pilot

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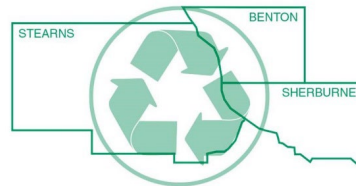
**Driven to Discover<sup>SM</sup>**

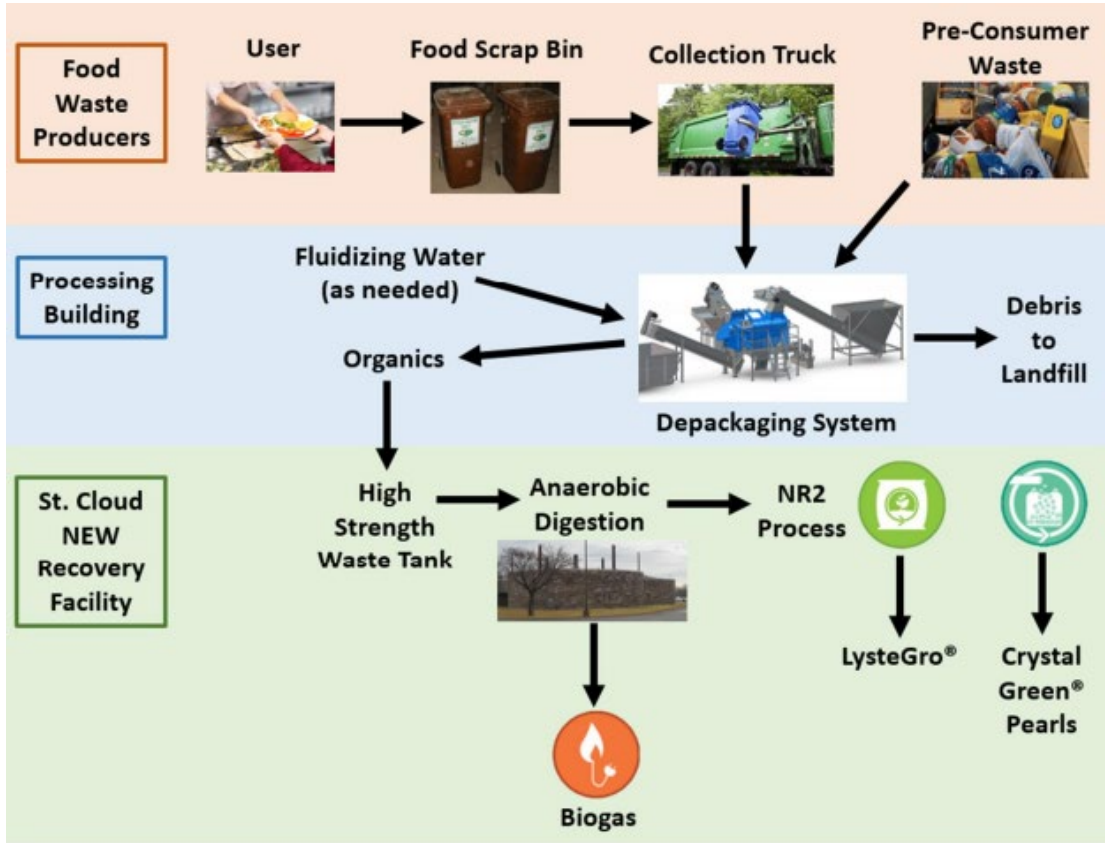
# St Cloud NEW Recovery Facility

- The facility treats wastewater (9.6 MGD) from St. Cloud, St. Augusta, St. Joseph, Sartell, Sauk Rapids, and Waite Park (120,000 people).
- Waste sludge is digested to produce biogas and Class A biosolids for beneficial reuse.
- 98.2% energy independent in 2021 (biogas, solar)



