

# DICKLANDS FARMS' BIOGAS PLANT

## FAMILY HISTORY

Established as a 75-acre farm with 50 milk cows in 1946, Dicklands Farms quickly thrived as a dairy farm. Today the farm has over 400 Holstein cows along with replacement cattle, young stock and spans 400 acres across two properties located at 42238 Sinclair Road in Chilliwack, BC. The farm uses cutting-edge technology and is ranked in the top 100 for production performance. Dedicated to land stewardship and farm resilience, Dicklands Farms built a biogas plant on their farm in 2023 to diversify revenue to better handle increasing land values, labour and other costs while supporting a viable local food system that can produce quality, local food. PlanET was responsible for overall engineering of the project, including process design, site layout, office and process buildings, integration of 3<sup>rd</sup> party process equipment, and permitting support. Today, PlanET provides ongoing operational support in addition to preventative and scheduled maintenance.



Figure 1: Biogas Plant located at Dicklands Farms

## BIOGAS PLANT

The Dicklands Farms biogas plant co-digests dairy manure, chicken manure and food waste to produce renewable natural gas, organic fertilizer pellets and clean water.

Dairy manure from Dicklands Farms and neighbouring farms is pumped into two 30m by 8m digester tanks. Food waste is either pumped into storage tanks or tipped into a hopper (if packaged). For packaged material, state-of-the-art de-packing equipment separates the food waste from non-organic material (e.g. plastic, polystyrene, cartons, tin, paper etc.). Dicklands Farms accepts a wide variety of food waste (including food processing, supermarket and restaurant waste, spoiled food, green-bin and residential waste, fats, oils & grease [FOG], animal feed, etc.) throughout the year.



**Figure 2: De-packaged Food waste**

Digester tanks convert manure and food waste into biogas, which is upgraded to renewable natural gas (RNG). RNG is injected into the gas pipeline as a substitute for fossil-fuel natural gas.



**Figure 3: Pumping manifold**



**Figure 4: Digester Tanks**

The digestate is pumped to sloped screens to capture large fiber, and then to vibrating sieves to capture as much small fiber as possible. The liquid fraction is then evaporated by a mechanical vapour recompression system. This process separates nutrients from digestate by heating it to produce steam. Once cooled, the steam turns into water and undergoes reverse osmosis filtration and the cleaned water is used as drinking water for the cows, process and cleaning water for the biogas plant, and for irrigating surrounding fields.

Fiber from the sloped screens and sieves passes through a screw-press to remove excess liquid. This fiber and the nutrient concentrate left after evaporation are then dried, pelletized and heated to  $> 70^{\circ}\text{C}$  for one hour (to kill potential pathogens). Organic pellets are sold as fertilizer. All digestate management equipment is housed inside a building to prevent odour issues.



**Figure 5: Dried Fertilizer Pellets**



PlanET supplied all the equipment for two (2) 1.5 million-gallon concrete anaerobic digesters, a de-packer, pre- and post-storage tanks, a flare and ancillary process equipment. During construction PlanET provided construction technical advisory services to guide the local contractors and also completed the commissioning.

