

Waste to Energy Technologies

Presented by:

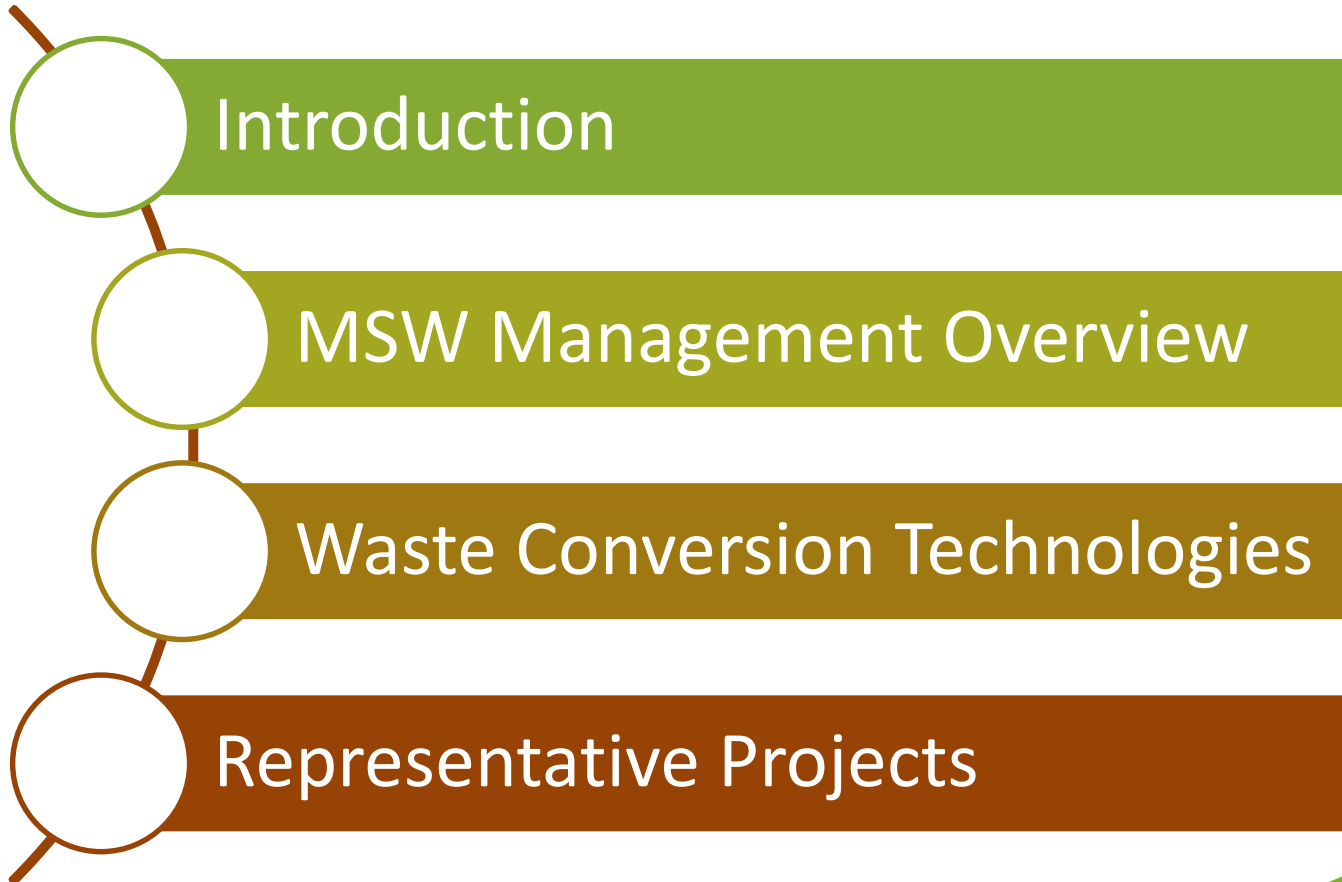
Stephen Simmons, Senior Vice President
Gershman, Brickner & Bratton, Inc. (GBB)

January 25, 2018



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Outline



INTRODUCTION



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Steve Simmons

- Senior Vice President and owner in GBB
- Over 35 years of experience in MSW and biomass conversion technologies
- Has developed, designed, built, and operated multiple waste conversion systems



Waste to Energy Facility Experience

- 15 years with the American Ref-Fuel Company (now a part of Covanta)
- Had a variety of engineering, project development and business management roles
 - ✓ Project Engineer for the American Ref-Fuel team that built the 2,750 tpd Essex County Facility
 - ✓ Business / P&L Manager of the 3,300 tpd Delaware Valley Facility



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's Waste Consulting Services

- Economic, technical and environmental reviews
- Procurements
- Due diligence third-party reviews
- Waste characterization and sourcing
- Process planning and conceptual designs
- Independent feasibility consultant



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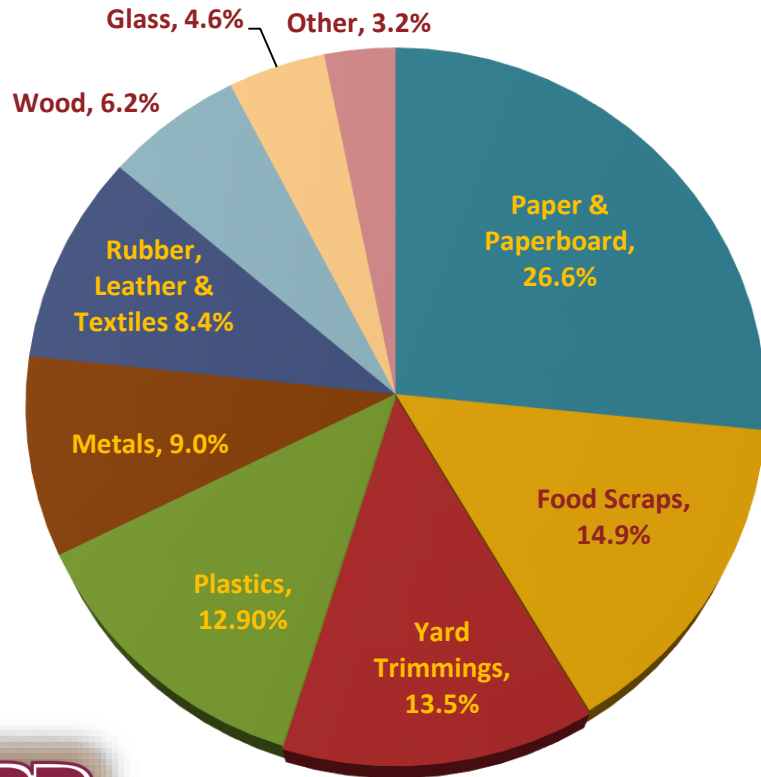
US MSW MANAGEMENT OVERVIEW



