

Waste-to-Resources
International Symposium MBT & MRF

Latest North American Perspective on Integrated Solid Waste Management

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Fairfax, VA USA
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Outline

- Introduction
- MSW in the United States
- Management Practices
- Technology Review
- Trends, Expectations and Opportunities

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GBB -- Quality -- Value -- Ethics -- Results



- Established in 1980
- Solid Waste Management and Technology Consultants
- Helping Clients Turn Problems into Opportunities

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GBB Waste Technology Services

- Economic, technical, and environmental reviews
- Markets development
- Process planning and design
- Waste characterization and sourcing
- Procurement and negotiation assistance
- Independent feasibility consultant
- Technology due diligence
- Acceptance testing and operations monitoring



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RENEWABLE Energy FROM WASTE

INSIDE:
Maximizing RDF Systemsp. 25
A Financial Source for WTEp. 29
Boiler Emission Rules Updatep. 32
Biogas Heats Up in Wisconsin.....p. 35
Fueling Fleets with Plastics.....p. 38

SERVING FUEL AND ENERGY PRODUCERS // SPRING 2012

www.rewmag.com

A WORKING MODEL
Greenwood Energy is producing market-friendly fuel pellets from waste in America's heartland.

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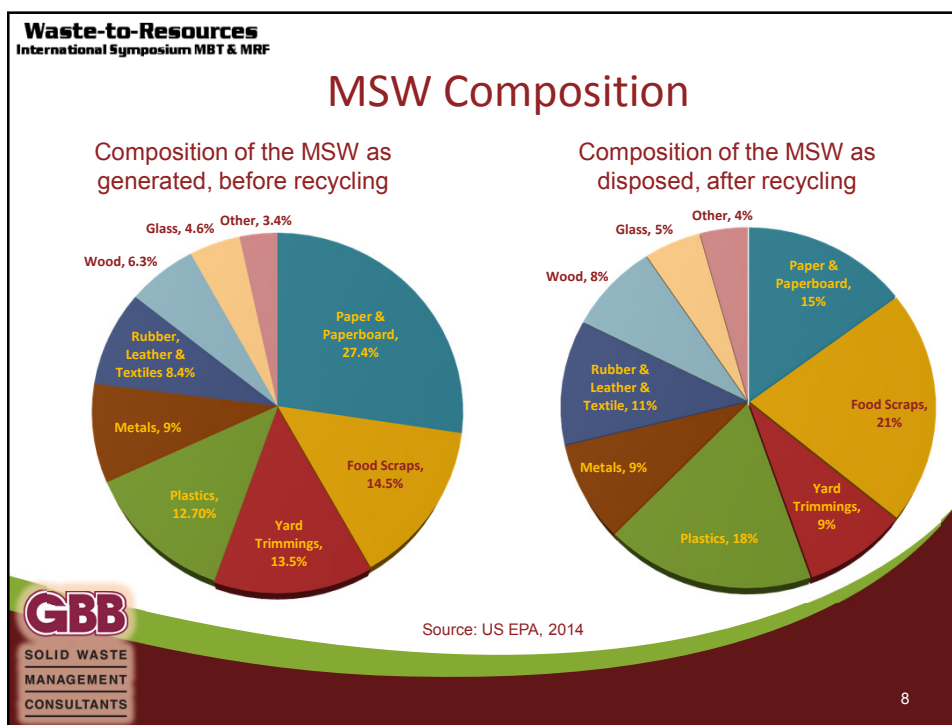
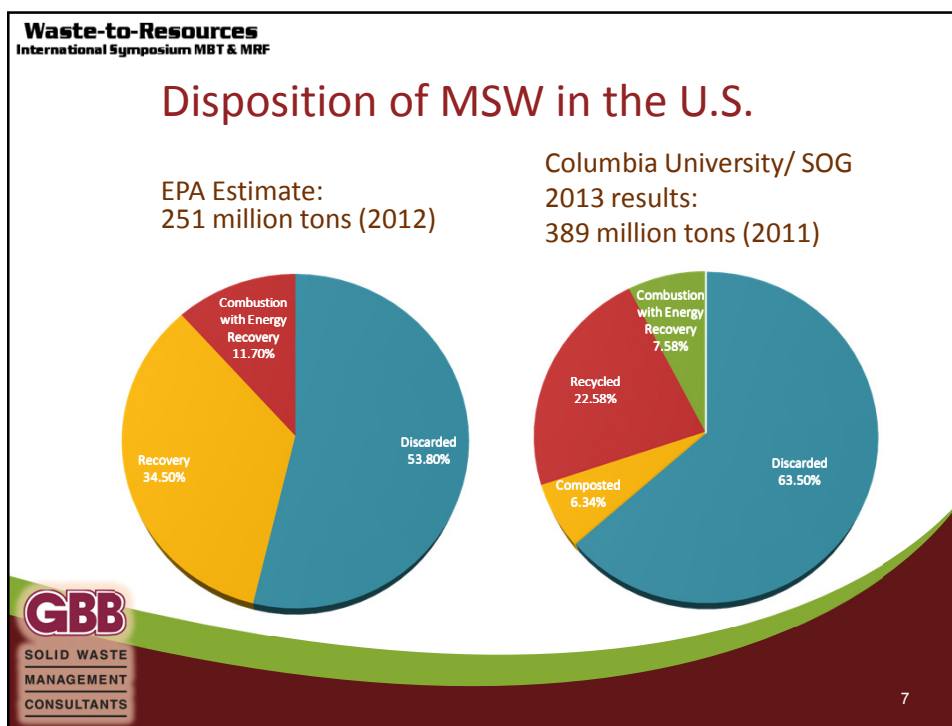
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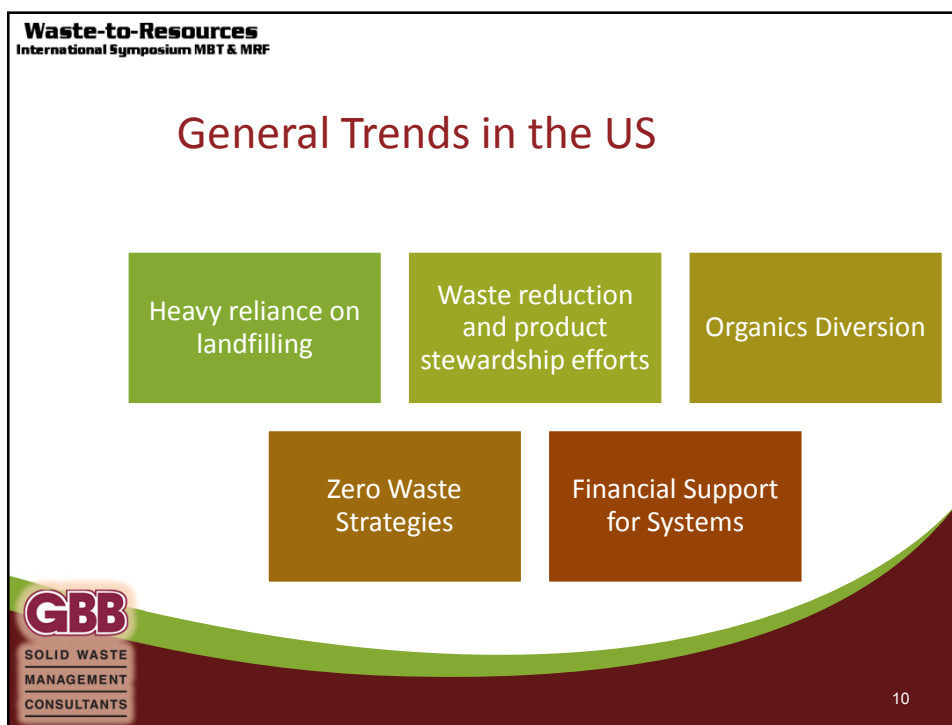
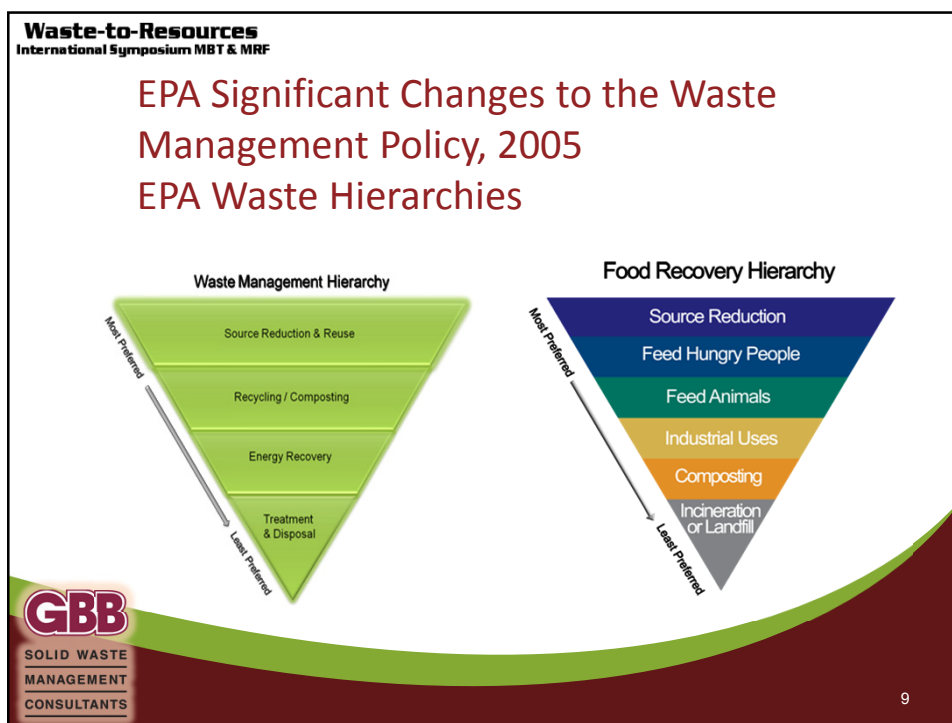