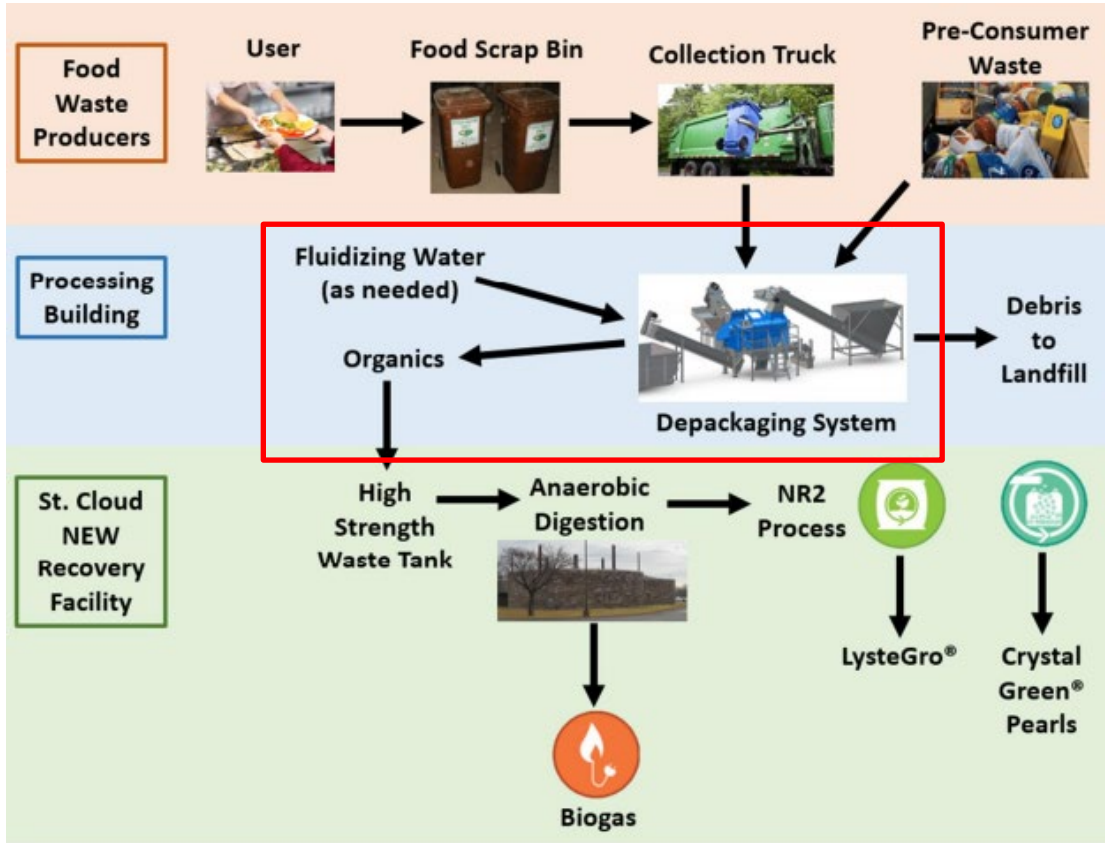
**Figure 1:** St Cloud NEW Recovery Facility  
Aerial View





# Food to Energy Process Diagram

**Figure 2:** Food Scrap Processing Diagram. *Organic Waste Diversion to Anaerobic Digestion*, Donohue & Associates. (2020)

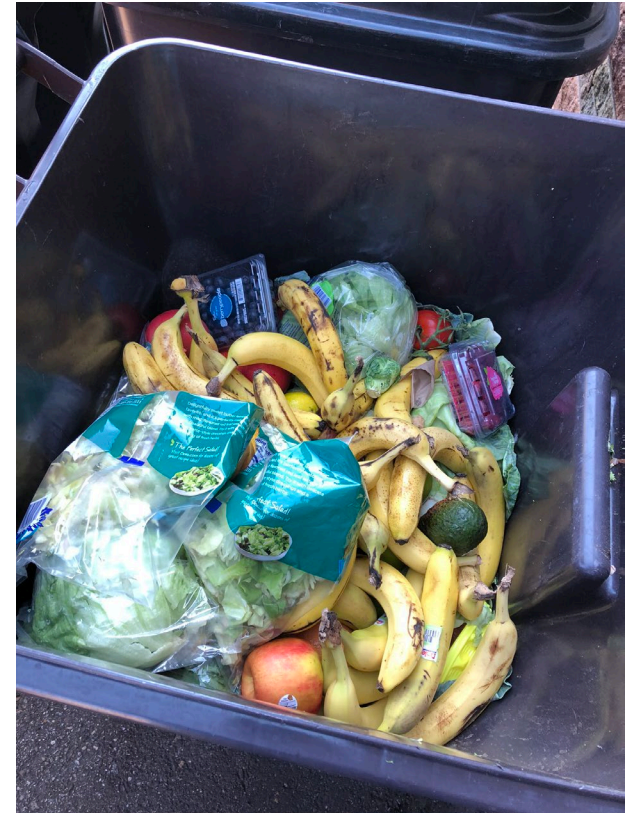


# Food to Energy Process Diagram

**Figure 2:** Food Scrap Processing Diagram. *Organic Waste Diversion to Anaerobic Digestion*, Donohue & Associates. (2020)

# Incentives to Change

- Landfill/Incineration Reduction
- Emissions Reduction (-183 kg CO<sub>2</sub> Eq/ton)
- Additional Biogas Production at NEW RF (120 m<sup>3</sup>/ton)
- Sustainable Development





