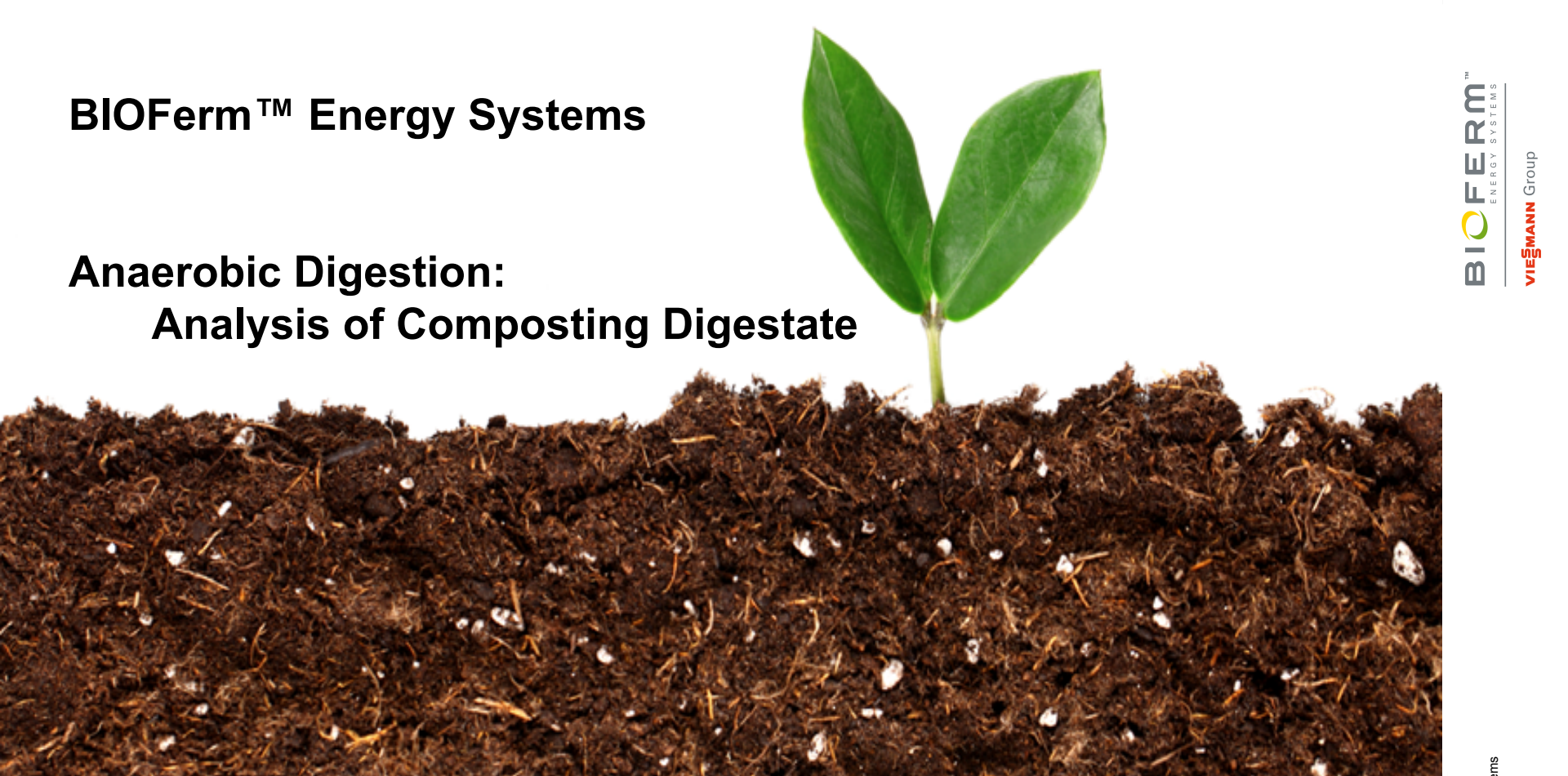


BIOFerm™ Energy Systems

Anaerobic Digestion: Analysis of Composting Digestate



Steven Sell

January 30, 2013

US Compost Council Conference

Orlando, Florida

