Overview of Best Management Practices in Conversion Technologies

Presented by:

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Overview of Presentation

• International Reference BMPs Facilities
  – Proven Technologies Exist

• Integrated Solid Waste Management (ISM)
  – Systems Approach for Robust Infrastructure

• What Will It Take to Build BMP Reference Facilities in California?
  – Industry / Government Collaboration
  – Government Leadership to Build Infrastructure
European Union
Envac System (Madrid, Spain)
Surge Storage Area (Under Disposal Port)
Central Collection / Pneumatics
EveRe (France) Integrated MSW Treatment Facility

Reception - Sorting - Methanization - Composting Process

Energy Recovery Unit Bunker

To landfill plant

Industrial sewage plant

Structuring element

Composting

Trommel

Compost
EveRe Community Viewing Walkway
Rail Container Unloading Center
EveRe Facility (France)
Bio-Gas Internal Combustion Engine
In-Building Aerobic Composting
Biofilter
EveRe Aerobic Composting and Biofilter
WTE Control Room (Madrid)
Real Time Emission Monitoring (Madrid, Spain)
Yokohama City, JFE WTE Facility
Yokohama City, JFE WTE Facility
Tipping Area, Yokohama City WTE Facility
Facility Entrance...!
Community-Based Facility
“No Shoes” in Control Room
Community Swimming Pool
Community Thrift Store
Tipping Floor (Ebara Gasification Facility)
Reverse Auction of Donated / Repaired Furniture
Community Tea Room
Reuse / Remanufacturing
Bioenergy (Foodwaste Processing) Facility, Japan
C & D Recycling Facility
Washing Machine Recycling Facility
Recycled PET Flakes
JFE/ Eco-Frontier (Kasama, Japan)
Molten Slag (JFE Gasifier, Japan)
Products from Bottom Ash (Japan)
Medical Waste Feed System
10-Tier Medical Waste Feed/Storage System
Treated Red Bag Waste at California Landfill
Combination of MSW and Sewage
(Energy Efficiency Improvement)

- MSW
- Kitchen Waste
- Sewage

Waste to Energy

Steam Turbine Generator

Turbine Exhaust Condenser

Sludge Dryer

Bio Gas

Gas Holder

Sewage

Digester Tank

Sludge

Digestive Sludge

Sludge Fuel

Treated Water

Waste Heat

Steam
Fukuyama Regional RDF Gasification Facility

1. Plant Outline

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Furnace Type</td>
<td>JFE High Temperature Gasifying and Direct Melting Furnace</td>
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<tr>
<td>Plant Capacity</td>
<td>314 t/d</td>
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<tr>
<td>Fuel</td>
<td>Pelletized RDF (18.2 MJ/kg)</td>
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<tr>
<td>Power Generation</td>
<td>20 MW</td>
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<tr>
<td>Boiler</td>
<td>Natural Circulation / Tail End Type (6.0 MPa / 450 deg-C @ SH outlet)</td>
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<tr>
<td>Exhaust Gas Control</td>
<td>Slaked Lime and Activated Carbon Injection, Bag Filter, Cathartic Reactor</td>
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<tr>
<td>Site Area</td>
<td>26,000 m² (approx. 6.5 acre)</td>
</tr>
</tbody>
</table>

2. Waste to Energy System in Large Region

Fukuyama City and 8 neighboring municipalities participate in this scheme.
Extensive Source Separation of Recyclables
Example of Japanese Recycling Program

“Social Processing”
Extensive Source Separation of Recyclables
Extensive “Pre-Processing” at Source
Source Separated Food Waste Collection Program (Taiwan)
Bali Incinerator, Taiwan (I.M. Pei)
Combination of Programs / Policies to Achieve Minimum Disposal at Landfills

- Maximize waste prevention, recycling, and composting
- Anaerobically digest remaining decomposable fraction
- Convert residuals to energy or fuels, and recycle/convert ash
Integrated MRF with Conversion Technology