### PROCESS FLOW (all quantities are annual)

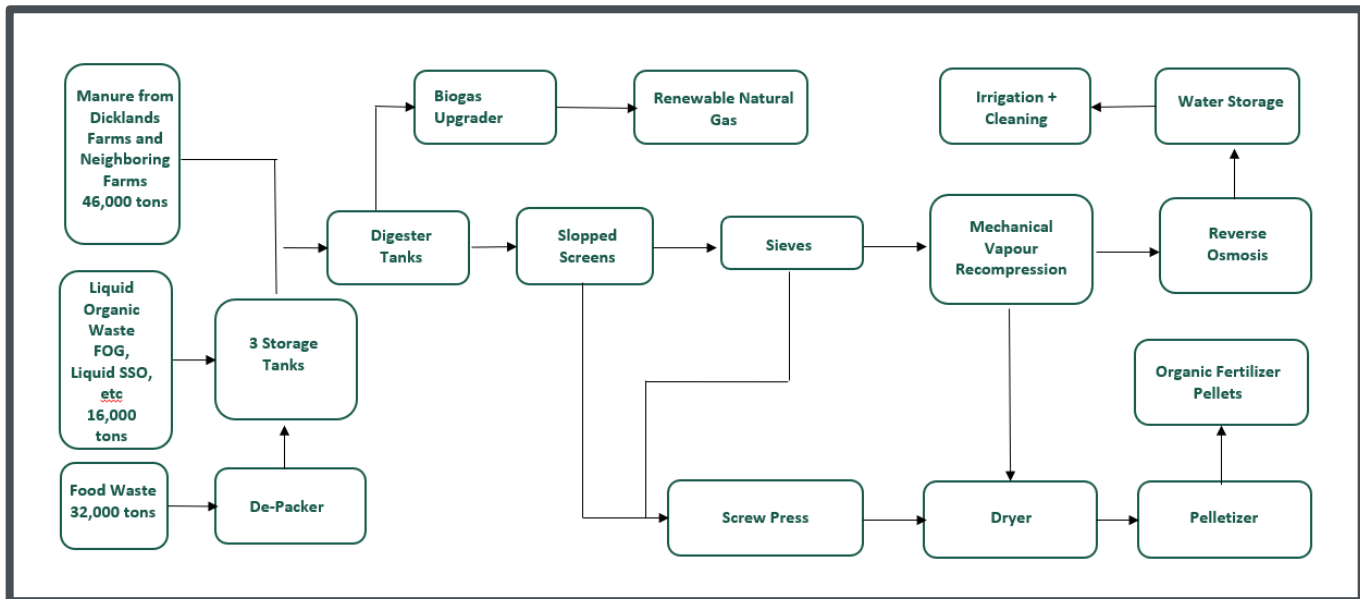


Figure 6: Process Flow Diagram

### ODOUR MANAGEMENT & NOISE

Dairy farms collect manure from barns and store it in pits. When appropriate to do so, manure is transported to fields and land applied. Dicklands Farm's biogas plant converts odorous manure to innocuous digestate to ensure odours do not occur during land application.

The feed tanks and process building operate under negative pressure to minimize potential for odour to escape. Air from these tanks and the building are treated using a chemical scrubber, in which a sulphuric acid/water solution captures >90% of ammonia emissions. A wood chip based biofilter then further deodorizes the plant air. Both air treatment technologies are considered to be the best achievable technology.

### STATERON BIOGAS UPGRADING PLANT

Dicklands Farms uses the PlanET STATERON M-Series packaged 3-stage membrane system with a >99% recovery yield. This technology cleans the biogas by removing impurities like carbon dioxide, hydrogen sulfide and moisture. The result is high-quality RNG that meets the necessary standards for injection into the FortisBC natural gas grid.

The capacity of the Dicklands Plant is 1,100 Nm<sup>3</sup>/h nominal flow, 1,250 Nm<sup>3</sup>/h max flow and it can be expanded to 1,260 Nm<sup>3</sup>/h nominally and 1,450 Nm<sup>3</sup>/h max flow by adding membranes. Currently the plant is equipped with three Activated Carbon Filters of 4m<sup>3</sup> volume each, one that is targeting VOCs and two in lead-lag configuration to filter out H<sub>2</sub>S.

Equipment noise attenuation is accomplished by installing the rotating equipment in soundproof enclosures.

For the STATERON M-Series RNG upgrader, PlanET performed the role of general contractor, working with local subcontractors to supply, deliver, install, and commission the equipment.



Figure 7: STATERON M-Series Biogas Upgrading Plant

### ENVIRONMENTAL BENEFITS

The environmental benefits of Dicklands Farms' biogas plant are many, including:

**Renewable-Energy Production:** The biogas plant produces renewable natural gas (RNG) that is used as a direct substitute for fossil fuel natural gas. RNG is carbon neutral. This carbon dioxide is part of the carbon-cycle because it was recently absorbed by crops fed to the cows or used to produce food. Therefore, unlike natural gas, RNG doesn't contribute towards climate change.

**Greenhouse Gas Emission Reduction:** The biogas plant captures methane. Under normal conditions, this methane would be released from manure storage pits. When compared to baseline conditions at Dicklands Farms, the biogas plant reduces greenhouse gas emissions by > 9,000 tonnes/year of carbon dioxide equivalent (tCO<sub>2</sub>e).

**Odour Reduction:** The biogas plant digests volatile organic compounds and, in doing so, reduces odours associated with manure storage and land application by > 90%. Residential communities and homeowners surrounding Dicklands Farms now benefit from a significant reduction in farm odour, especially during spring, summer and fall months (when manure spreading occurs).

**Water Quality:** the biogas plant converts manure into RNG, clean water and organic fertilizer pellets. Using manure from the farm and neighboring farms significantly reduces the amount of manure nutrients and pesticides (to control weed seeds) that are applied locally. Reducing the amount of manure and pesticides that are spread on local fields reduces the potential for nutrient and pesticide run off into local ground and surface water.

### PlanET BIOGAS

Servicing North America since 2006, PlanET Biogas is a pioneer in the biogas industry. The company provides AD & RNG technology solutions consisting of detailed engineering & equipment design, procurement & fabrication, project development and biological, technical & commissioning services. PlanET ranks among the leading biogas technology providers today and has representation in 870+ anaerobic digestion systems and 150+ AD to RNG plants operating worldwide.