Key Facts

1917 Company foundation of the Viessmann family enterprise

9,600 Employed workforce today

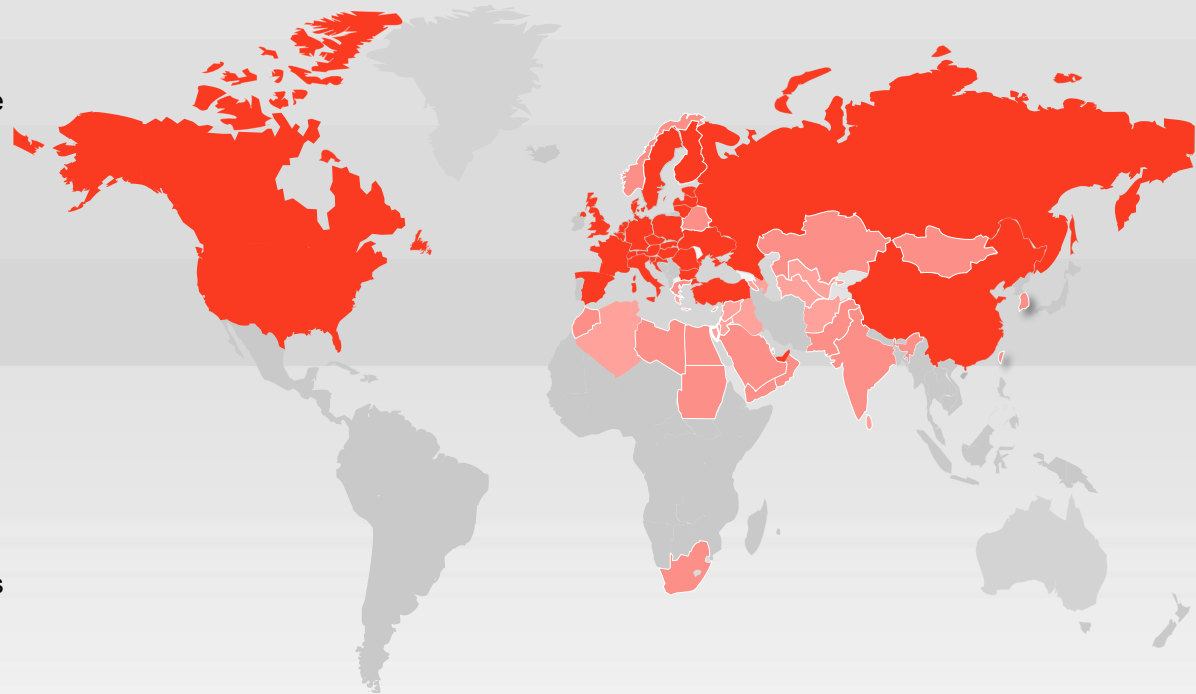
2.4 Billion dollars Viessmann Group turnover in 2011



