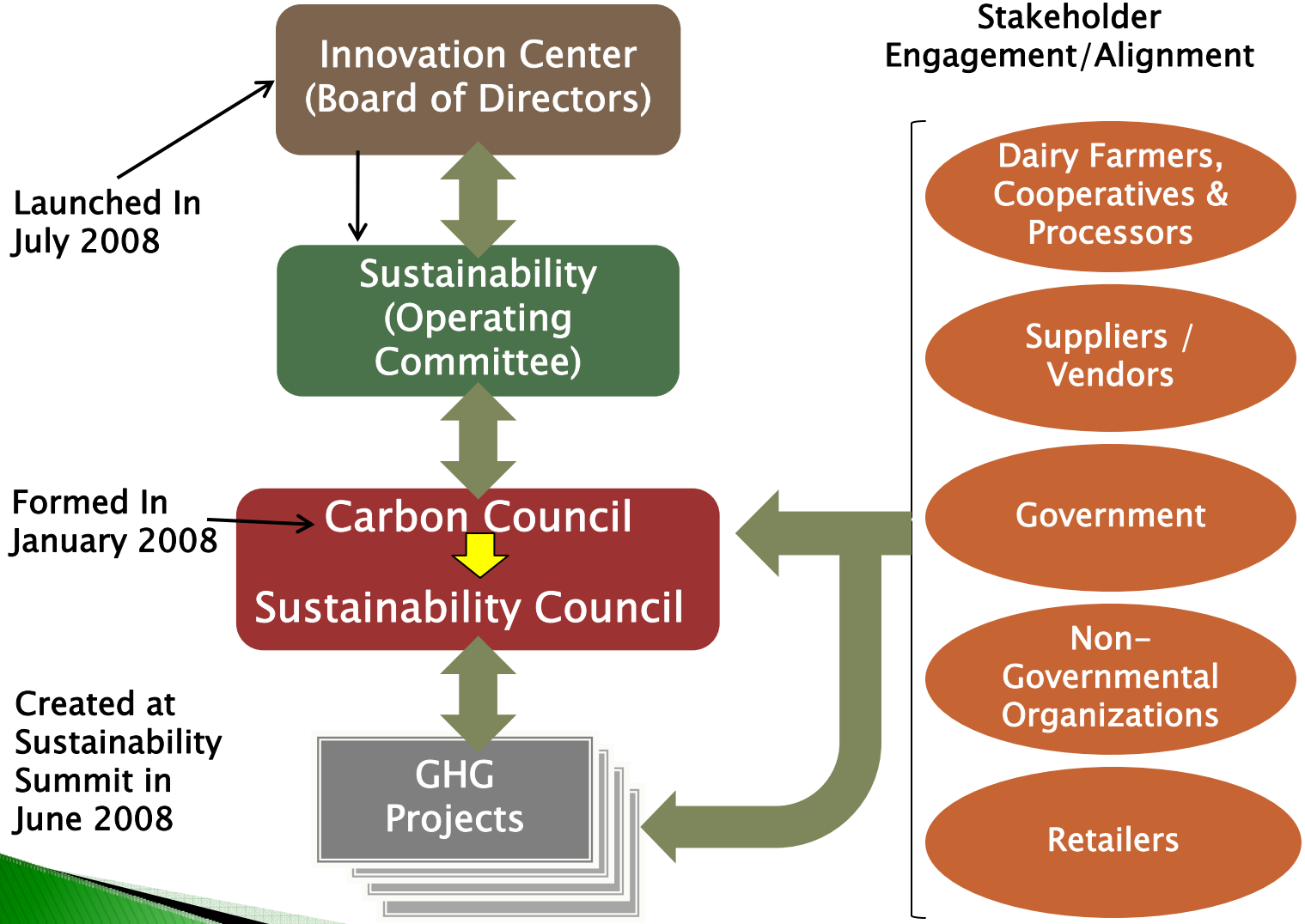
The Path Toward Sustainability

Mike McCloskey, Select Milk Producers & Fair Oaks Dairy

INNOVATION CENTER FOR U.S. DAIRY
HEALTHY PEOPLE • HEALTHY PRODUCTS • HEALTHY PLANET

GHG Initiative Structure



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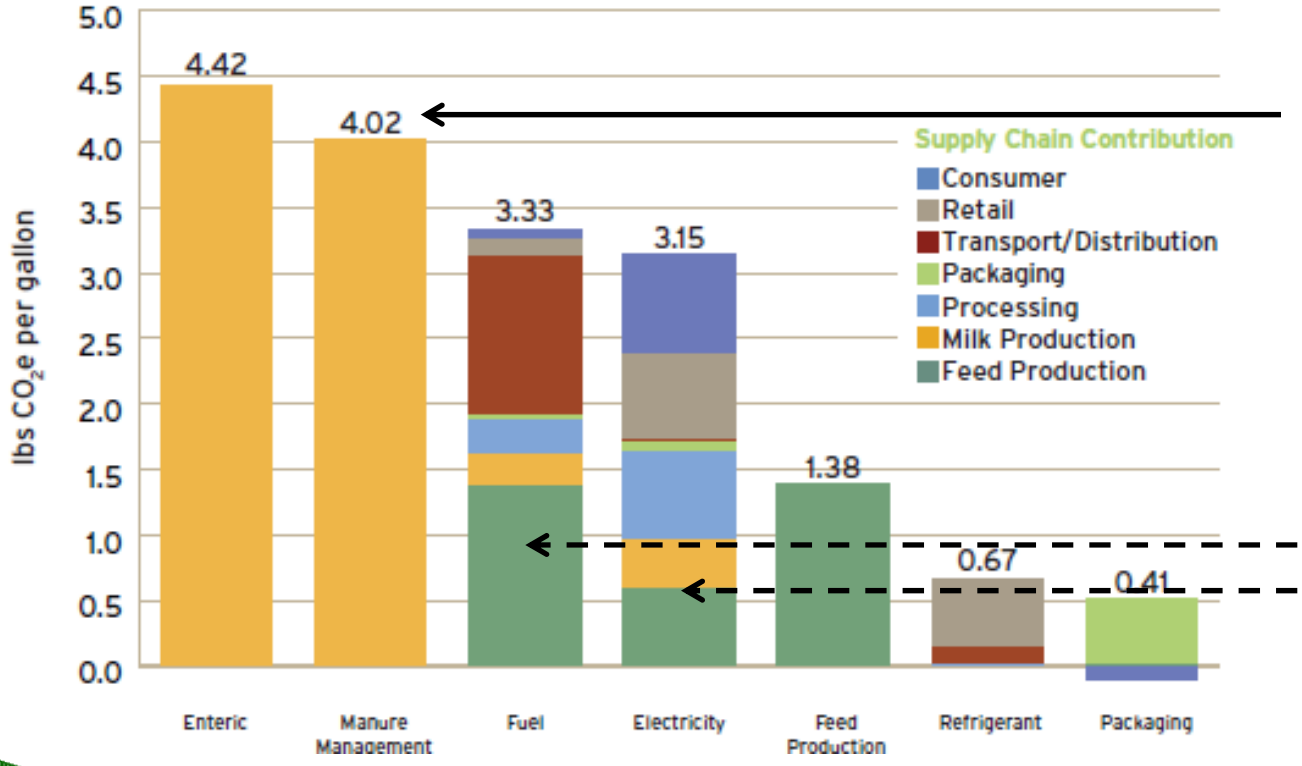
Dairy Power Challenge

Carbon footprint of 1 gallon of milk=
17.6 lbs CO_2e/gallon fluid milk consumed[2]

Industrywide goal of 25% GHG reduction by 2020



Manure Management goal of 30% GHG reduction by 2020

Digesters current projections, is a potential 12% GHG reduction, without the proven impact on fuel and electricity.

[1] Does not include sources related to waste.
[2] 2010. "Greenhouse Gas Emissions of Fluid Milk in the U.S." University of Arkansas. Based on environment and consumption data from 2007-2008, the total fluid milk carbon footprint is approximately 35 million metric tons, with a 95% confidence range from 30 to 45 million metric tons. Natural variability in data ranges from 15.3 to 20.7 lbs. CO_2e per gallon.

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- Feed Production
  - Dairy Farm Smart
- Milk Production
  - Cow of the Future
  - Dairy Power
  - Farm Energy Efficiency
  - Biogas Capture and Transport
- Processing
  - Dairy Plant Smart
  - Next Generation Clean-In-Place
  - Next Generation Processing – UV
- Packaging
  - Processing and Packaging Life Cycle Assessment (LCA)
- Transportation
  - Dairy Fleet Smart
- Retail

GOALS OF AN IDEAL MANURE TREATMENT SYSTEM

1. EFFICIENT ODOR CONTROL
2. EFFICIENT CONTROL OF N & P & K (CLEAN WATER ACT)
3. IMPROVE FLY CONTROL
4. ABILITY TO CONTROL PATHOGENIC BACTERIA
5. REDUCED AIR EMMISSIONS (CLEAN AIR ACT)