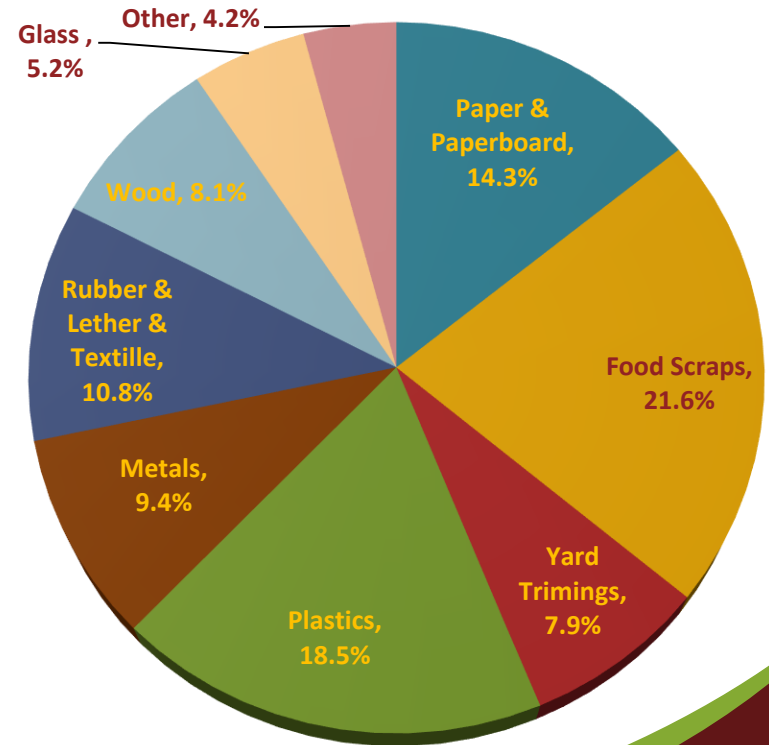
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MSW Composition

Composition of the MSW as generated, before recycling



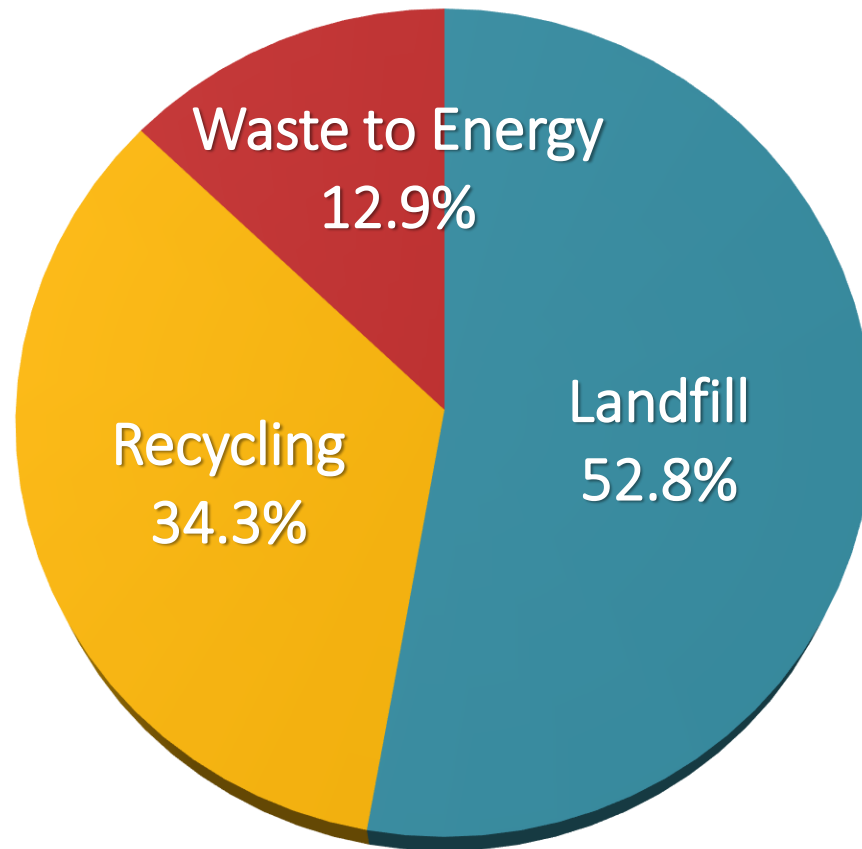
Composition of the MSW as disposed, after recycling and composting



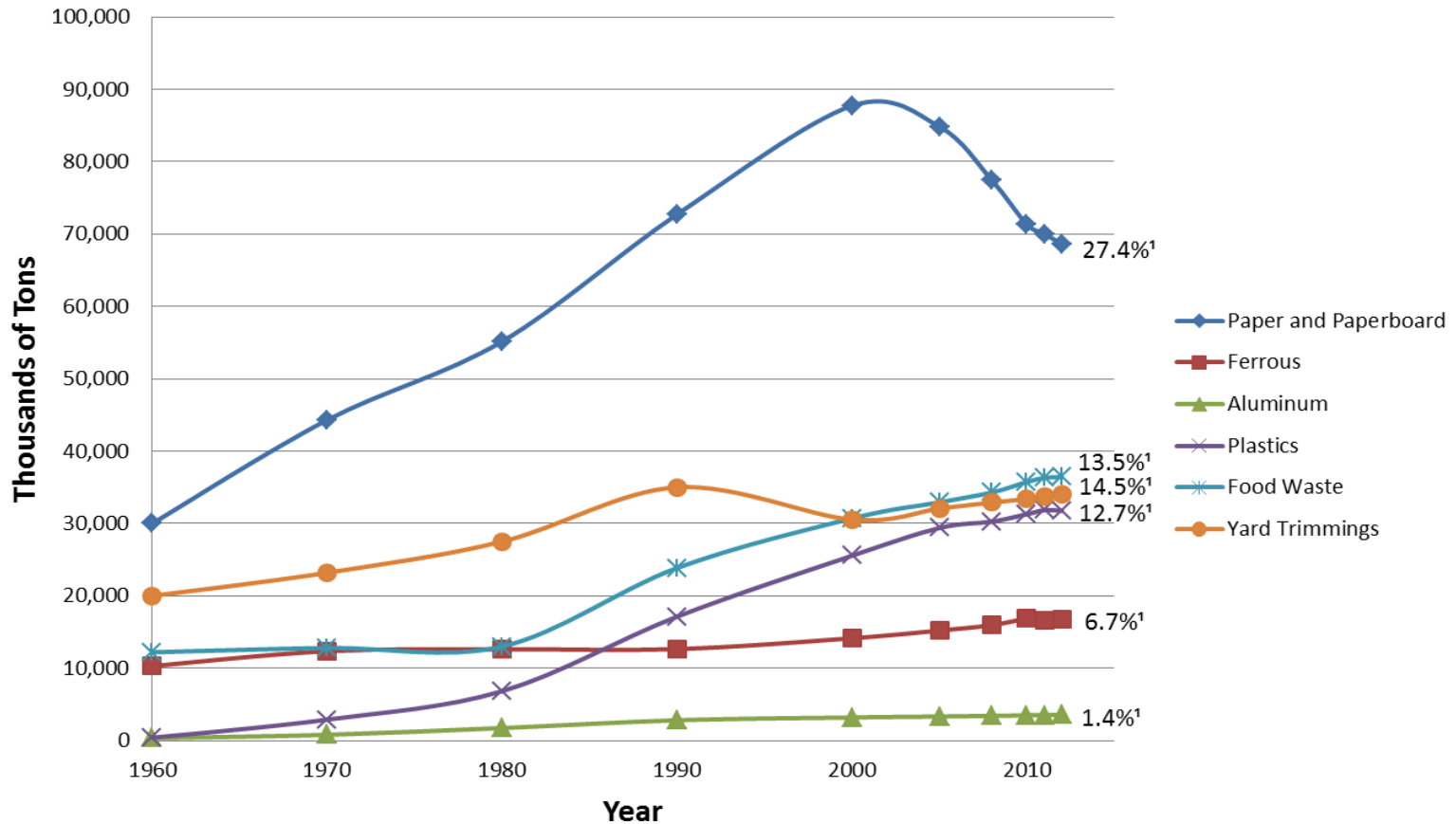
Source: US EPA, 2016 (2014 data)