MSW in the US


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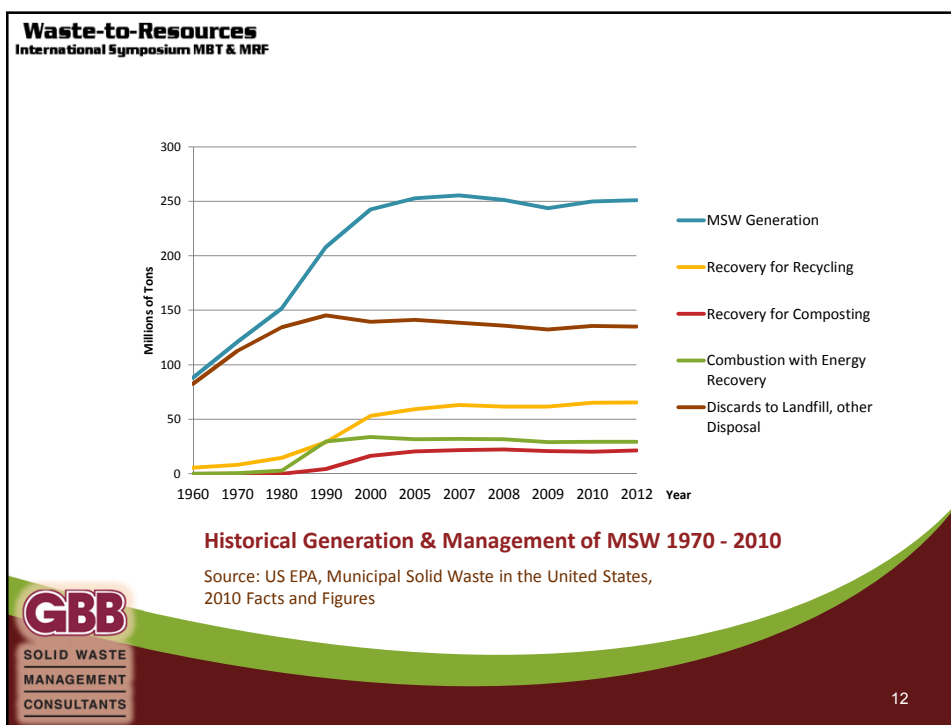