   - METHANE
   - AMMONIA
   - HYDROGEN SULFIDE
   - NOx

6. RETURN ON CAPITAL THROUGH BY-PRODUCTS

   - FERTILIZER
   - ELECTRICTY
   - HEAT
   - EMISSIONS CREDITS

7. EASE OF OPERATION / LOW OPERATING COSTS

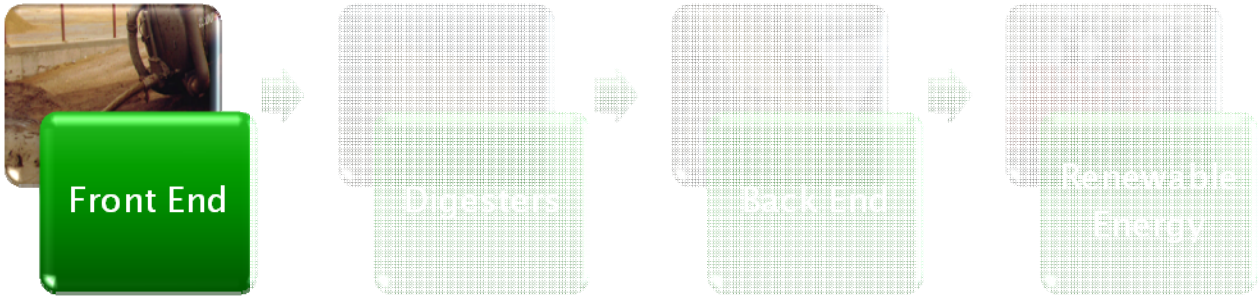
Digester Basics

Front End

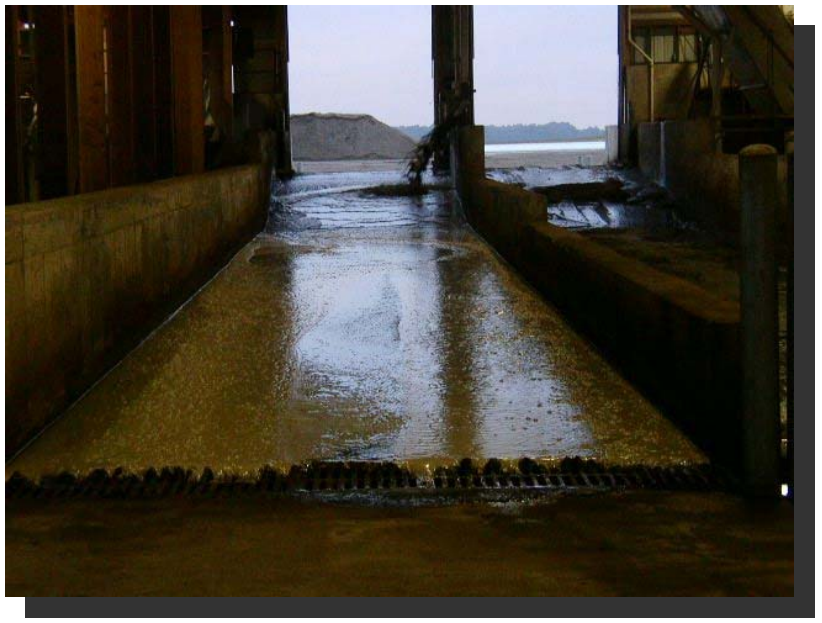
Digesters

Back End

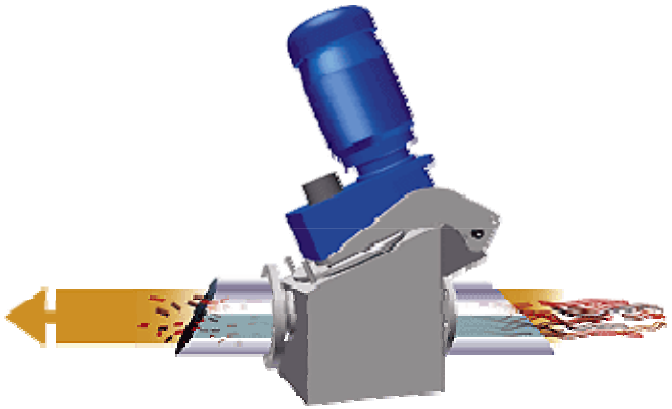
Renewable Energy

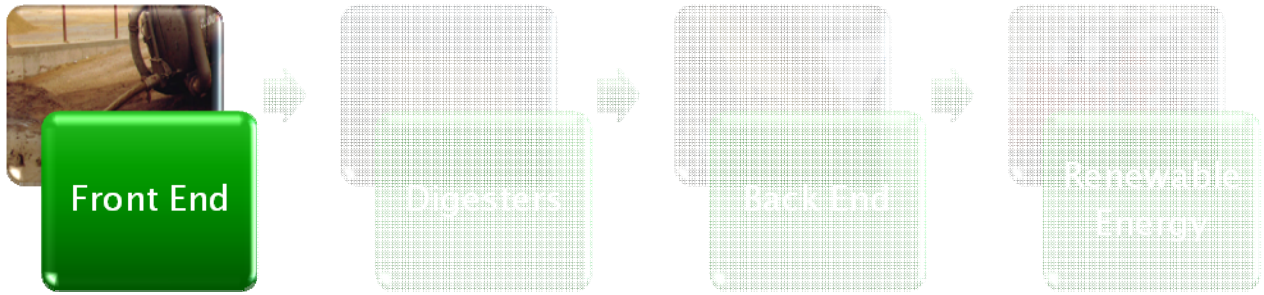