MSW Disposal: Over 50% is Still Landfilled



History of US MSW Composition



Source: USEPA, 2013



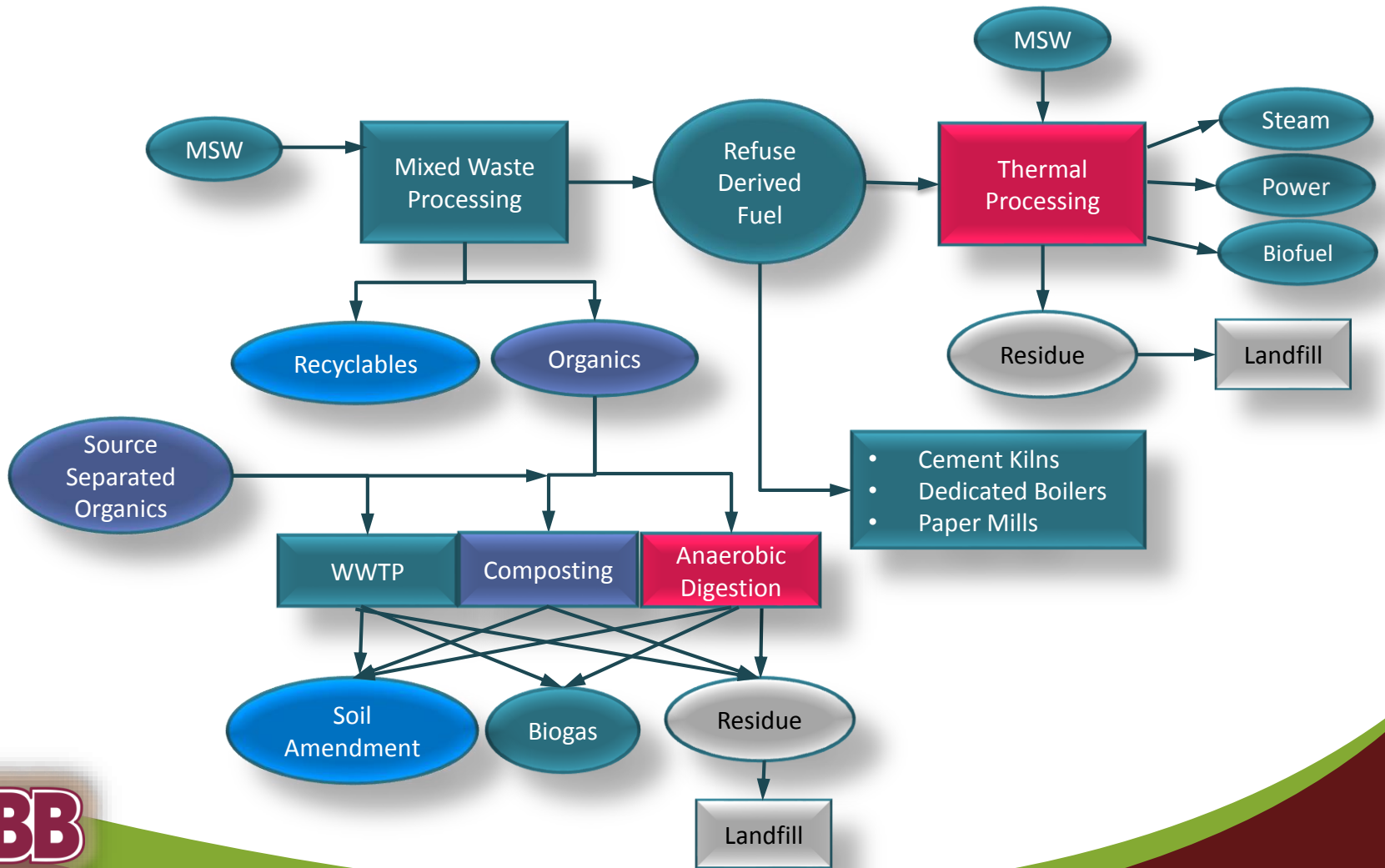
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MUNICIPAL SOLID WASTE CONVERSION TECHNOLOGIES