Management Practices

What are we doing today with our waste?

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U.S. Waste Management Infrastructure

Technology	Number
Transfer Stations	3,350
Material Recovery Facilities (MRF)	586
Mixed Waste Processing Facilities (MWPF)	51
Composting	2,300
Anaerobic Digestion	19
WTE	84
Landfills	1,908

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Recycling and Material Recovery Facilities

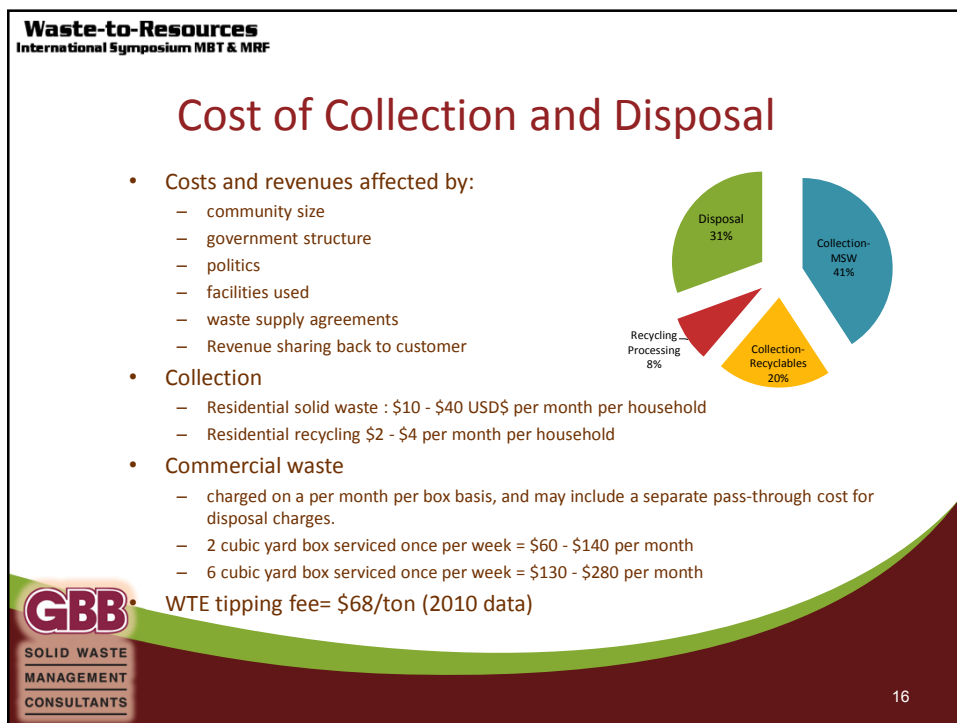
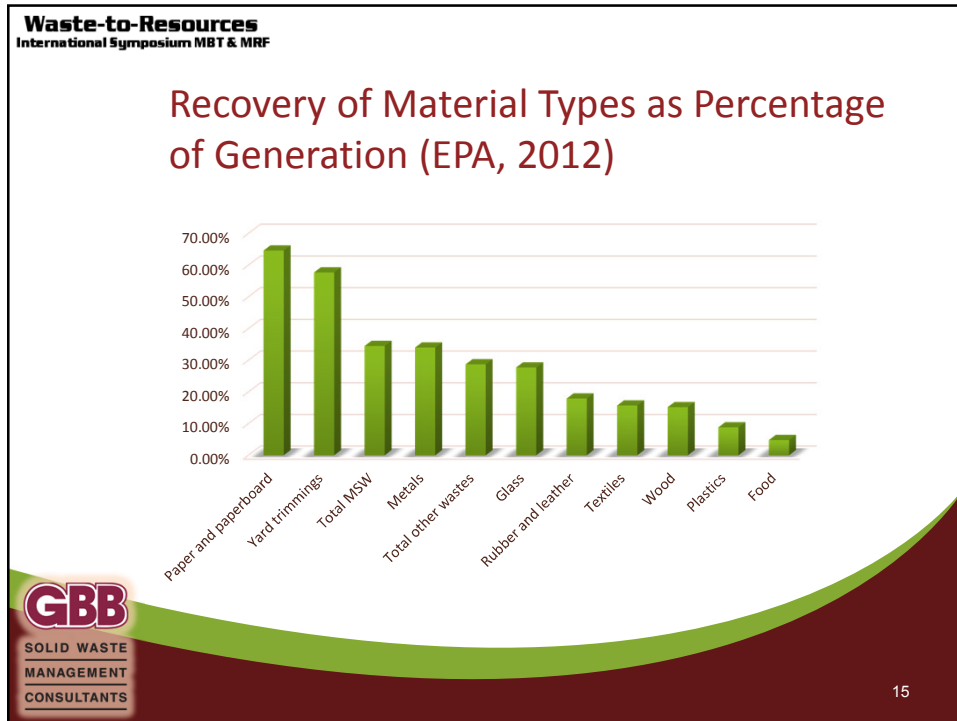
- In 1970, US relied on local scrap yards and waste paper dealers to receive and prepare materials for recycling
- Now, US also has MRFs:

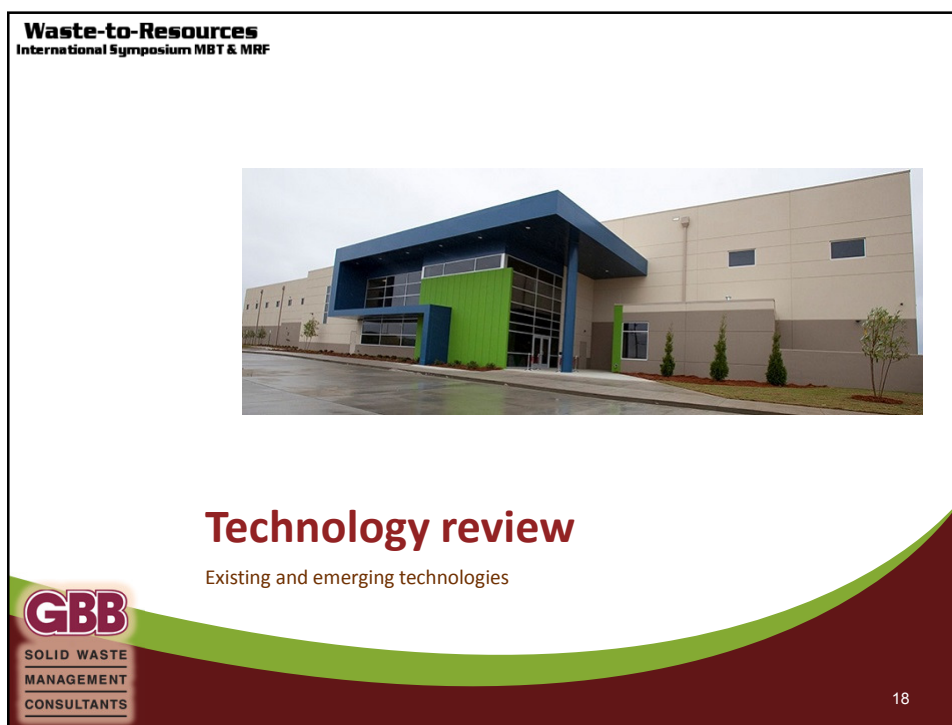
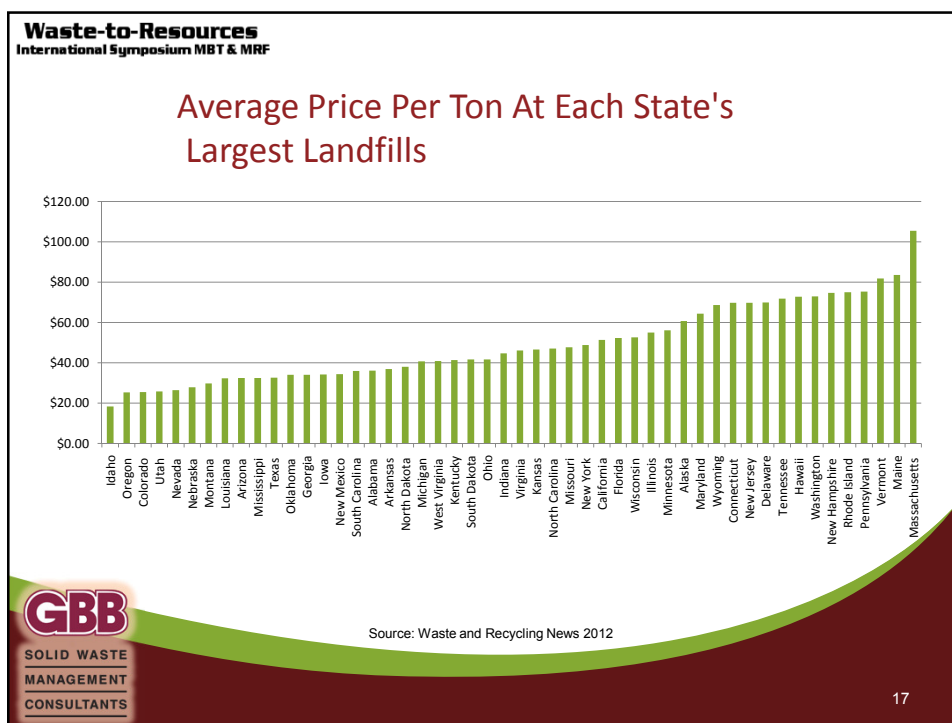
MRF Type	Number of MRFs	
Year:	2006	2012
Single Stream	144	263
Dual Stream	227	228
Source Separated, Other Programs	127	95
All MRFs	437	586