24 Production companies in 11 countries

74 Countries with sale activities and distribution partners

120 Branches world-wide

55 Percent of the turnover derived from export activities

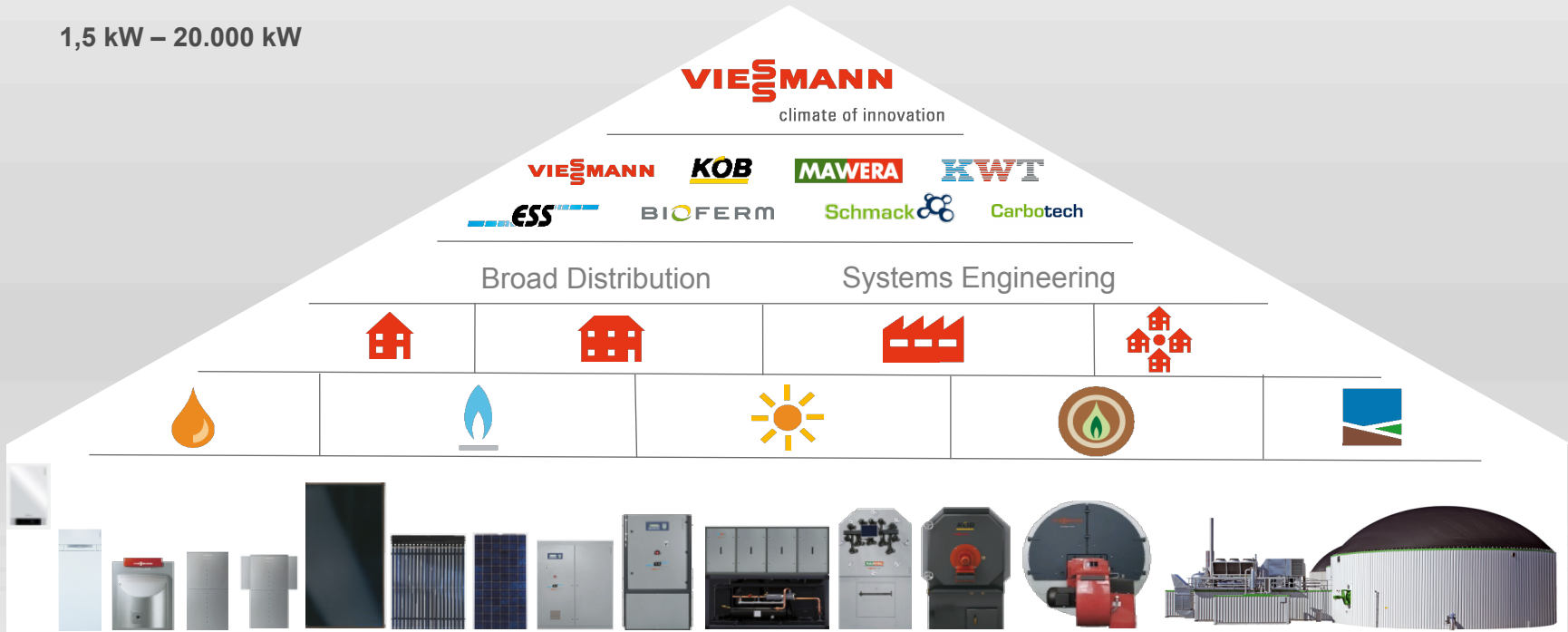


 Branches
 Distribution partners



Comprehensive Product Range

1,5 kW – 20.000 kW



Based on the specific demands of our international markets, we offer individual system solutions for every area of applications; for both heating and air conditioning technology.

BIOFerm™ Energy Systems

- Supplier of anaerobic digestion plants for most types of organic materials
- Leading supplier of dry and wet fermentation systems in North America
- BIOFerm™ Energy Systems is a wholly owned subsidiary of Viessmann Group
- BIOFerm™ USA, Inc, dba BIOFerm™ Energy System was founded in 2007 in Madison, WI



Offering AD Systems for Most Organic Materials

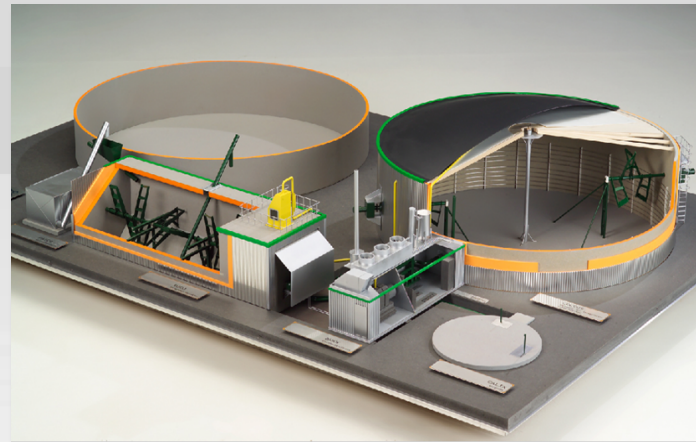
Solid Waste Products
E.g. municipal organic waste,
manure on Straw