Sand Separation- Needed for Sand Bedding and High Sand Entrainment Areas

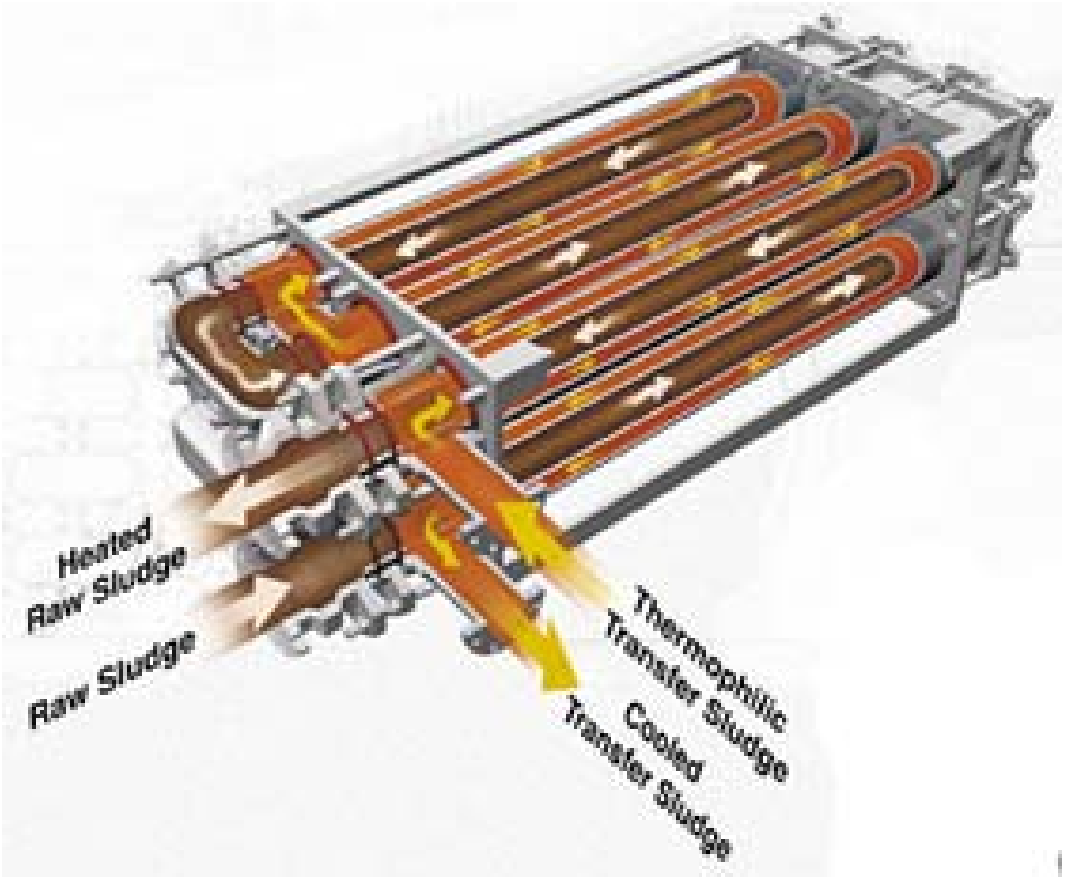


Macerators and Grinders – Reduce large particles of feedstock



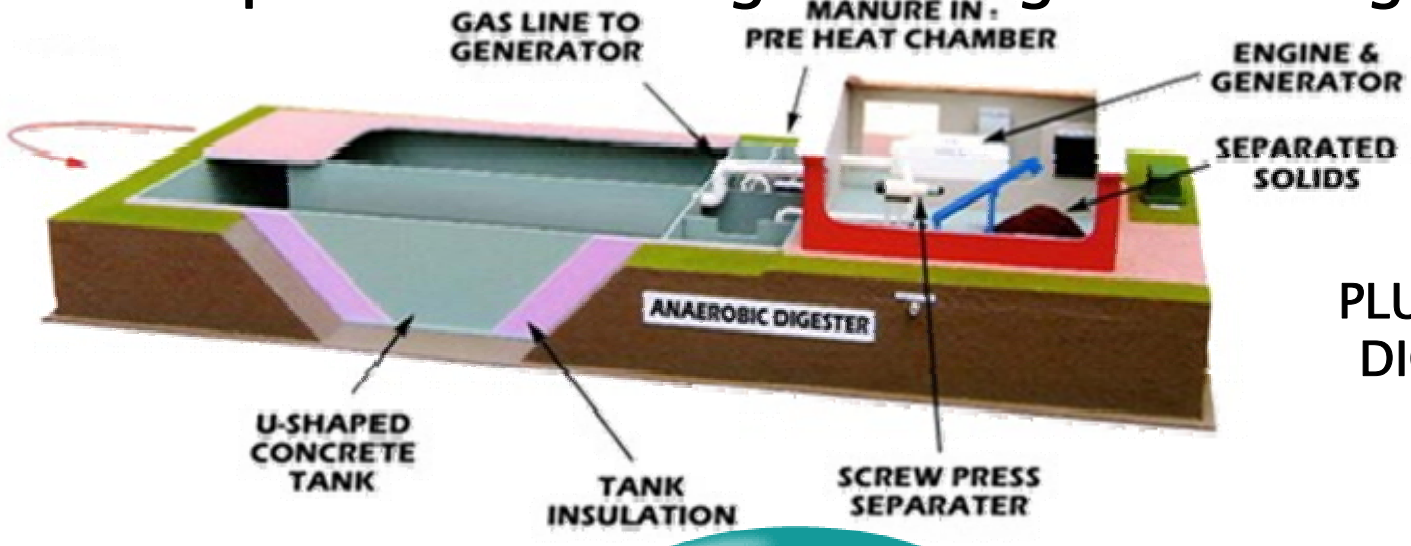


Heat Exchangers – Heats digester influent stream with digester effluent



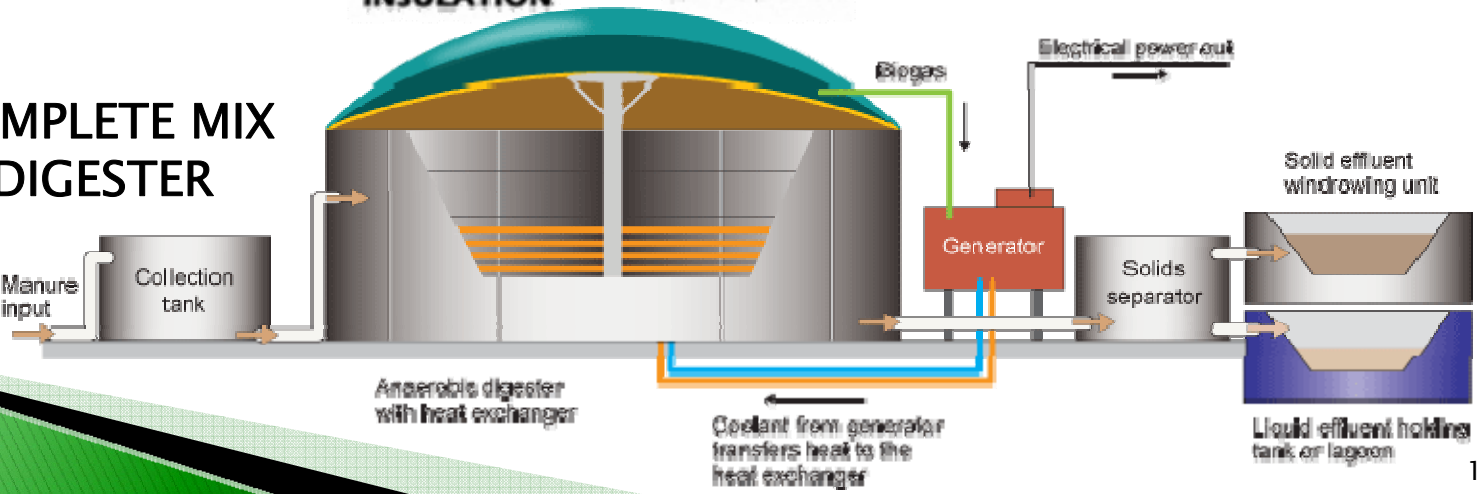
Substrate Feed Equipment – Specialized for the substrate if needed