**Figure 3:** Images from the food waste depackaging process.





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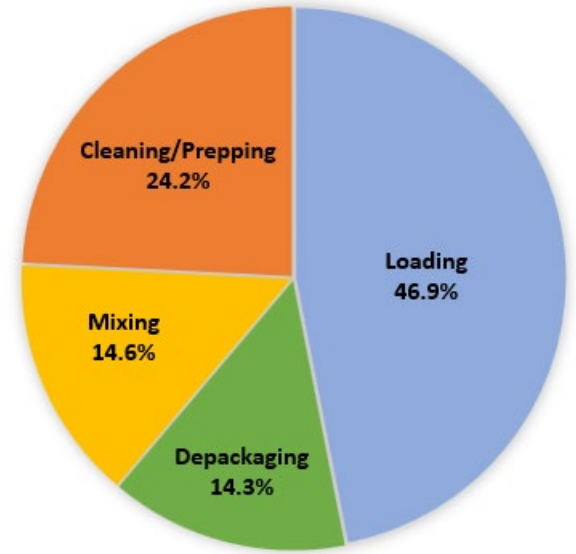




**Figure 3:** Images from the food waste depackaging process.

# Process Findings

- Mass to volume conversions
- High strength waste dilution requirements
- Optimal machine settings
- Machine processing rate



**Figure 4:** Breakdown of depackaging operations time.

# Laboratory Analysis

- No changes to digester health
- Energy and nutrient profile of food waste was determined (COD, pH, Volatile Solids, Nitrogen, Phosphorous, etc.)

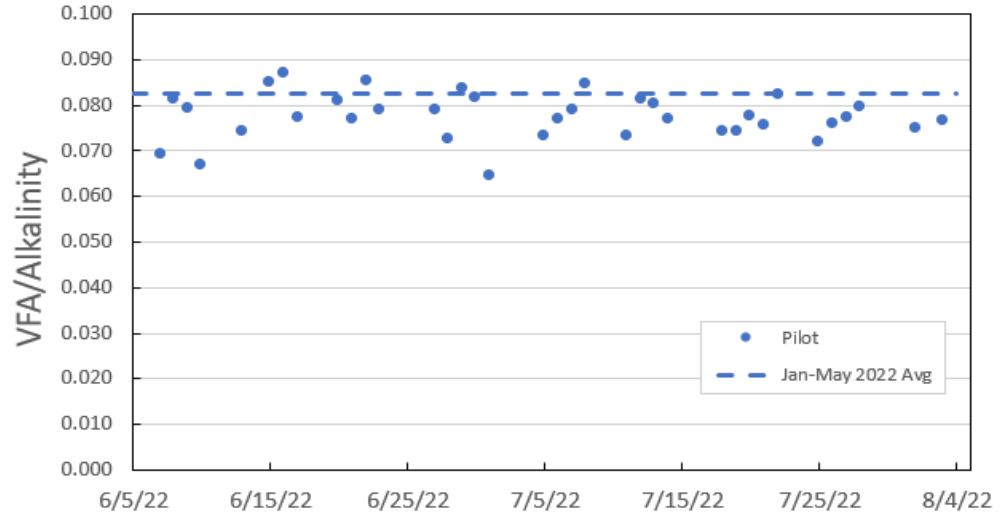


Figure 6: VFA/ALK ratio for digester 1 over the pilot.

# Biogas Production

- No observable changes to biogas production
- Samples have high energy densities
- External laboratory analysis will be used to determine exact methane potential



**Figure 8:** Biomethane Potential (BMP) samples from the food pilot.

# Recommendations

Recommendation	Impact
Amp load control for depackager VFD's	<ul style="list-style-type: none"><li>• Reduced operator input</li><li>• Maintains optimized separator settings</li><li>• Preventing machine depreciation</li></ul>
Batch/Continuous Mixer	<ul style="list-style-type: none"><li>• Eliminates manual labor</li><li>• Reduces mixing time</li></ul>
13.3 gpm dilution HSW flow rate	<ul style="list-style-type: none"><li>• Standardizes mixing procedure</li></ul>
Float control for discharge pump	<ul style="list-style-type: none"><li>• Prevents tank overflow</li><li>• Automates discharge process</li></ul>

# Solutions

Scenario	Landfill Reduction	Emissions Reduced	Additional Biogas Generated	Additional Biogas Generated (%)	Renewable Energy Generated
Pilot	52 tons	9,400 kg CO <sub>2</sub> -eq	220,000 ft <sup>3</sup>	0.2%	12,300 kWh
Full-Scale (Annual)	5,150 tons	945,000 kg CO <sub>2</sub> -eq	22,100,000 ft <sup>3</sup>	21.1%	1,230,000 kWh

# Personal Benefits

- Introduction to wastewater and waste management industries
- State certified wastewater laboratory experience
- Physical activity
- Fantastic coworkers