- **PRE-PROCESSING**
  - Dry Fraction
  - Wet Fraction

- **ANAEROBIC DIGESTION**
  - Digestate
  - Biogas

- **COMPOSTING**
- **BIOGAS (CHP ICE or BOILER)**
  - Energy
  - Compost
  - Ash

- **THERMAL GASIFICATION**
  - Energy
  - Metallic Slag
  - Vitrified Slag

- **Non-Acceptable / Non-Processable Materials**
- **Recyclables**
- **Landfill Disposal**
FCV – Fuel Cell Concept Car
Municipal Solid Waste to Renewable Hydrogen

Sort and Process MSW to Optimize Feedstock

- Readily Available (+)
- Environmentally Beneficial (+)
- Inexpensive Feedstock (++)
- Widely Varied Composition (-)
- Known Technologies / Processes (+)
- Requires Tailoring to Feedstock & Type of CT (-)

Conversion Technologies (CT)

- Proven Technologies (+)
- Used Worldwide (+)
- Few US MSW Applications (-)
- Requires Development (-)

Residuals: Slag, CO₂, etc….

- Renewable H₂ (+)
- Renewable FCV Fuel (+)
- Replicability (+)
- Requires Development (-)

Distribute, Compress, & Dispense

- Recovered Recyclables
- Compostables
- Compost
- Digestate

Anaerobic Digestion

Biogas Process and Clean

Gasification / Pyrolysis

Syngas Process and Clean

H₂
SYSTEMS ENGINEERING BASED APPROACH TO INTEGRATED WASTE MANAGEMENT PLANNING

START

Existing Infrastructure

Master Plan

Optimum Way to Achieve Goals

FINISH

Zero Waste Goals

<10% Disposal
Assess and Optimize Existing Infrastructure

SOFT INFRASTRUCTURE:
Expand Existing Programs
Implement New Policies
Implement New Programs

HARD INFRASTRUCTURE:
Upgrade Existing Facilities
Expand Existing Facilities
Develop Integrated MRF w/CT

Zero Waste Goals
<10% Disposal
ROLE OF THE INTEGRATED MRF WITH CONVERSION TECHNOLOGY

- Optimize Existing Infrastructure
- New Programs and Policies
  - Reduction
  - Education
  - Outreach
  - Tech Assistance
  - Policies
  - Bans
  - Wet/Dry System Enforcement
- Integrated MRF with Conversion Technology
  - EcoPark Concept

NEW DIVERSION

DISPOSAL

FINISH

Zero Waste Goals

<10% Disposal
Building the Infrastructure

• Collaboration of Industry and Government
• Role of Government and Political Leadership
  – Life-Cycle / Systems Engineering Approach
  – Create Robust / Flexible Infrastructure
• Create the Supporting Infrastructure
• Invest / Encourage Innovation
• Paying the True Costs
• Role of Education
• Focus on Protection of Public Health and Protection of the Environment
ACHIEVING YOUR “VISION”
Building a Robust IWM Infrastructure

Industry/Government Collaboration

Governance (Government Leadership)

Kaizen  (Continuous Improvement...there is no “Best”, .... commit to continuously making it better)

Character is Defined by Your Actions
PASSION AND / OR INSANITY ?
Can You Save Landfill Space By Using Your Leftovers?

By Terri Tseng
What I Want out of Life

I figure that life is very precious so I want to make the most of it. I have a long list of things I want to be but I will write down the ones that I want the most. First I want to be an astronomer. Second I want to be a writer. Third I want to be a scientist developing new software and computer parts. But one thing is for sure. I DO NOT want to be an environmentalist that jumps in the dumpsters and sorts out the trash like my dad!

So far I have read a lot of books from most categories that I know pretty much about the jobs I described in the first paragraph. I am very happy that I have already won a writing contest.

I like classical music and play the piano. I know I do not seem like Joe Average, but that’s just me. I plan on getting a nice and cozy house just like the one I live in now. One goal that I have is to be happy, healthy and live to an old age.

I hope to have contributed to my community and the world by preventing asteroid impact, bringing laughter to homes and by making things in life more efficient before I die.
THANK YOU!

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