


Biogas From Anaerobic Digestion

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Norm Olson P.E.
BECON Facility Director
Iowa Energy Center

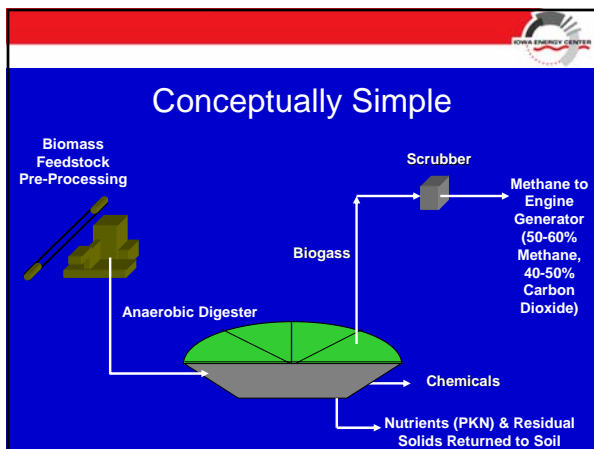
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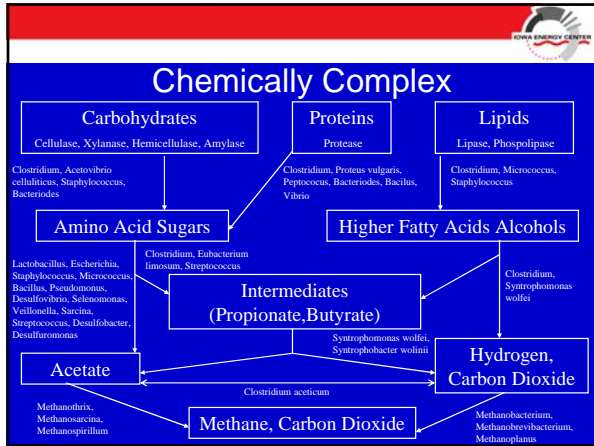


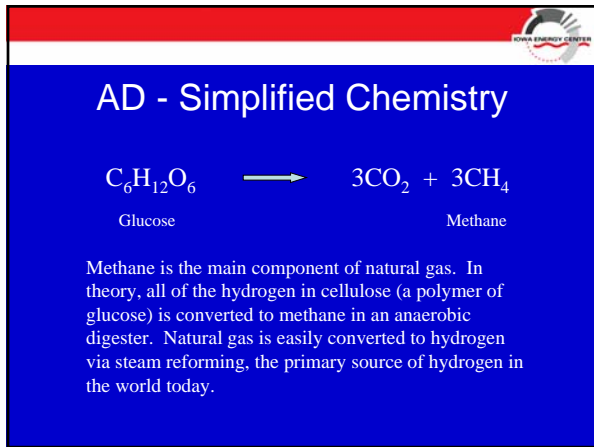
Anaerobic Digestion?

A naturally occurring decomposition of organic material by numerous strains of bacteria working together in an oxygen free environment.

The primary products formed during the decomposition of the organic material are sugars, organic acids, alcohols, methane, carbon dioxide, and hydrogen.







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- Conventional Applications**
- Waste Water Treatment Plants
 - Food Processing Plants
 - Dairy and Swine Farms



Pella WWT Facility Pictures





Haubenschild Dairy


1999; 750 cows; 350,000 gallon digester; 98% availability; 135 kw engine-generator, \$355,000 cost






Top Deck Dairy


2001; 700 cows; 295,000 gallon digester; 100 + 30 kw engine-generators, \$586,000 cost; Annual Savings = \$66,900 (avoided electrical costs plus electricity sales @ 6 cents per Kwh)



Types of Anaerobic Digesters

General	Percent Solids	Phase
Lagoon	High Solids	Single Phase
Plug Flow	Medium Solids	Two Phase
Mixed (CSTR)	Low Solids	Mesophilic-Thermophilic (TPAD)
Fixed Film		Acid-Phase, Methane Phase
ASBR		
Membrane		

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- ## Optimum Operating Conditions
- Nutrients
 - C/N ratio (20 to 30)
 - Cattle 10-14
 - Swine 3-8
 - Poultry 2-7
 - pH
 - Temperature
 - Mixing



Feedstocks

Manure, Agricultural Residues, Sorghum, Wood Chips, Corn, Switchgrass, etc. and mixtures of the above.



Inputs/Outputs/Efficiencies

Depending on the feedstock, forty to ninety percent of biomass can be converted during the anaerobic digestion process.



Nutrients

Nutrients are preserved during the anaerobic digestion process. Nitrogen actually becomes more usable by plants during the anaerobic digestion process. Phosphorus and potassium along with other nutrients and undigested fiber can be returned to the soil and act as excellent soil amendments.



Benefits

Odor reduction, nutrient recycling, ground-water pollution control, clean energy production, chemical production, etc.



New Applications

- Ethanol Plants (methanator)
- Dedicated Energy Crops/Combined Systems
- Bio-refinery

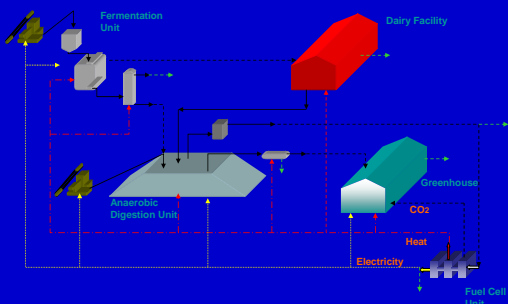


Digester Sites

Ag STAR
Iowa DNR



Combined Systems





Summary

Anaerobic digestion systems have a bright future in Iowa both as stand-alone units and as a part of the Iowa Bio-refinery concept.



Resources

AgSTAR
USDA – Agricultural Waste Management Field Handbook*
Minnesota Project
Wikipedia
AD-Nett The European Anaerobic Digestion Network
