Anaerobic hybrid digestion

A technology worth replicating

Fast facts

Technology: **Anaerobic hybrid digestion**
Replicability: **Moderate potential**
Capital cost: **$40 to 80 million**
Output: **Renewable energy, renewable heat, sulphuric acid**

Advantages of anaerobic hybrid digestion[1]

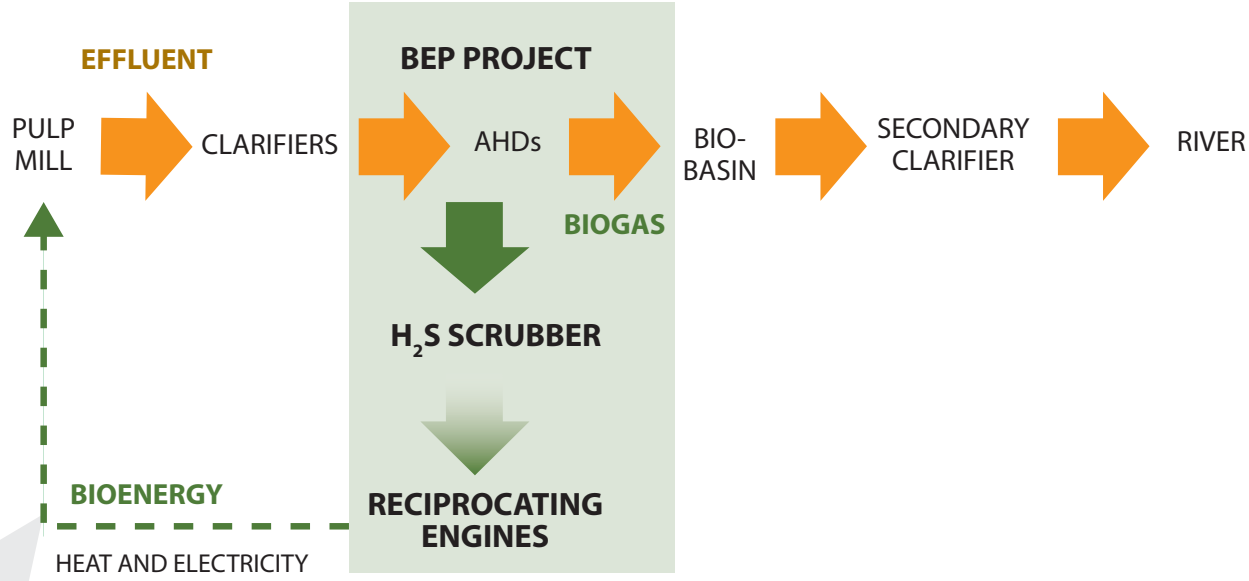
- Excellent stability (due to large residence time and a fixed sludge bed)
- Allows for the ability to handle toxic substances, shock loadings, and influent suspended solids
- Reduces the chemical costs associated with pH and alkalinity control
- Provides consistent performance because of a high biomass inventory in the UASB zone
- Longer solid retention time promotes higher removal rates and lower waste sludge production
- Reduced nutrient and energy costs

Success story

In 2012, **Millar Western** initiated the Bioenergy-Effluent Project (BEP) to install Canada's first known anaerobic hybrid digestion (AHD) system in a pulp and paper facility.

AHD is a process in which microorganisms convert organic matter from a mill's effluent into a methane-rich biogas, providing the mill with an **energy-efficient, renewable energy** that can displace fossil fuels and generate electricity.

How it works



H_2S: Hydrogen Sulfide

Source: KSH Consulting

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[1] KSH Consulting

Canada

Technology maturity (high)

Has the technology been commercialized outside Canada?

- The anaerobic process has been successfully implemented in other sectors.
- However, as with the Millar Western AHD project, effluent characterization studies are necessary prior to implementation, as the organisms are sensitive to many factors such as feed characteristics, nutrient dosing, and climate.

Ease of implementation (low)

How easily can the technology be replicated, with regard to process complexity, capital costs or intellectual property issues?

- Core components and IP are commercially available from vendors; however, AHD is a capital intense technology.
- Any replication of AHD technology would likely be based on a similar design but would require incremental IP to integrate with systems already in place at other Canadian facilities.

Potential for replicability (moderate)

Are there multiple sites available with the potential to facilitate such a project?

- As mills look to reduce their environmental footprint, effluent treatment will become a primary focus, and consequently, many Canadian mills with high organic content in their effluent would be strong candidates for replication.

Market opportunities (high)

Is the relative market size targeted by this technology accessible?

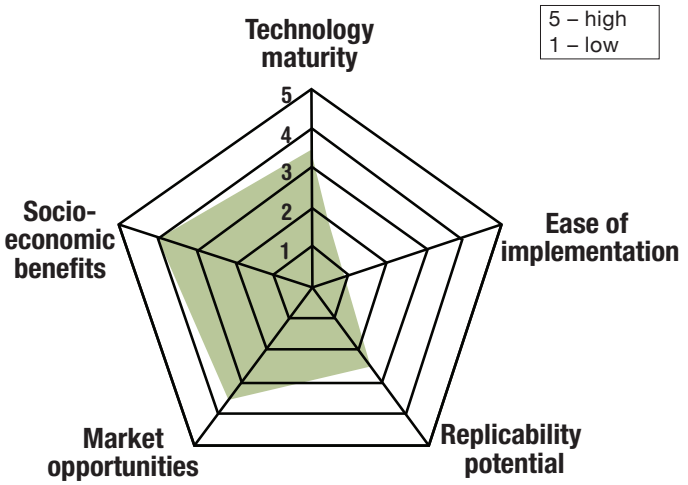
- The potential to either use the biogas produced for the production of green electricity on-site or to sell to natural gas distributors provides significant market opportunities to increase revenue and improve overall profitability.

Socio-economic benefits (high)

Would the project lead to job creation opportunities, environmental benefits and the potential to transform the industry?

- AHD technology is capital intense, but with high market potential, strong environmental benefits and good replication potential across Canada.
- Facilities would become more energy self-sufficient by using steam and electricity cogenerated from the biogas, leading to direct and indirect GHG reductions.
- Further economic and environmental benefits are achieved by selling green power to the local grid, reducing mill inputs (power, natural gas, water and chemicals), and improving the mill's effluent quality.
- Each replication would bring new jobs and economic stability to the area surrounding the mill.

Replicability Radar Diagram



Disclaimer: This replication analysis is based on the technology implemented under the project funded by IFIT. The IFIT program does not endorse any specific technology provider and has produced this brief analysis for the benefit of those considering implementing this type of project.

Is it suitable for you?

- ☑ This is a capital-intense project, requiring multiple storage vessels along with associated piping, pumps and control systems designed and calibrated for large industrial processes.
- ☑ As applied at Millar Western, this technology would be available to similar pulp and paper mills in Canada that produce effluent streams with similar organic content to that of the Millar Western mill.

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