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MSW Processing Systems

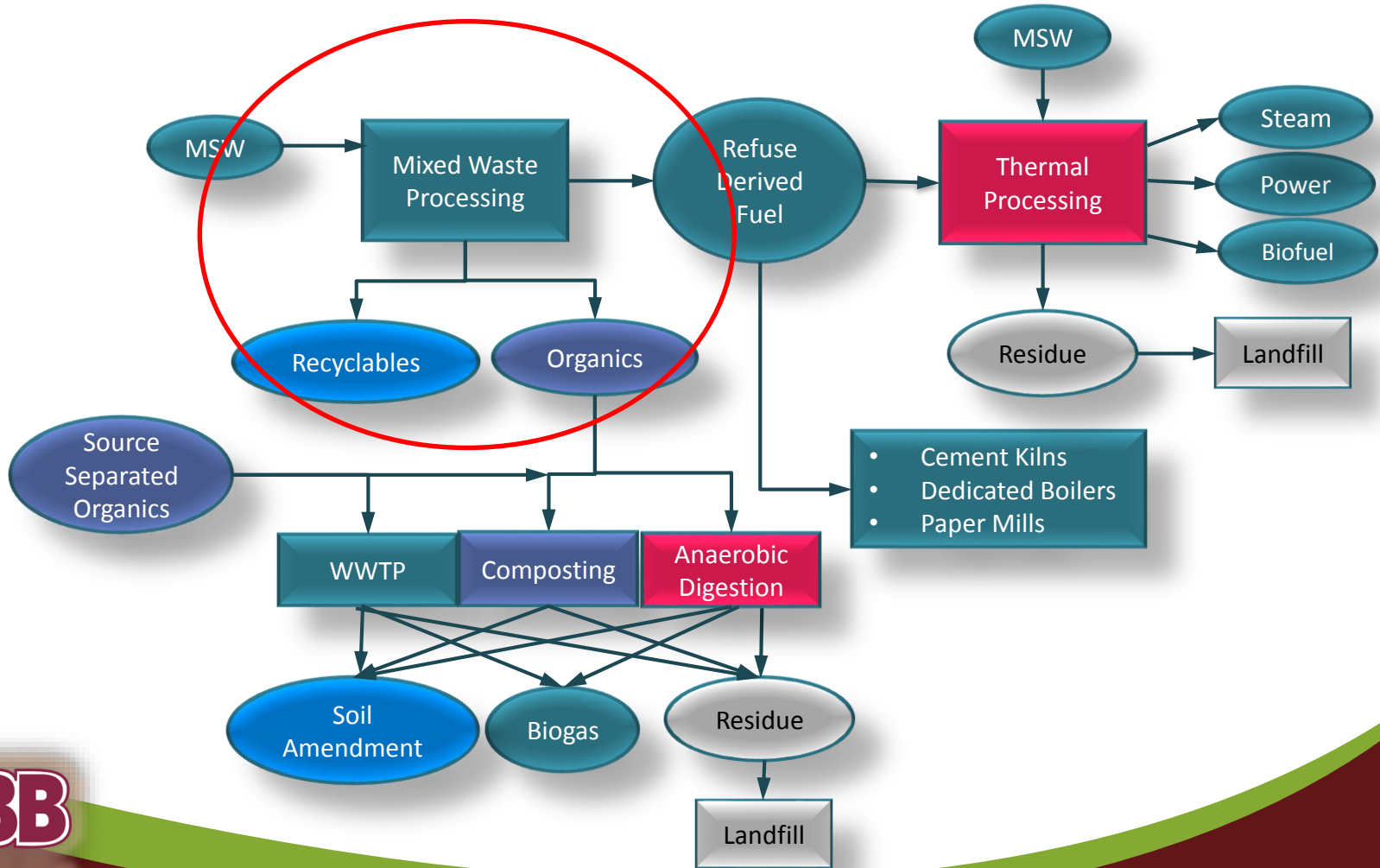


MIXED WASTE PROCESSING (MWP) TECHNOLOGIES

- Mixed Material Recovery Facilities
- Refuse Derived Fuel Facilities
- Mechanical Biological Treatment Approach



Advanced Systems Start with Waste Processing



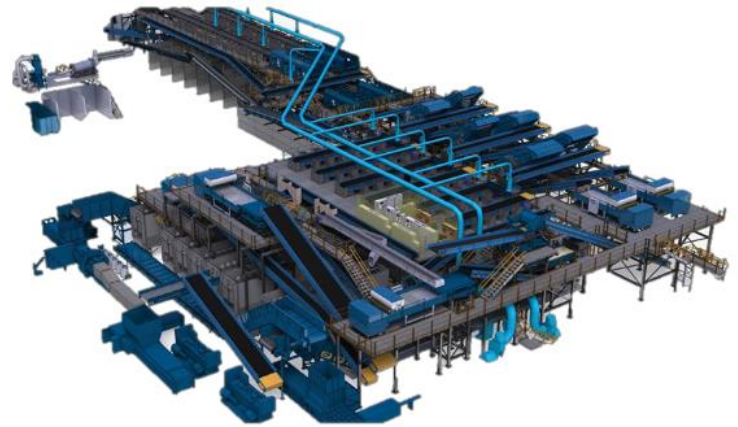
Mixed Waste Processing Facility

Recovers additional recyclables
from mixed waste

Focus on additional containers and
removal of organics

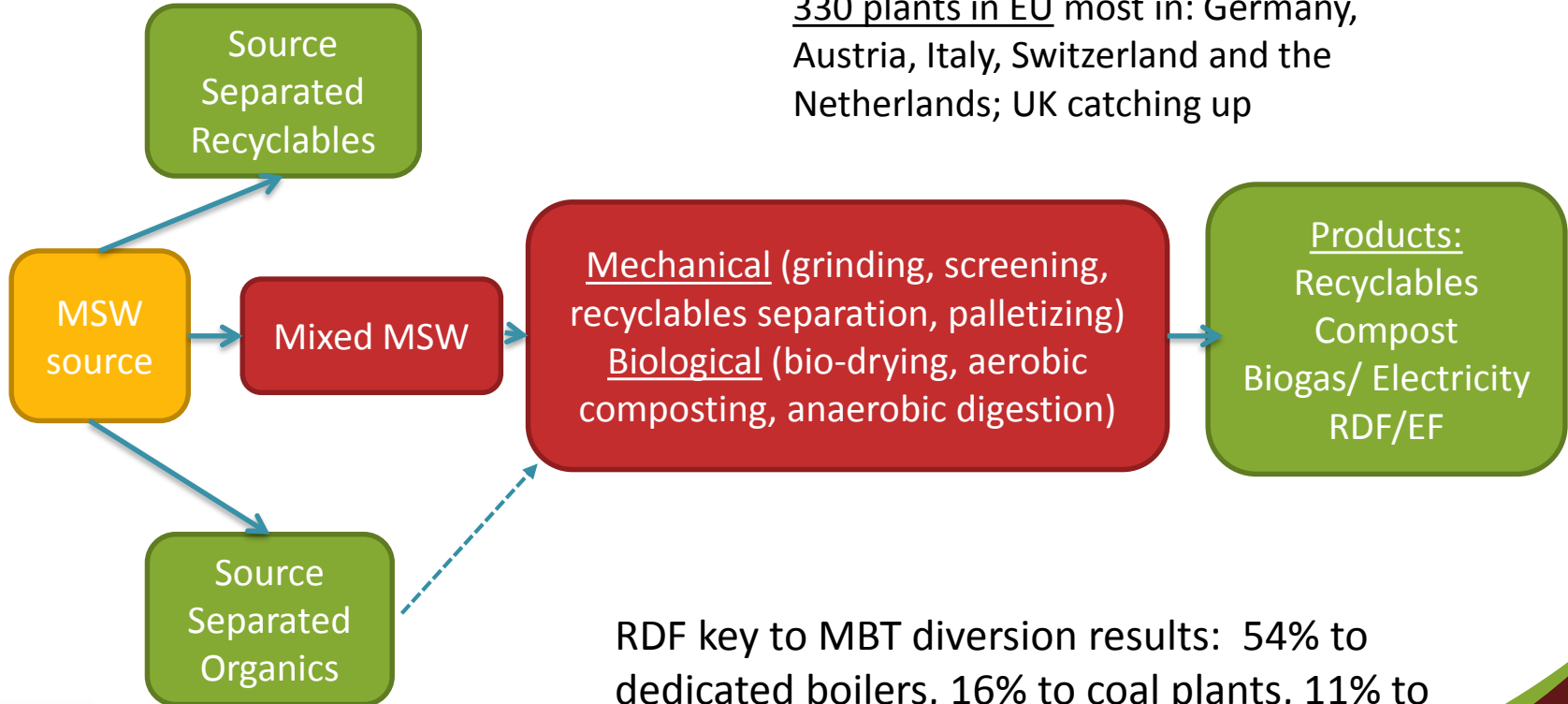
Best viewed as a complement to
single stream recycling, not a
replacement