Liquid Waste
e.g. liquid manure

Energy Crops
e.g. corn and grass silage

Mixed Wastes
e.g. liquid manure and energy crop



Liquid Waste
e.g. liquid manure

Mixed Wastes
e.g. liquid manure and energy crop



A System for Every Applications

Optimal systems for every waste stream

**up to 10%
solids**
e.g. liquid
manure

COCCUS®
tank digester



**10% to 25%
solids**
e.g. manure,
refusal

EUCO®
plug flow digester



**25% and
higher solids**
e.g. manure on
straw

BIOFerm™ dry
fermentation
digester



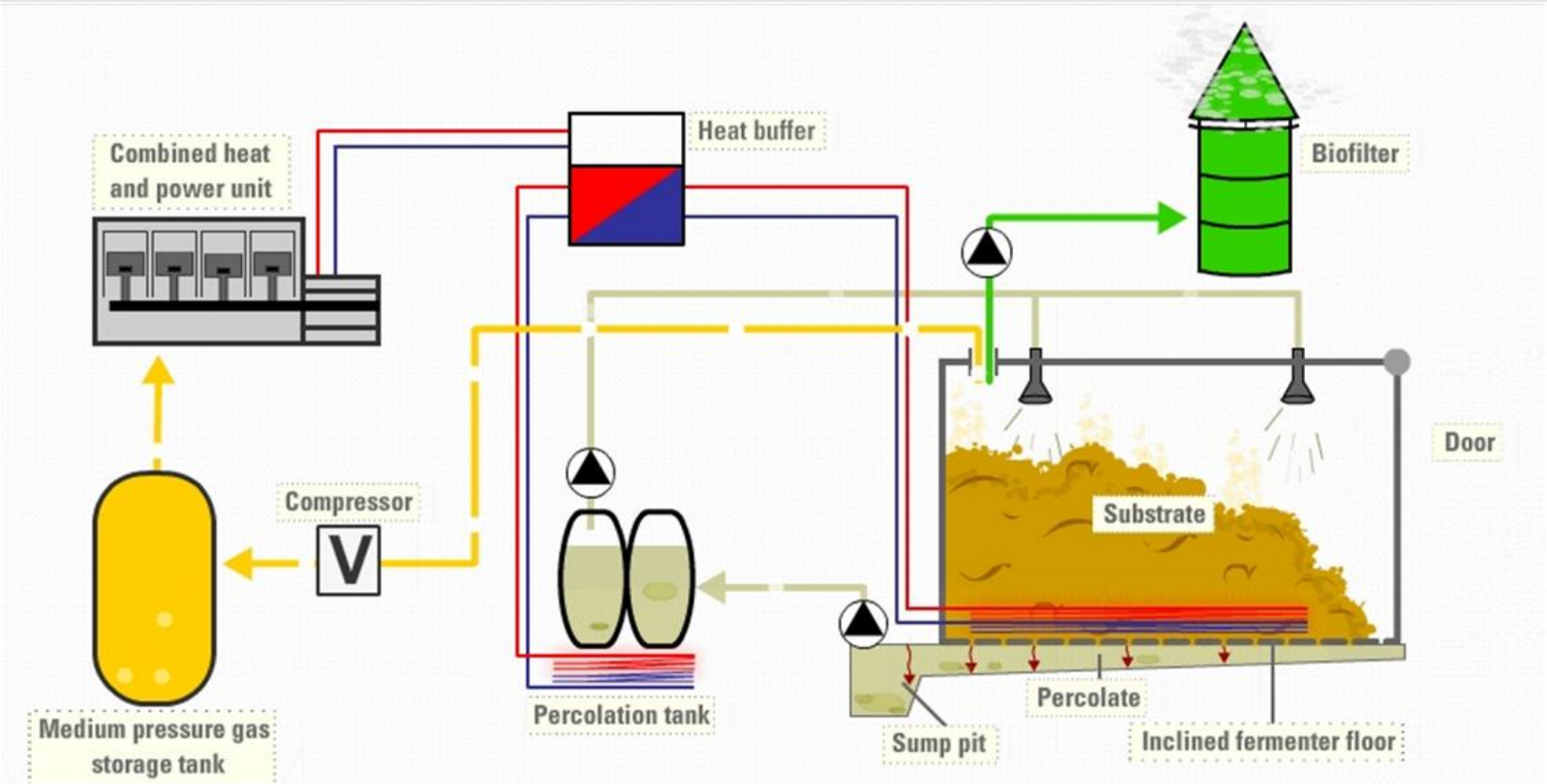
Systems can be combined to match waste stream

