

Thurston County Biodigester Study



September 16, 2015

AD Tech Assist Group (AD-TAG)

- Thurston Solid Waste
- Thurston Water Resources
- LOTT Clean Water Alliance
- Puget Sound Energy
- The Evergreen State College

Plus All Stakeholders

What is Biogas?

Biogas is a natural substance produced by the anaerobic decomposition of organic waste

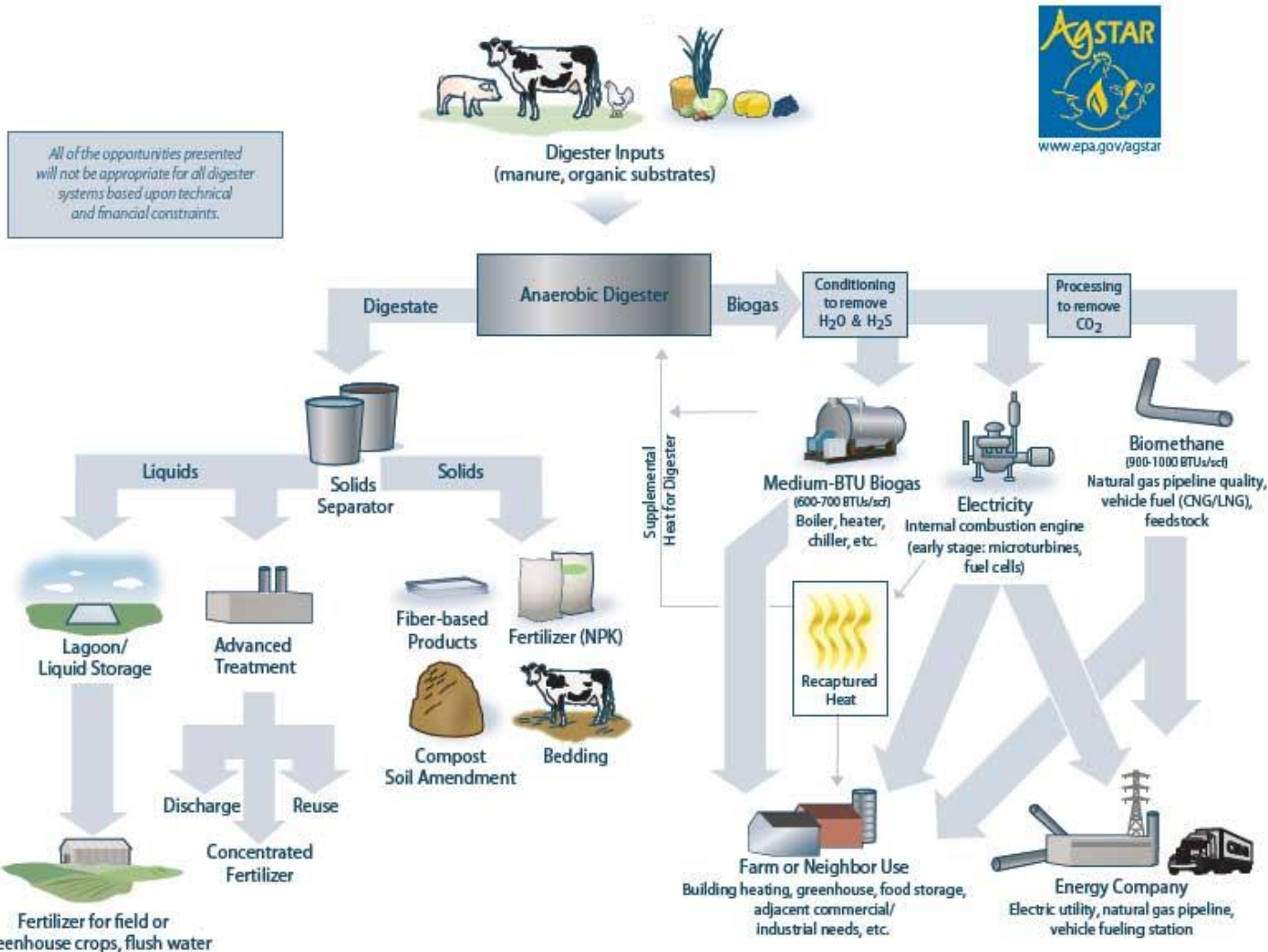
Composting	Digestion
Aerobic	Anaerobic
With Oxygen	Without Oxygen
Produces Carbon Dioxide	Produces Biogas: Carbon Dioxide + Methane Also known as “Swamp Gas”

Biogas is Natural

<p>BIOGAS (50-60% methane + carbon dioxide, hydrogen sulfide, etc.)</p>	<p>Ancient of fossil biogas (100% methane) = Natural Gas</p>
	<p>New biogas when cleaned to 100% methane = Biomethane or Renewable Natural Gas (RNG)</p>

Biogas is Renewable

Basic Anaerobic Digester System Flow Diagram



Digester Revenue Streams

1	Methane energy: electricity or fuel
2	Surplus thermal heat
3	Tipping fees and/or avoided costs (landfill diversion)
4	Digester solids (fiber) = bedding, compost, RePeat
5	Liquid effluent = crop fertilizer and water
6	Liquid effluent = surplus nutrients = fertilizers
7	Renewable energy and/or fuel credits and carbon credits
8	Ecosystem services: water quality/quantity
9	Carbon dioxide?
10	Bioplastics?