Mechanical Biological Treatment
(MBT) Concept in Europe

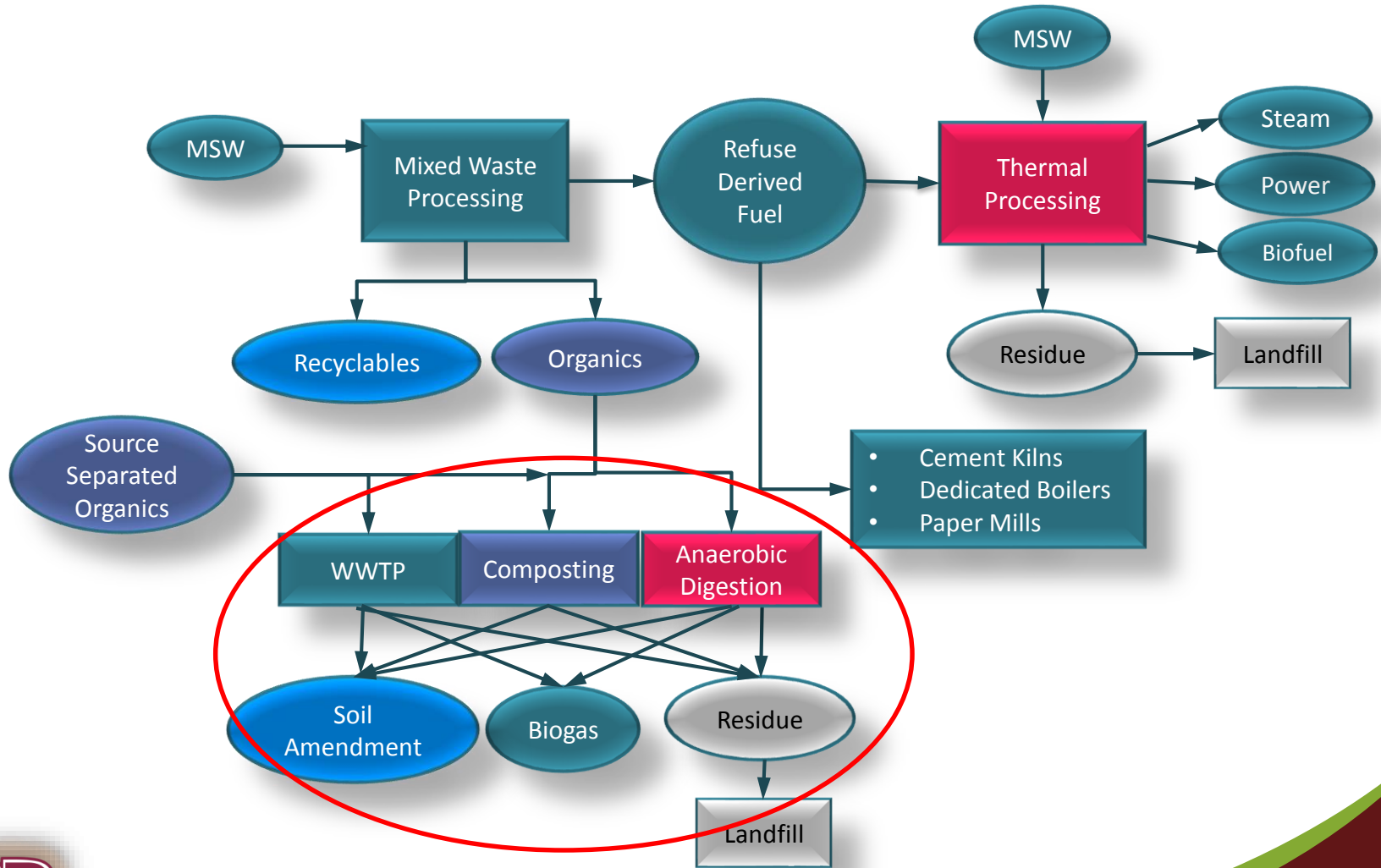


Mechanical Biological Treatment (MBT)

330 plants in EU most in: Germany, Austria, Italy, Switzerland and the Netherlands; UK catching up



RDF key to MBT diversion results: 54% to dedicated boilers, 16% to coal plants, 11% to cement kilns and 19% to others