*Materials Recycling and Processing
in the United States (BERENYI, 2012)*

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WTE (mass burn) plants in the US

Status of WTE facilities	
Operating Facilities	80
Inactive Facilities	4
Total number of facilities	84
Facilities under construction	1




Hartford, CT (RDF dedicated boiler)



Alexandria, VA – Covanta (mass burn facility)

WTE facilities by Technology	
Mass Burn	64
Refuse Derived Fuel (RDF)	13
Modular	7

Source: Energy Recovery Council, 2014


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Anaerobic Digestion

- Currently most popular in the US
- 19 commercial plants operating in the US
- Feedstock: Commercial food waste, residential SSO, co-digestion at WWTP and farms



ZeroWaste[™]
ENERGY, LLC.
Recovery and Energy with Zero Waste



Anaergia



HARVEST[™]
Power of We[™]



EISENMANN



QWIS
Organic Waste Systems



quasar
energy group


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HARVEST™
Power of We™

- US company founded in 2008 in Waltham, MA
- Licensed European AD technologies
- More than 10 composting plants
- Three commercial AD plants
 - Richmond Energy Garden, Canada- 40,000 TPY of food and yard waste
 - London Ontario Energy Garden, Canada- 65,000 TPY of mixed organic waste
 - Energy Garden in Bay Lake, FL (Disney World) - 100,000 TPY of Mixed organic waste