Complete Mix or Plug Flow Digester Design

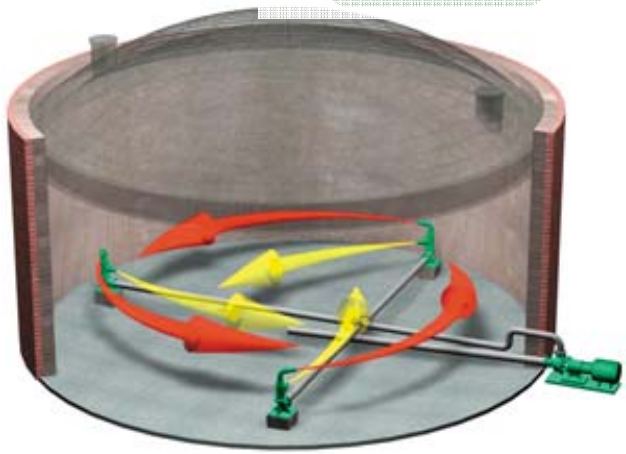


PLUG FLOW DIGESTER

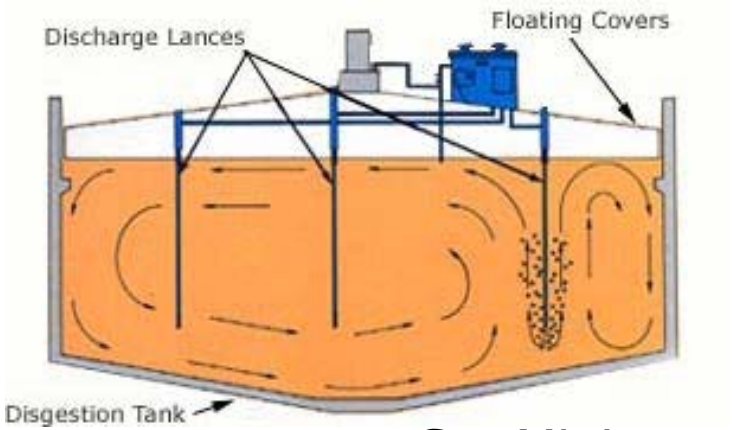
COMPLETE MIX DIGESTER



Mixing Systems



Pump Mixing



Gas Mixing

Mechanical Mixing

Front End → Digesters → Back End → Renewable Energy

Fiber Separation

Nutrient Removal

Nutrient Recovery

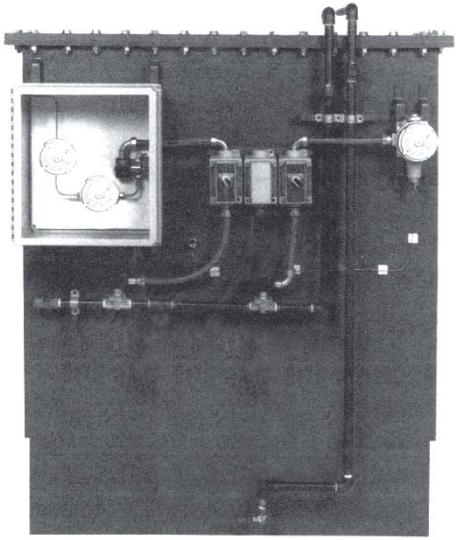
Digested Fiber

Effluent Lagoon

Front End → Digesters → Back End → Renewable Energy

Gas Collection & Safety Equipment

Pressure Relief

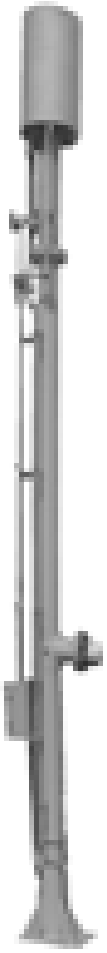


H2S Removal

Flame Arrester

Thermostatic Valve

