

Anaerobic Digestion As An Investment



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What is Anaerobic Digestion (AD)?

Anaerobic digestion is the natural process in which microorganisms break down organic materials. AD happens in closed spaces where there is no air (or oxygen). The initials “AD” refers to the process of anaerobic digestion or the structure where anaerobic digestion takes place, also known as a digester.

The following materials are generally considered “organic.” These materials can be processed in a digester with varying efficiencies.

- Animal manures
- Food scraps
- Fats, oils, and greases from abattoirs
- Industrial organic residuals; and
- Wastewater, sewage sludge (biosolids).

What is made during the AD process?

Biogas is generated during AD when microorganisms break down (eat) organic materials. Biogas is comprised of about 50% methane (CH₄) and 50% carbon dioxide (CO₂), with very small amounts of water vapor and other gases. The carbon dioxide and other gases can be removed, leaving only the purified methane which can be converted into a high-quality Renewable Natural Gas (RNG).

The material that is left after anaerobic digestion happens is called digestate - it is a nutrient-rich organic material that can be directly applied to agricultural fields and used as a high-value fertilizer.

What type of renewable energy can AD provide?

Depending on size, an AD system can provide enough biogas to offset very large portions of industrial electricity use from a biogas generator, or with additional processing, be converted into pipeline quality RNG.

What is better? Electricity or RNG?

When converting biogas into energy, there is a difference in output between electricity generation and RNG. The energy potential of biogas, measured in gigajoules (GJ), has a conversion rate of approximately 30% when burned for electricity. This conversion rate is boosted by using a Combined Heat and Power (CHP) system that allows for the recapturing of waste heat. More significantly, biogas has a conversion rate of approximately 80% when converting into RNG which also allows for capture of CO₂ as an additional revenue stream.

Are there AD systems in operation in Nova Scotia?

Yes, there are few AD systems in operation today. Each system has different design specifications and outputs. Some focus on solving a waste problem, while others focus on electricity generation to sell to the grid through the now closed Community Feed-In Tariff (COMFIT) program through the Government of Nova Scotia.

What does an AD System look like?

An AD System is typically a collection of 2 to 4 cylindric domes and a large reservoir tank. There are also a series of underground and above-ground pipes and 2 or 3 structures the size of shipping containers. This along with the storage of feedstock make the footprint of a medium-sized AD system about 2 to 2 ½ acres.



Stock image of large AD System Concept

Why invest in renewable energy?

Propane Costs

- According to the Canadian Gas Association, propane costs have increased by approximately 75% since January 2016
- Similar trends are predicted for 2020 - 2025

Electricity Costs

- According to NS Department of Energy's 2015 report "Our Electricity Future" power rates increased by 73.6% between 2004 and 2014.
- With the conclusion of NSP's 3 year "Rate Stability Plan" many are predicting power rate increases of 5% to 7% in 2020.

Conventional Compressed Natural Gas (CNG) Security

- According to Heritage Gas' Historical Rates, the annual weighted averages of natural gas (Gas Cost Recovery Rate) by year jumped over 20% in 2014 and continued to rise until 2016.
- The National Energy Board's Canadian Energy Pricing Trends 2000-2010 has shown the North American Henry Hub price more than doubled when events like California Energy Crisis, Hurricane Katrina, and high oil prices hit the market.

Creating an onsite renewable solution allows for energy security and stability in your energy costs.