Managing Organic Waste

Source Separated Organics



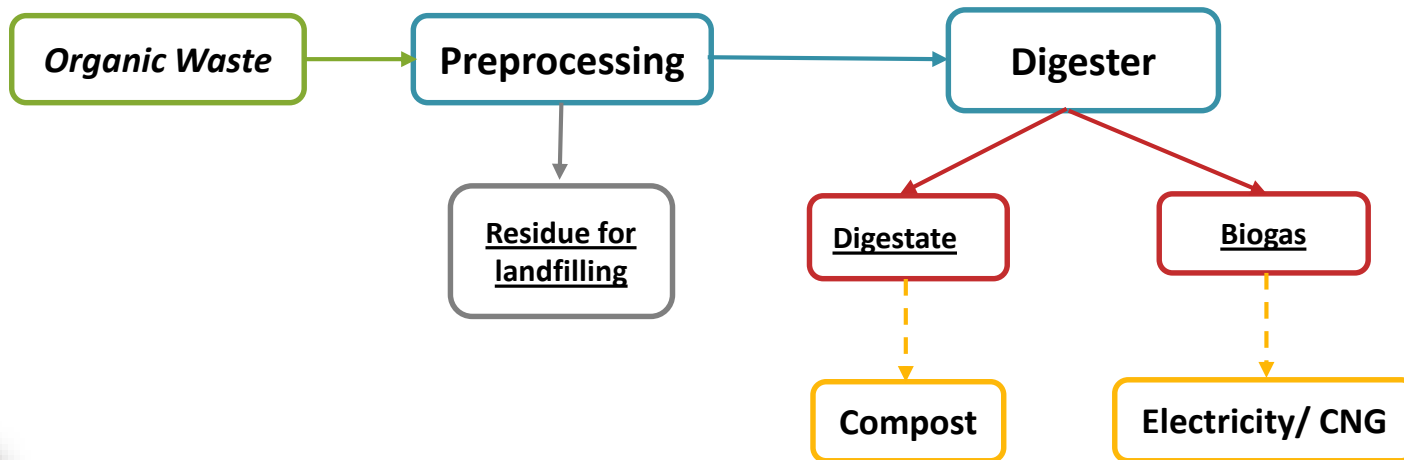
Aerobic
Composting



Anaerobic
Digestion

Anaerobic Digestion (AD)

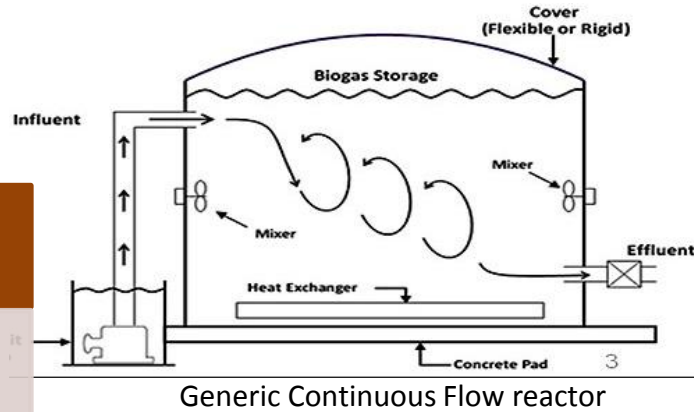
Decomposition of biodegradable waste in oxygen depleted conditions to biogas and solid residue (digestate)



Classification of AD Technologies

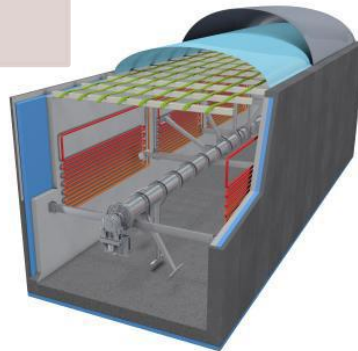
Feedstock Introduction

- Continuous flow
- Plug flow
- Batch



Solids Content

- Low Solids
 - Pumpable material (“wet”)
 - <15% Solids content
- High Solids
 - 25-30%- pumpable (“wet”)
 - >50%- stackable (“dry”)



Eisenmann Plug Flow Reactor



Zero Waste Energy Batch reactors

AD Feedstock

Grocers

Restaurants
and
Cafeterias

Urban
Farms

Food
Processing
Industries

Curbside
Collections



Source: Getty Images



Source: Seattle Public Utilities



BioMethane Application

IC Engine/Electricity
and Heat



Source: GBB Visit to Zero Waste –
Monterey, CA

Renewable Natural Gas
(RNG)



Source: CleanEnergy

Compost

Source Separated Organics

Maturing Windrows



Screened Final Compost



Source: GBB Visit to Zero Waste –
Monterey, CA

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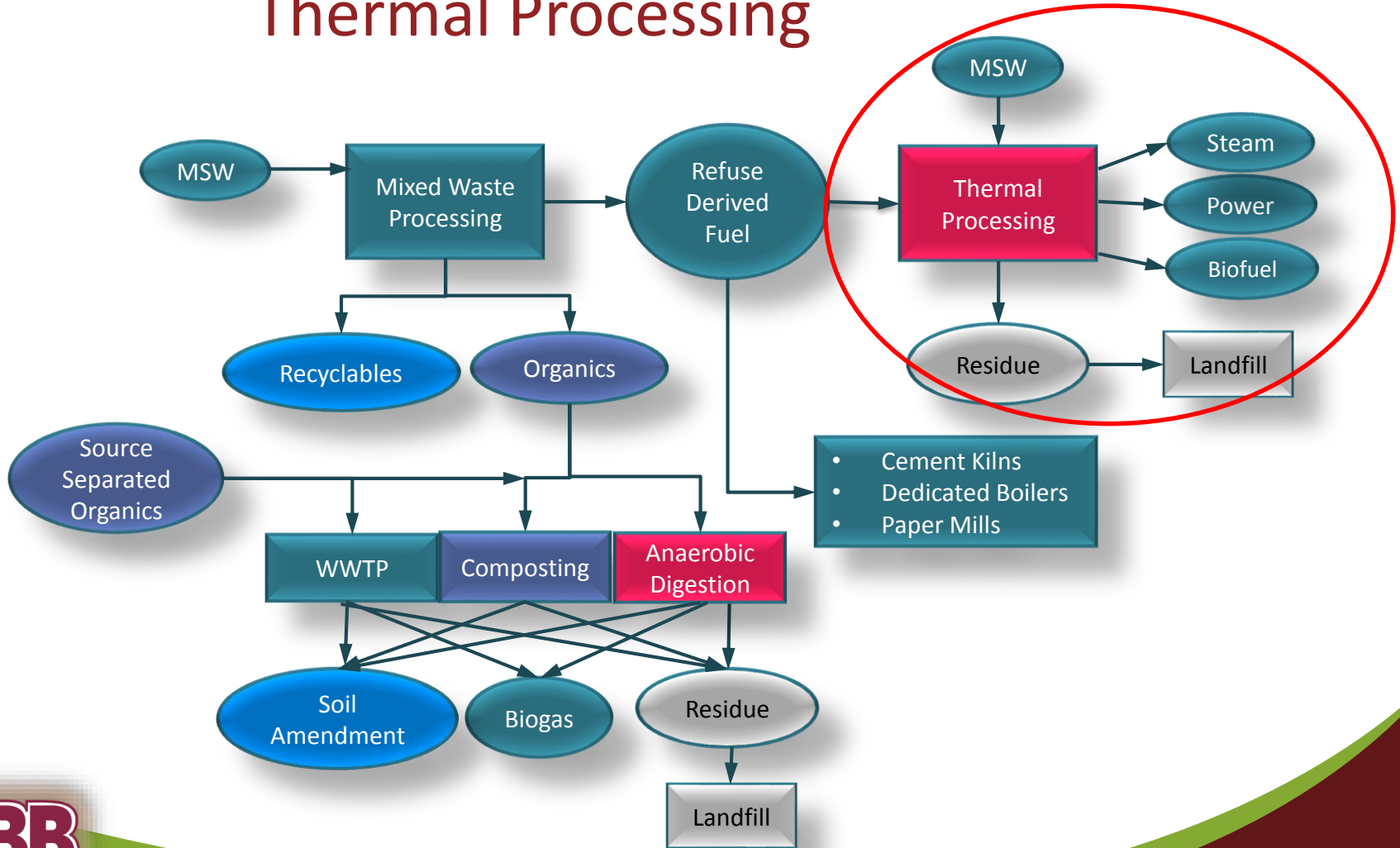
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THERMAL PROCESSING TECHNOLOGIES