BIOFerm™ Dry Fermentation System



- 1 Biomass Storage
- 2 Mixing Platform
- 3 Fermentation Chamber
- 4 Flexible Gas Storage
- 5 Biogas Boiler
- 6 CHP
- 7 To District Heating
- 8 Electric Grid Connection

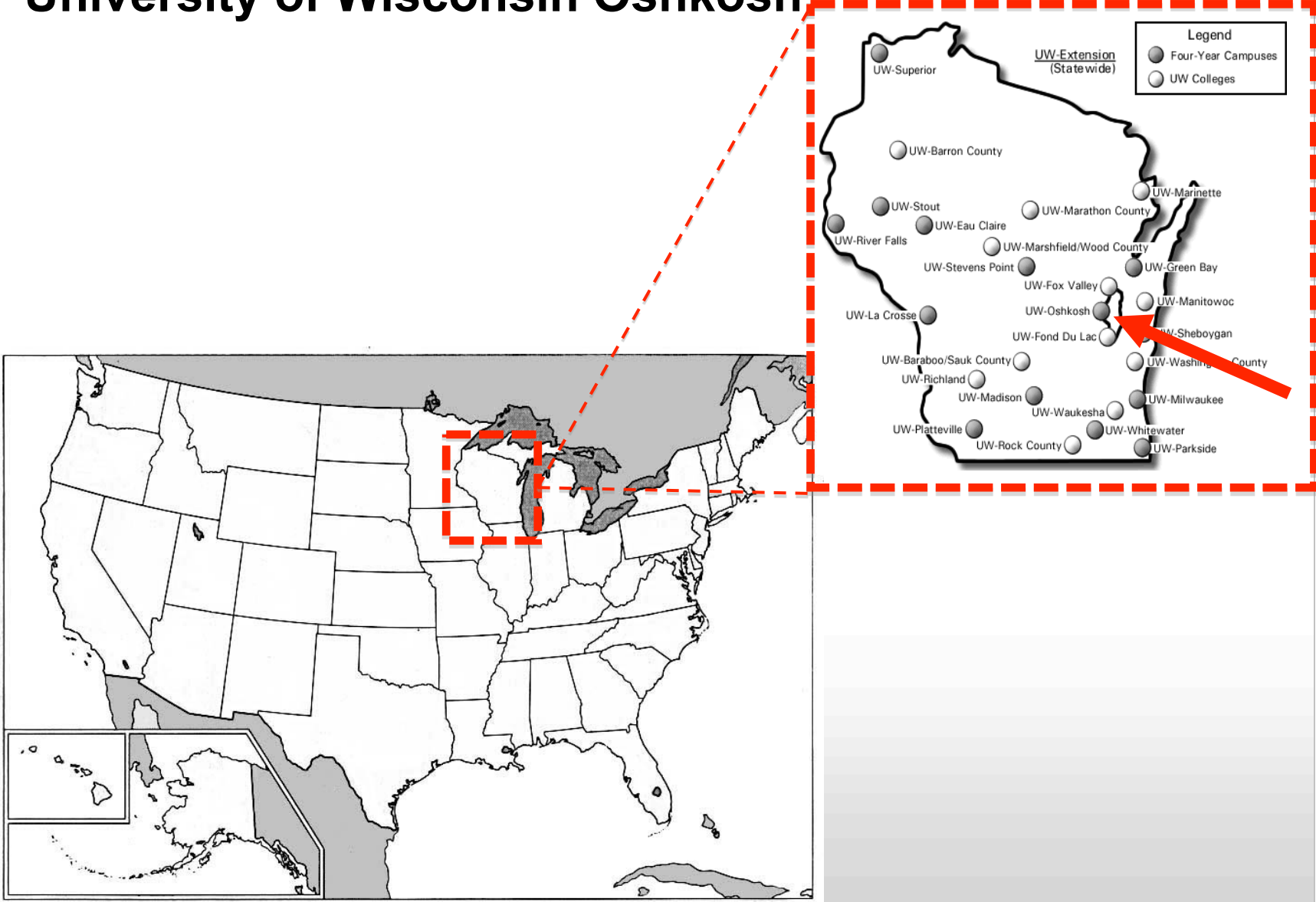
BIOFerm™ Dry Fermentation System



The Dry Fermentation BIOFerm™ System

- The BIOFerm™ industrial grade dry fermentation anaerobic digestion process uses organic input materials to produce biogas
- A batch system - reloading on a 28 day cycle
- Minimal additional water required
- Material stays stationary, while bacteria (percolate) is sprayed over it to accelerate the decomposition process
- Percolate seeps through the biomass and is reused again
- The input material is reduced by up to 40% and energy is extracted in the process
- The end product (digestate) can be further composted to make commercial grade compost or can be land applied as a fertilizer

University of Wisconsin Oshkosh



BIOFerm™ References

University of Wisconsin - Oshkosh

Plant Parameters

Technology:	Dry Ferment.
Installed electrical capacity:	370 kW
Installed thermal capacity:	495 kW
Input material:	up to 8000 tons agricultural waste and SSO
No. of fermentation vessels:	4
Length x Width x Height:	65 ft x 23ft x 13 ft
Construction start date:	September 2010
Beginning of operations:	Summer 2011



University of Wisconsin – Oshkosh