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Richmond Energy Garden



London Energy Garden

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quasar
energy group

- US company established in 2006 in Cleveland, OH
- Initially European technology, now, more than 98% of the components are purchased in the U.S. and more than 76% of those are from Ohio-based companies
- Integrated Anaerobic Digestion System (iADs) is patent pending technology developed at Ohio State University
- Projects:
 - 11 operating commercial AD projects in the US
 - 2 commercial projects under development

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Cleveland, Ohio- 42,600 TPY of
Biosolids, FOG and food waste



Wooster, OH- 20,000 TPY,
Pumpable and high solids organic
biomass

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ZeroWaste™
ENERGY, LLC.
Recovery and Energy with Zero Waste

- US company based in Lafayette, CA
- Dry Anaerobic Digestion licensee for:
 - KompoFERM
 - SmartFERM
- Plants:
 - Monterey Regional Waste Management District- 5,000 TPY of food and green waste
 - City of San Jose (start-up November 2013)- 90,000 TPY of commercial food waste
 - Operator for Infinitus in Montgomery, AL
 - 6 plants under construction and development



Monterey, CA



San Jose, CA

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Gasification

- Emerging technology
- Partial combustion in an air-controlled environment
- Product: Syngas for production of electricity, chemicals/ fuels (ethanol)
- Feedstocks: MSW, biomass, medical waste,

Enerkem

Fulcrum BIOENERGY

INEOS Bio

IWT
INTERSTATE WASTE TECHNOLOGIES

SIERRA ENERGY


ALTER NRG

COVANTA CLEERGAS™


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- Commercial plant in Edmonton, Alberta- 10 million gal/year, start-up June 2014
 - City MSW Processing Facility with Vecoplan equipment prepares feedstock
- Commercial scale demonstration facility in Westbury, CA (since 2009, 1.3 million gallons/year)
- Pilot plant in Sherbrooke, CA (since 2003)
- Under development: Pontotoc, Mississippi and Varennes, Québec, each 10 million gal/year (MRF construction in 2015)



Edmonton Transfer conveyor between MSW processing and Enerkem Facility



Enerkem Edmonton Facility June 2014










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Pyrolysis

- Thermal conversion in the absence of oxygen
- Non-recyclable plastics to oils, fuels
- Plastics-to-Oil Technologies Alliance formed by ACC

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TRENDS, EXPECTATIONS, AND OPPORTUNITIES FOR THE FUTURE

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Technologies and Risk

Alternative	Risks/Liability	Risk Summary
Mass Burn Combustion	Proven commercial technology	Low
RDF Combustion	Proven technology; limited U.S. commercial experience	Moderate to Low
Anaerobic Digestion	Proven technology; limited U.S. commercial experience	Moderate to Low
Pyrolysis and Gasification	Previous failures at scale; no operating experience with large -scale operations in the U.S.; full-scale demonstrations nearing operation	High

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Source: Gershman, Brickner & Bratton, Inc. 2014

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Current Trends

- Conversion technologies are advancing
- Increased interest in mixed waste processing and MBT
- Single vs dual stream collection of recyclables
- Sustainability and zero waste
- Organics diversion and bans

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A Tale of Two "Cities"

- City of Montgomery, Alabama
- Medina County, Ohio

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Opinion of Trends for Future

More mixed waste processing (MBT is gaining interest)	"One-bin" approaches will be considered
Easier or cleaner recycling	Organics and AD

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Legislation and Regulations

Landfill bans for organics	Permitting for conversion technologies	Waste-to-Energy as "renewable"
Extended Producer Responsibility (EPR)	Biofuels	

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Questions and comments?

Thank you!!

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