Benefits of Digesters

Stakeholders	Revenue Enhancement	Cost-Reduction or Avoidance	Risk Mitigation	Other
Dairy Producers	<ul style="list-style-type: none"> • Excess electricity • Scrubbed biogas • Cow bedding • Compost • Food waste • Tipping fees • Carbon credits 	<ul style="list-style-type: none"> • Reduced or avoided: <ul style="list-style-type: none"> ✓Energy costs ✓Bedding fees ✓Fertilizer costs 	<ul style="list-style-type: none"> • Pathogen reduction • Diversified revenue streams • Contracted price rates 	<ul style="list-style-type: none"> • Odor control • Nutrient management • Expertise and knowledge-building • Public relation/Price premiums • Expansion opportunities
Digester Industry	<ul style="list-style-type: none"> • Digester sales • Consulting/education • Service and support • Expansion opportunities 	<ul style="list-style-type: none"> • Reduced sales and marketing costs 	<ul style="list-style-type: none"> • Broader client base 	
Utilities	<ul style="list-style-type: none"> • Rate payer programs (e.g., PSE's "Green Power" program) 	<ul style="list-style-type: none"> • Reduced capital investment accessing new energy inputs 	<ul style="list-style-type: none"> • Supporting distributed, base load energy development 	
Substrate Providers	<ul style="list-style-type: none"> • Supporting clean energy development 	<ul style="list-style-type: none"> • Reduced disposal costs 	<ul style="list-style-type: none"> • Supporting waste reduction 	
Government	<ul style="list-style-type: none"> • Tax revenue from new businesses created 	<ul style="list-style-type: none"> • Avoided cost of environmental cleanup 	<ul style="list-style-type: none"> • Greenhouse gas reductions 	<ul style="list-style-type: none"> • Job creation

Washington Case Studies

Edaleen



Van Dyke



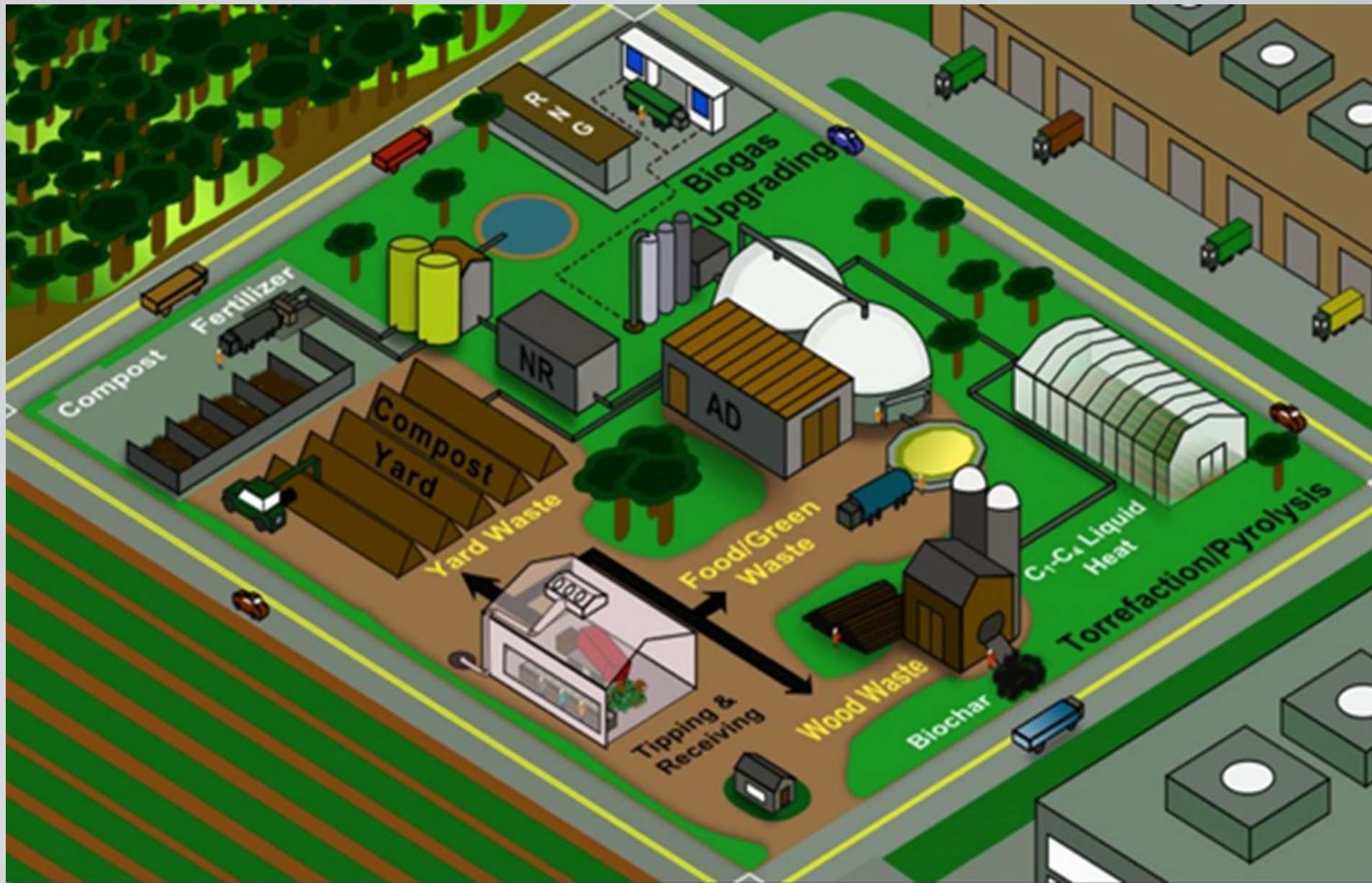
Qualco



Promus (development)



WSU Research on Biorefineries





Thurston Particulars

Inputs-Feedstocks

- Limited dairy
- Poultry
- Food scraps
- FOG
- Food processing, brewing
- Seafood
- Institutional

Outputs-Products

- Scale
- Green power or green fuel
- Bedding or compost or other products
- Natural fertilizers
- Environmental offsets and credits