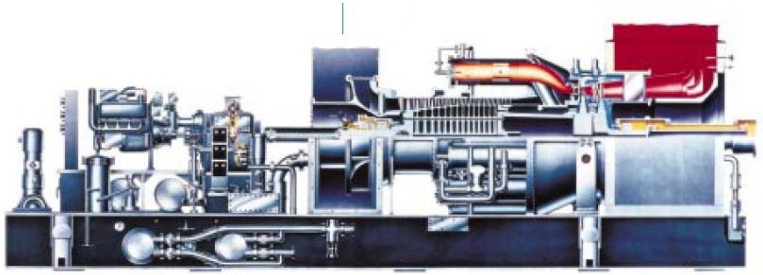
Regulator



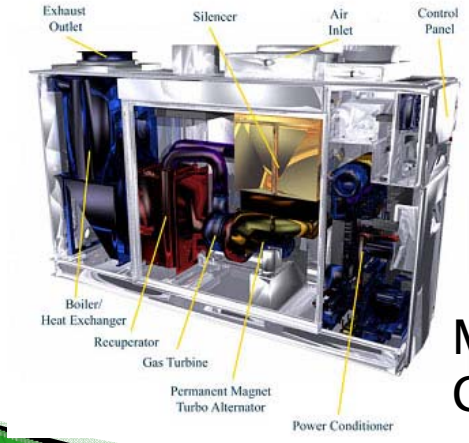
Candlestick Flare

Electrical Generation Equipment

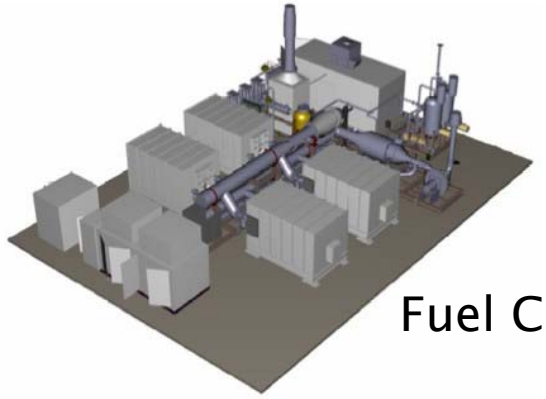
ICE Generator



Gas Turbine Generator

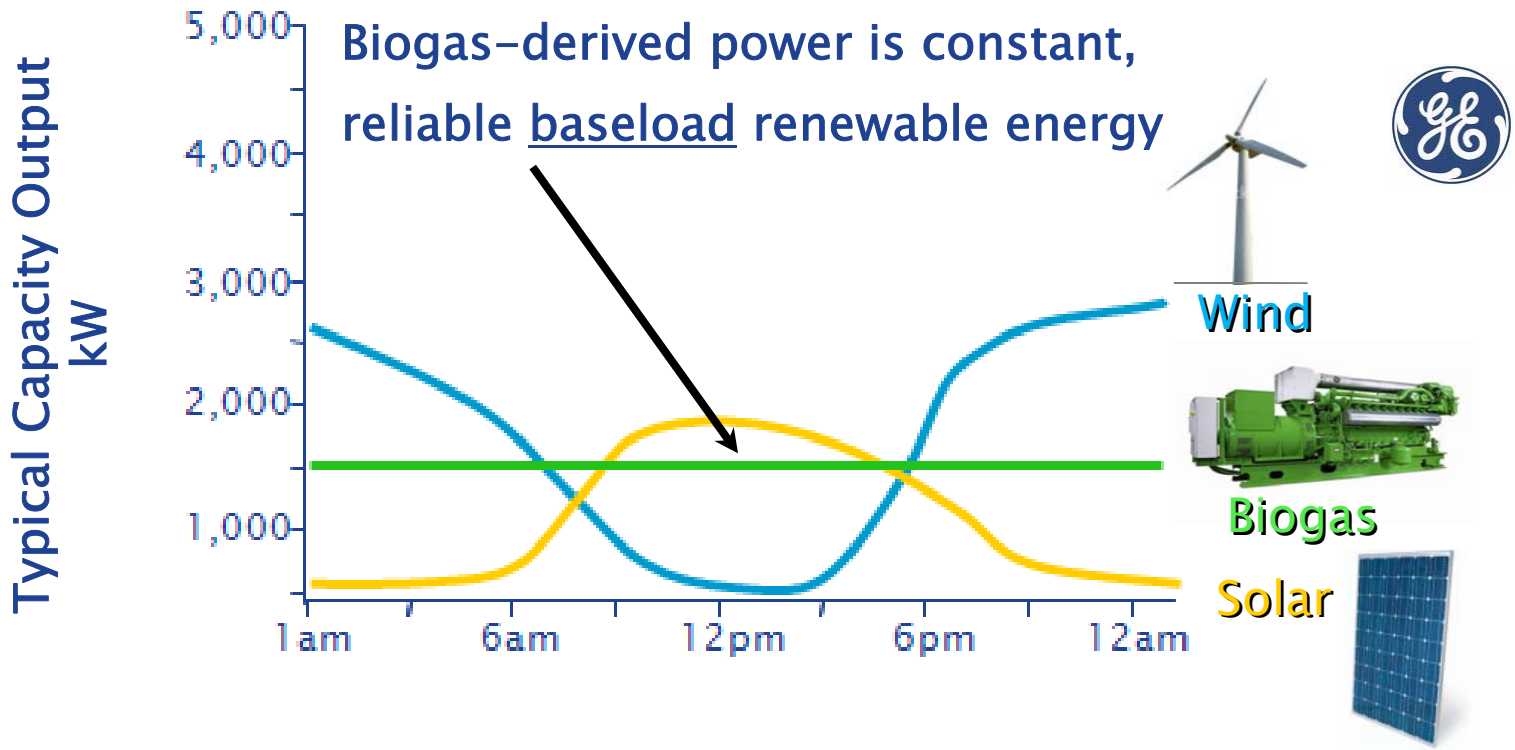


Microturbine Generator



Fuel Cells

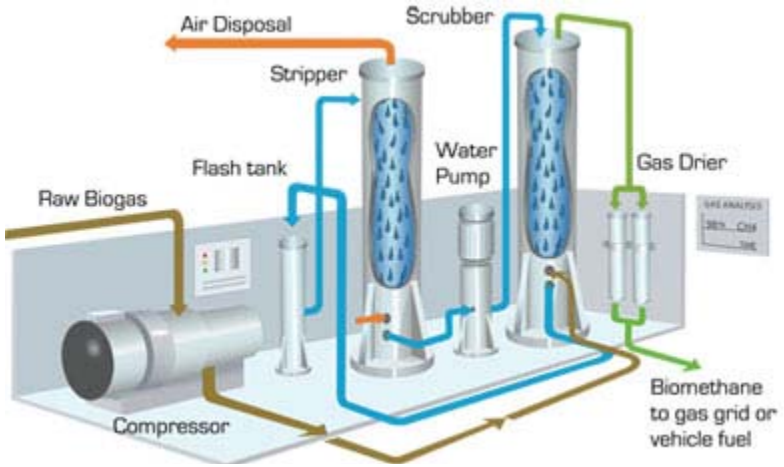
Digester Biogas-to-Electricity 24/7 365 Renewable Energy



"We want our dairy to be an example of agriculture contributing positively to the community. We have developed strong links in our community economically, environmentally and socially."

