

# CLEAN AND RENEWABLE ENERGY FROM PULP MILL WASTE USING MICROSLUDGE AND ANAEROBIC DIGESTION



Waste activated sludge (WAS) is generated in large quantities at pulp and paper mills as a by-product of treating the mill's effluent. Currently, WAS is managed as a waste and is either incinerated, land-filled, or land applied. However, WAS has economic and environmental value: it is a potential source of both green renewable energy and fertilizer that can lower greenhouse gas emissions and a pulp mill's environmental footprint.

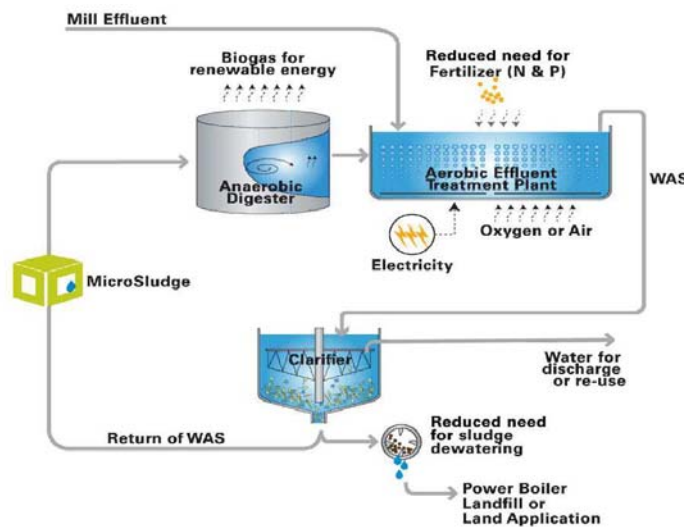
A lab study by FPInnovations (the Canadian pulp and paper industry's R&D organization) showed that MicroSludge<sup>®</sup> significantly increased the rate of anaerobic digestion of pulp and paper WAS. Faster digestion materially decreases the capital and operating costs to produce biogas. The process also reduces waste for disposal and enables recovery of fertilizer that otherwise must be purchased to operate a mill's effluent treatment plant.

## Benefits for a pulp and paper mill

- Generate clean, renewable energy as biogas from pulp and paper waste activated sludge
- Use biogas to displace non-renewable fossil fuel to generate energy
- Recycle nitrogen and phosphorous from WAS to reduce fertilizer costs for effluent treatment
- Increase the rate of WAS digestion to minimize the size and the cost of anaerobic digesters
- Reduce the amount of residual sludge for disposal
- Reduce polymer costs for sludge dewatering
- Reduce electricity costs for aeration to treat mill effluent
- Reduce greenhouse gas emissions

## How MicroSludge Works

MicroSludge destroys the bacterial cell membranes and releases the cell contents of WAS. An anaerobic digester then converts WAS to biogas and reduces sludge for disposal. Digester effluent, containing nitrogen and phosphorus, is returned and reused by the mill's effluent treatment plant.