- *Mass-Burn Combustion*
- *RDF Combustion*
- *Gasification*
- *Pyrolysis*

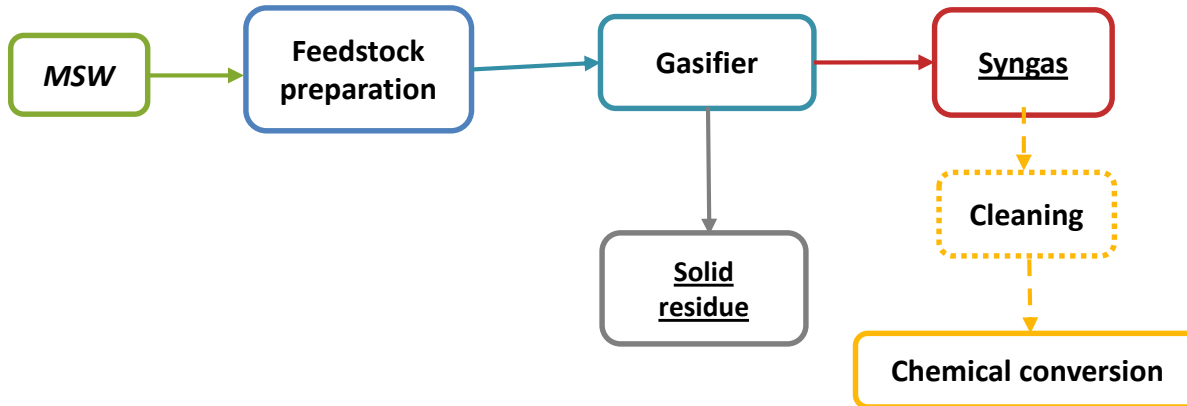


Thermal Processing

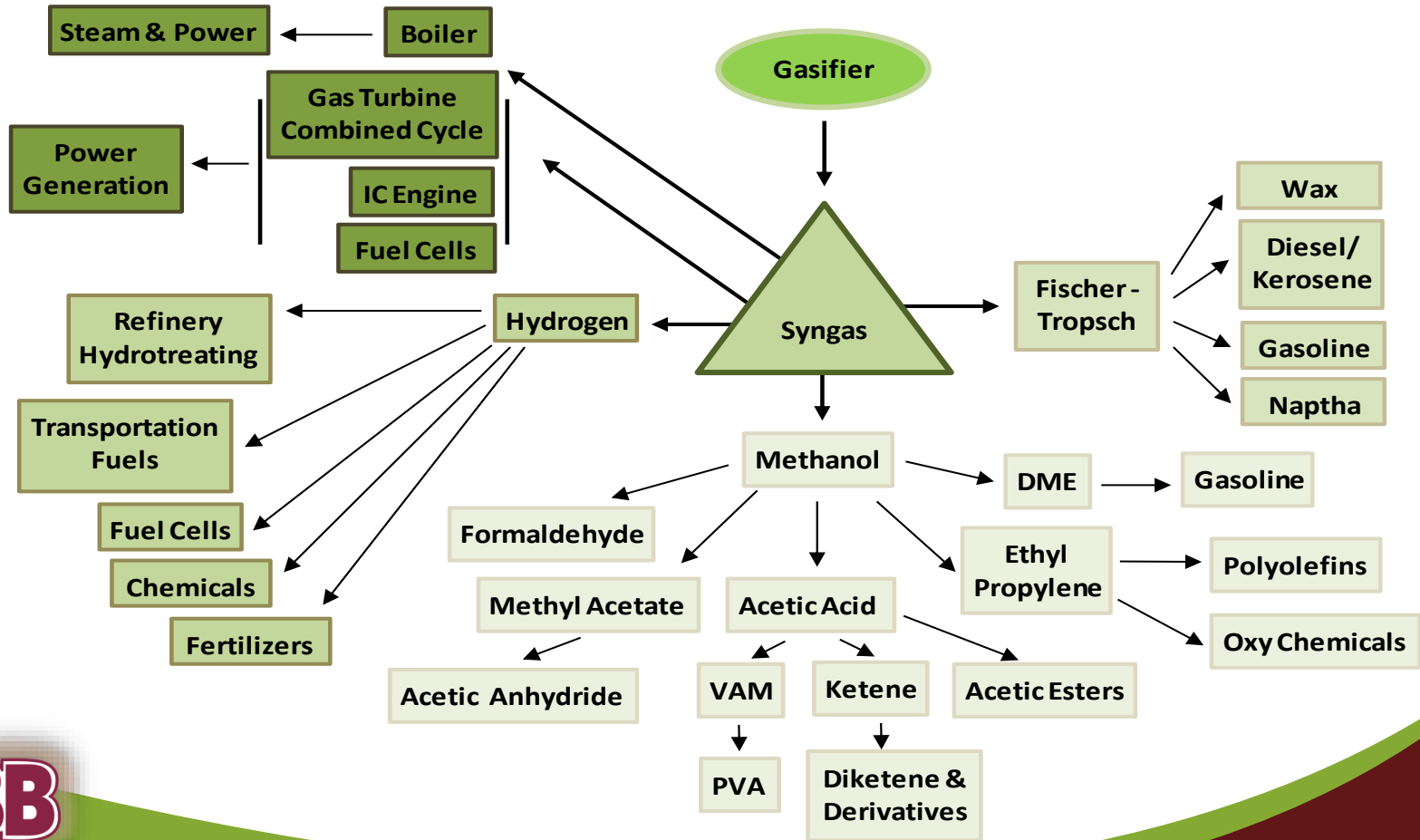


What is gasification?

Thermal conversion of organic or fossil fuel based carbonaceous materials into carbon monoxide, hydrogen and carbon dioxide in partial combustion with controlled amount of oxygen and/or steam.