- Food waste from local grocery stores and restaurants
- Yard waste consisting of grass clippings, leaves, brush, shrubs and tree clippings
- Post-consumer food waste University cafeteria
- Animal bedding from local farmers





Anaerobic Digestion Facility

- Methane (biogas) produced by fermentation of organic matter
- Biogas combusted to generate electricity and heat
- Digestate used for composting, soil amendment, etc.



University of Wisconsin – Oshkosh Raw Digestate Characteristics

- Total Solids
 - Range 18.2% to 36.1%
 - Average 29.2%
- Volatile Solids
 - Range 45.2%TS to 60.4%TS
 - Average 48.4%TS
- pH
 - Range 7.8 to 8.6
 - Average 8.3



Composting of Digestate Low-Budget Operations

- Minimal Additional Carbon Used
- Aeration Method: Windrow Turner
- Minimal monitoring (temperature etc...)



Composting of Digestate Operations

- Positives
 - NPK Retained
 - Uniform Digestate
 - Contaminants easier to process



- Negatives
 - Raw Digestate → Prolonged Finish Time
 - High Moisture



Conclusion & Further Research

- Enhanced Aeration Method
 - Faster Turnaround Time
 - More Complete Breakdown
- Carbon Addition
 - Boost C:N Ratio between 20:1 and 30:1
 - Lower Moisture Content
- Enhance Monitoring
 - More Frequent Temperature Readings
 - Perform Maturity Tests (Solvita Index)



THANK YOU!

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