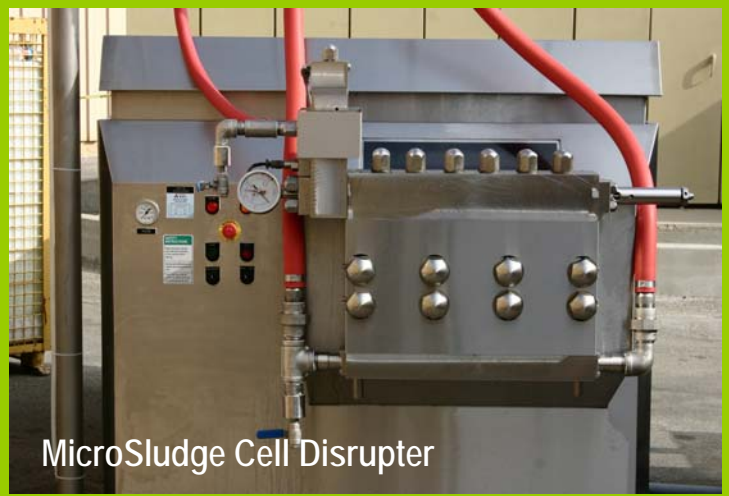
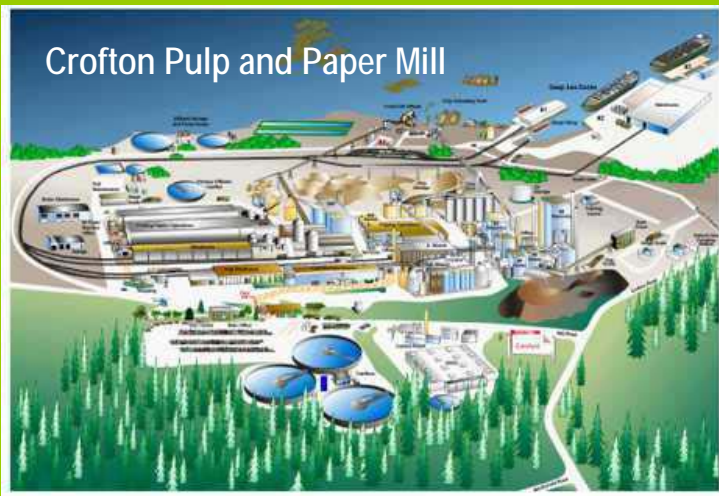


*"MicroSludge and anaerobic digestion show great promise to recover green energy and fertilizer from WAS while reducing the consumption of petroleum-derived sludge dewatering polymers, potential aeration cost for the bio-treatment system and the amount of sludge requiring disposal"*

FPInnovations

## Demonstration Project – Catalyst Pulp and Paper, Crofton, BC

A transportable plant will be installed at the Crofton pulp mill in early 2011 to demonstrate the technology on a small portion of the WAS. The plant will replicate full scale operations to include: MicroSludge, anaerobic digesters and aerobic activated sludge units. This will enable trials to optimize benefits and reduce capital costs for permanent operations. The plant will be used for future trials at other pulp mills.



MicroSludge Cell Disrupter

**MICROSLUDGE REDUCES GREEN HOUSE GASES**

|                            |                                                                                                                                                                                                                                                            |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Biogas Generation</b>   | Biogas will reduce mill consumption of fossil fuels (coal, diesel, fuel oil, natural gas) or will be used to generate clean electricity and heat.                                                                                                          |
| <b>Reduced Sludge</b>      | Less sludge requires less fossil fuel-derived polymer for dewatering, less fossil fuel for incineration, fewer diesel trucks for sludge haulage, and emits less methane, nitrous oxide and carbon dioxide by land application, landfills, or incineration. |
| <b>Reduced Electricity</b> | MicroSludge enables the aeration system in a mill's effluent treatment plant to operate more efficiently, reducing electricity consumption.                                                                                                                |
| <b>Less Fertilizer</b>     | Less fossil fuel-derived fertilizer will be needed because MicroSludge releases nitrogen and phosphorus for reuse in the effluent treatment plant.                                                                                                         |

**Crofton Demonstration Partners**



**About Paradigm Environmental Technologies**

Paradigm Environmental Technologies Inc. is a private company located in Vancouver, British Columbia, Canada that has developed MicroSludge®, a patented technology for industrial and municipal wastewater treatment plants (WWTP.)

MicroSludge is a sustainable technology that significantly enhances the anaerobic digestion process, thereby reducing operating costs and increasing plant capacity. MicroSludge is modular, and can be easily deployed at existing WWTP facilities. MicroSludge can also be used to process industrial wastewater applications including pulp and paper, meat and food processing, pharmaceutical, and chemical plants.

**Paradigm Environmental Technologies Inc.**  
 Suite 200 – 1600 West 6<sup>th</sup> Avenue  
 Vancouver, BC, Canada, V6J 1R3

Tel: 1.604.742.0360  
 Fax: 1.604.742.0368  
 Email: sales@microsludge.com

www.microsludge.com  
 www.paradigmenvironmental.com

*Pulp and Paper Crofton-- 001 - Paradigm Environmental© 2011*