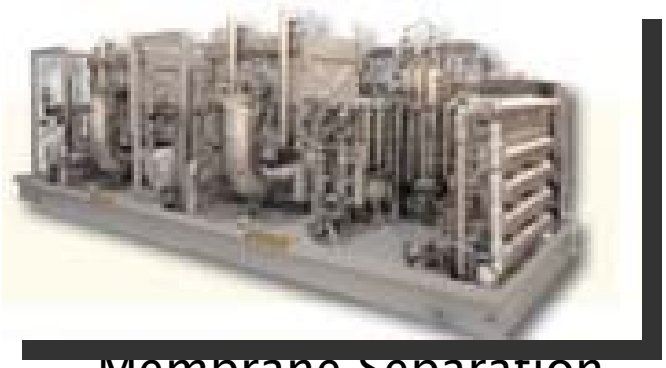
–Kenn Buelow, Holsum Dairies, LLC

Gas Upgrading Equipment



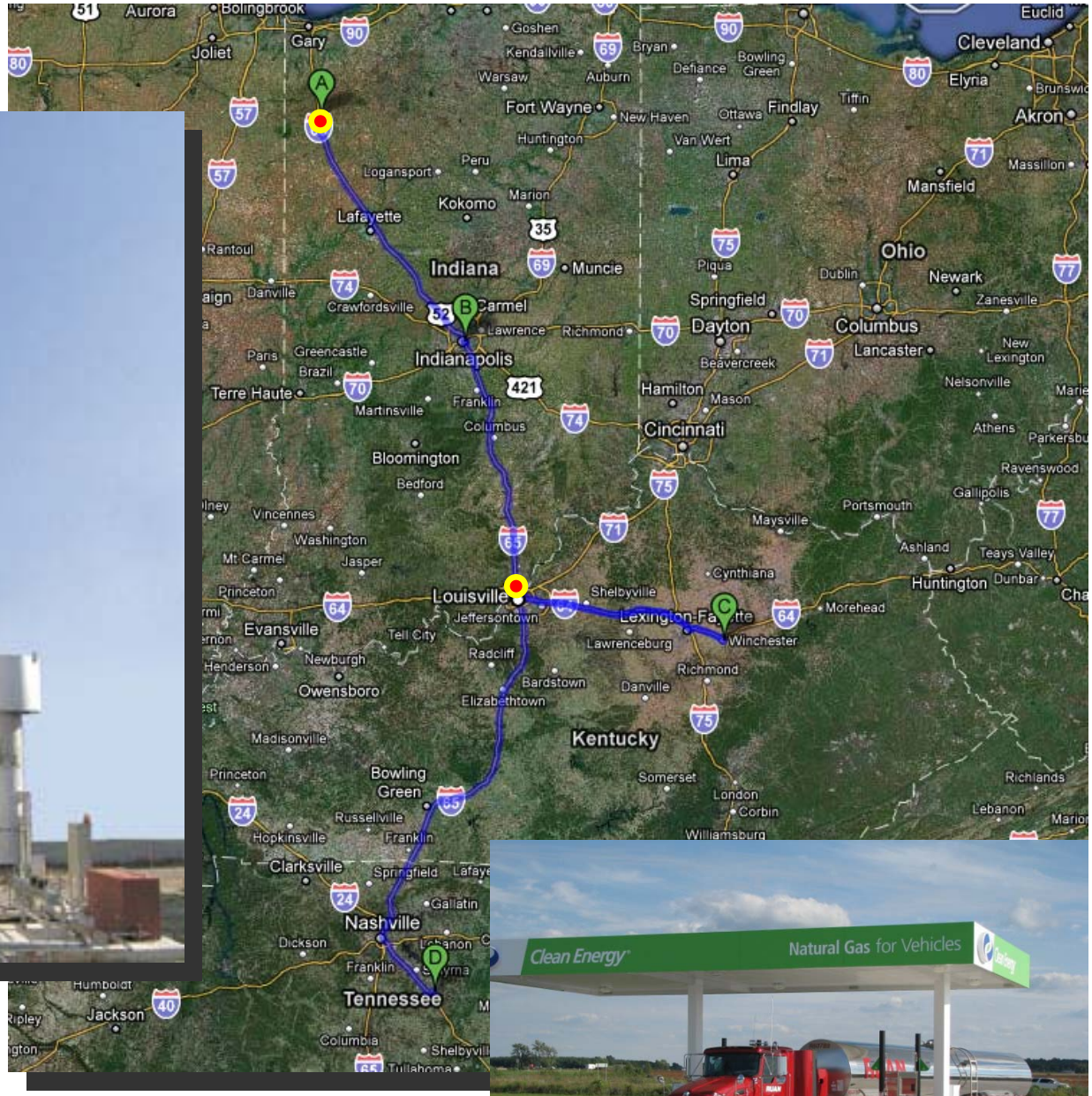
Water Scrubbing Technology

Pressure Swing Adsorption



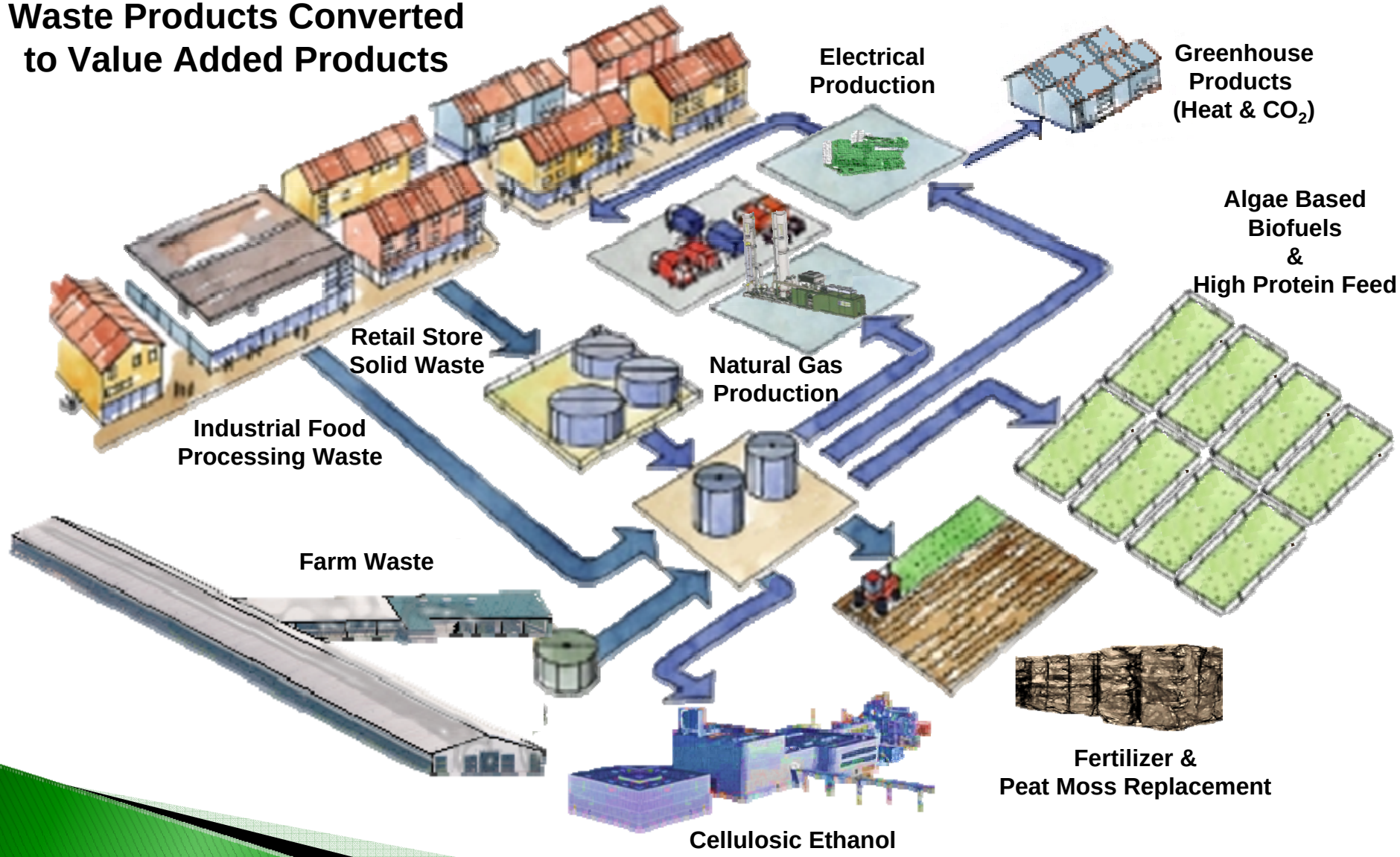
Membrane Separation

Digester Biogas-to-Transportation Fuel – Reduced Emissions & Renewable Energy



Integrated Production

Waste Products Converted to Value Added Products



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