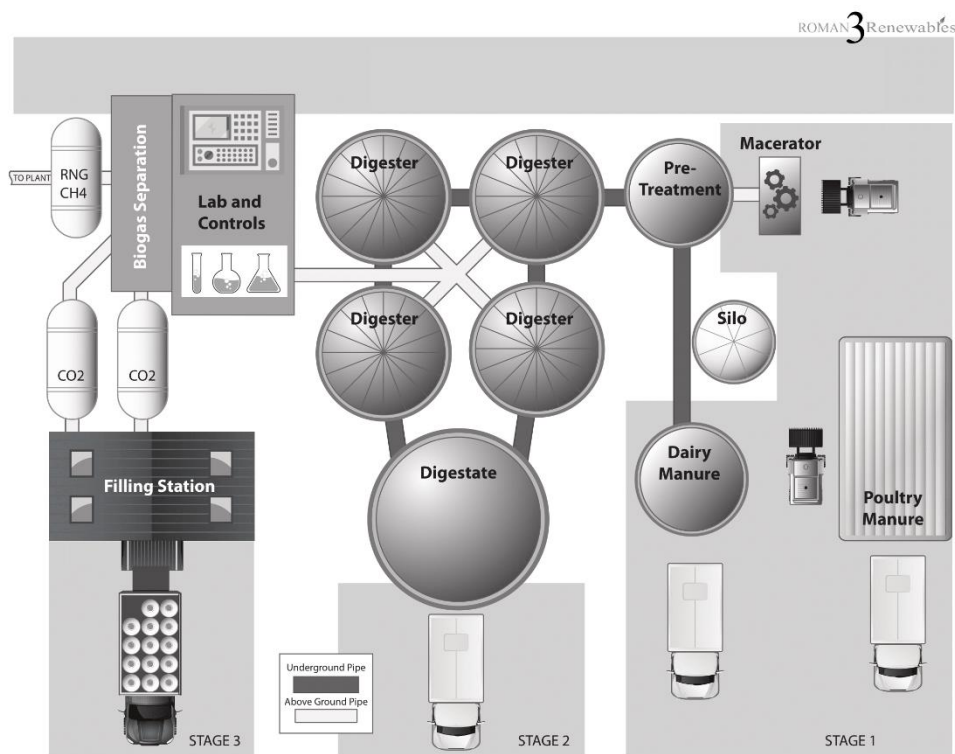
What is the cost/benefit of investing in an AD Solution?

(All stats and figures are approximations and not guarantees)

	Industrial Small Scale	Industrial Medium Scale	Industrial Large Scale
Capital Costs	\$4 - \$7 Million	\$6 - \$9 Million	\$12 - \$15 Million
Maintenance Cost	\$450,000	\$600,000	\$1.4 Million
Foot Print	1 Acre	2.5 Acres	4 Acres
Feedstock input (Annual)	10,000 Tonnes	16,000 Tonnes	33,000 Tonnes
Biogas output (Exclusive*)	55,000 GJ (annual)	88,000 GJ (annual)	176,000 GJ (annual)
Biogas value (compared to Natural Gas)	\$990,000	\$1.5 Million	\$3.15 Million
Electricity output (Exclusive*)	7.2 Million kWh (annual)	11.5 Million kWh (annual)	23 Million kWh (annual)
Electricity value (\$0.09/kWh)	\$650,000	\$1.04 Million	\$2.07 Million
Carbon Offset Credit output	23,000 (annual)	37,000 (annual)	74,000 (annual)
Carbon Offset Credit value	\$460,000	\$700,000	\$1.5 Million
ROI Biogas	4 – 7 Years	3.5 – 5.5 Years	3.5 – 4.5 Years
ROI Electric	6 – 10 Years	5.25 – 8 Years	5.5 – 7 Years

*Exclusive refers to a single output of Biogas or Electric, not both)

What could an AD Solution look like?



What makes Roman 3 Renewables unique in this field?

At Roman 3 Renewables, we work with you to design and build a custom solution that incorporates long-term strategic goals to address the energy and/or waste needs of your organization.

This may include:

- Identify and secure the optimal feedstock
- Manage government regulations and permits
- Create a custom solution for your specific needs
- Project management
- Bridge relationships with public and private partners
- Feedstock management and chemistry support
- Create business models and strategies for value-added by-products (CO₂, Digestate, Carbon Offset Credits, etc.).

Where to start:

Contact us for a free consultation.

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