Gasification Output Pathways



Edmonton

Waste-to-Biofuels Facility, Alberta, CA

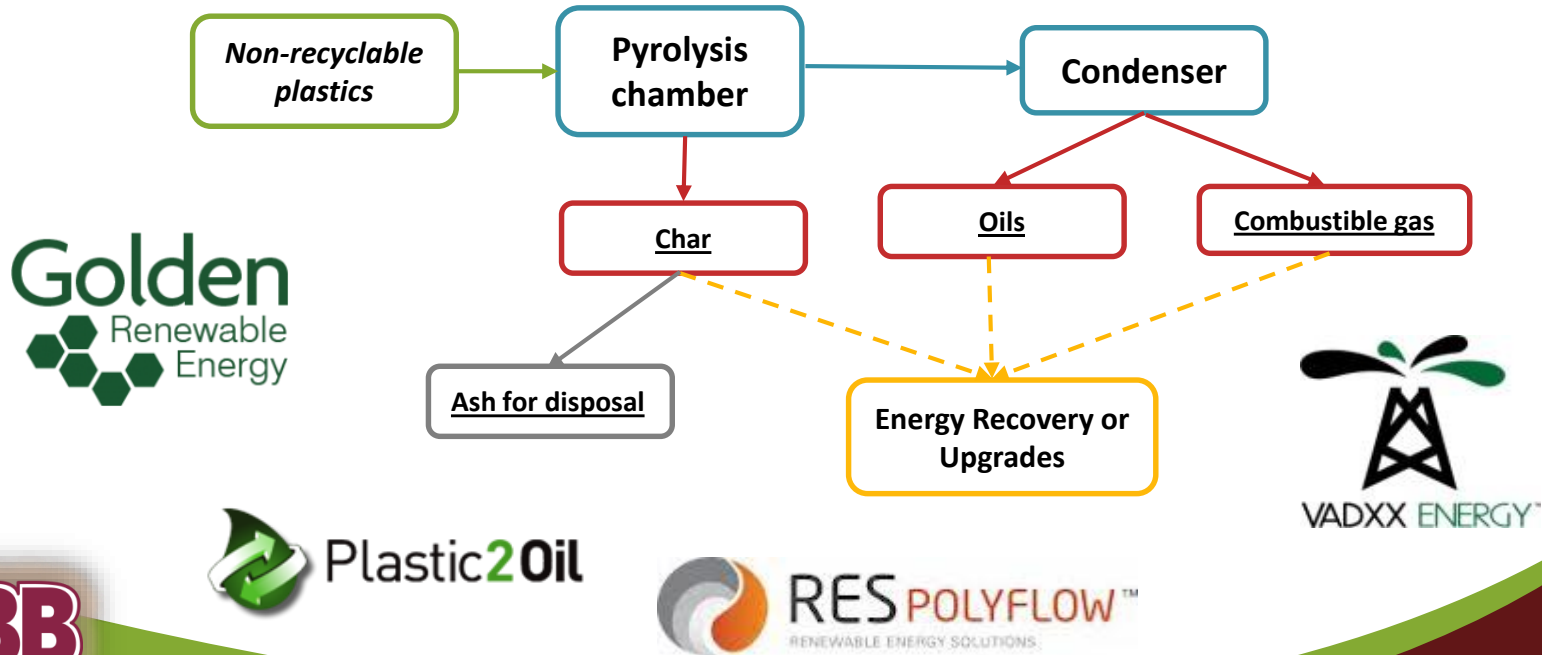
- 330 TPD refuse derived fuel
- 10 million gallons/year of ethanol
- Edmonton Waste Management Centre:
 - Refuse Derived Fuel Facility
 - Enerkem Waste-to-Biofuels Facility
 - Advanced Energy Research Facility



Source: SWANA Northern Lights 2013, Bud Latta,
Processing and Disposal Waste Management
Services, City of Edmonton

Pyrolysis Process

Thermal processing of non-recyclable plastics in oxygen-free high temperature chamber to be made into a crude oil like fuel and synthetic gas.



Newest Traditional WTE: Solid Waste Authority of Palm Beach County, FL



- 3,000 TPD Mass Burn facility (1,040,000 TPY)
- Babcock & Wilcox
- 130 MW renewable power; enough for over 86,000 houses
- \$668 million construction price
- \$20.5 million first year O&M cost
- Advanced emissions controls, ferrous and non-ferrous metals recovery



Copenhagen, Denmark – Ski Slope Plant



- 400,000 TPY
- Electricity and steam for district heating

REPRESENTATIVE PROJECTS






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Metlakatla Indian Community Small Scale Waste to Energy Facility

Phase 1: Evaluated three technical solutions

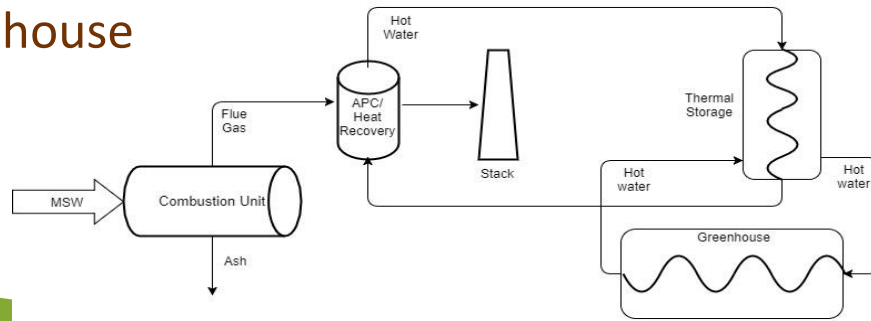


-  Waste-to-Electricity
-  Waste-to-Heat
-  Off-Island Disposal

Phase 2: WTE development

-  Project Renderings
-  Project Economics
-  Architectural Rendering
-  Detailed site plan
-  Environmental Critical Issues and Permits

Phase 3: Beneficial use of heat options: greenhouse & biomass drying



Mesa Grande Band of Mission Indians Conceptual Study for a Biomass Facility

Ongoing/
by the end
of 2017

- Conceptual Study
- Feedstock Procurement Plan
- Compost market study

2018

- RFIQ
- Identify the best applicable AD & Composting technologies
- Business Plan
- Preliminary design and renderings of the facility
- Project Implementation Strategy

2019

- Final “go” - “no go” decision



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Us District Court - Guam Consent Decree

- Appointed Receiver of Solid Waste Program on Guam
- Managed Entire Solid Waste System and Engineered 180° Turnaround for island – population 165,000
- Created a self-sustaining system based on Revenue
- Opened first Landfill on island – Subtitle D
- Closed violating 70 year old open dump
- Renovated Residential/Convenience Centers
- Provided all coordination management with Region 9 EPA



Guam - Closed Ordot Dump



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2016-01-18

Guam – New Subtitle D Landfill



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Guam – New Citizen Convenience Centers



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Thank You

Steve Simmons: ssimmons@gbbinc.com
(610) 742.4611



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