Integrated Waste Management in The U.S. and The Role of Alternative Technologies For Energy Recovery

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Overview Of Presentation

• Integrated Waste Management
• Basis For Energy Recovery Studies
• Examination and Implementation(?) Of Alternative Technologies: A Brief Review Of Past Studies And Lessons Learned: A Personal Odyssey
• The Future: Some Thoughts
Basis For Energy Recovery Studies

- The conservation of a limited resource; namely, petroleum based hydrocarbons
- Unnecessary waste of resources, such as the loss of methane in uncontrolled landfills
Examination and Implementation(?) of Alternative Waste-to-Energy Technologies

- Gasification Studies
- High Solids Anaerobic Digestion
- Gas Recovery From Landfills
- Landfill Bioreactors
- Co-Digestion With Wastewater Treatment Plant Sludge

Overview of Gasification Reactor
Interior View of Gasification Reactor

Densified Refuse Derived Fuel (dRDF)
Feeding Gasification Reactor

Starting The Gasifier
Lesson Learned

1. Able to operate process to meet U.S. EPA emission standards
2. With a change in EPA administration, process fell off the radar screen
3. Received congratulatory note on success of project
4. Final report filed, never to see the light of day
Modeling Gas Recovery From Landfills

- Objective: Maximize energy and emissions recovery from landfills
- Examine practice of using vertical and horizontal gas recovery wells

Landfill Gas Recovery Using Vertical Wells
Landfill Gas Recovery Using Horizontal Wells

Modeling Gas Recovery From Landfills

CLAY CAP, NO LINER
PERIPHERAL WELLS
EVERY 100 FEET
Lesson Learned

1. Use of horizontal extraction wells superior with respect to energy recovery as compared to use of vertical wells, drilled after landfill completed
2. Vertical well drilling technology well established – no interest in different approach to gas recovery
3. Few landfill operators adopted practice
Flow Diagram For High-Solids Anaerobic Composting Process

Overview of Anaerobic Digestion Facilities
Front View of Anaerobic Digester

Back View of Anaerobic Digester
Feeding Anaerobic Digester

Typical Digester Feedstock And Product
Digested Sludge After One Day

Transferring Sludge to Dryer
Aerobically Dried Sludge

Vegetation Plot With Dried Digested Sludge
Lesson Learned

1. Learned how to operate process effectively and how to design workable mechanical mixing system
2. Secure landfill opens in Nevada accepting waste at a charge of $10/ton. As a result, interest in high-solids anaerobic composting disappears
3. Reports prepared and papers presented, but no further funding. Process on hold
Lesson Learned

1. Process is feasible and implementable, but costly
2. Maintaining optimum conditions for anaerobic conversion more difficult than originally anticipated
3. More suitable for boutique landfills

Digestion Of Organic Fraction Of MSW
Co-digestion of Wastewater Sludge And Organic Fraction of MSW

Typical Anaerobic Digestion Facilities
Preliminary Findings

1. Process is technically feasible
2. Addition of organic fraction of MSW serves to dilute metal content of sludge.
3. Presence of endocrine disrupters and similar compounds may limit land application of sludge
The Future: Some Thoughts

• As petroleum prices continue to increase and available supplies are depleted, waste-to-energy technologies will come into their own.
• A window of opportunity will become available for alternative waste-to-energy technologies.
• To be prepared when the window of opportunity presents itself, continued research must be carried out now on a variety of waste-to-energy technologies, so that answers to critical questions will be available.

The Future: A Final Thought

As an educator, I could not close without saying that we must all continue to seek funding for the study and implementation of waste-to-energy technologies to help foster a more sustainable policy for the utilization of petroleum based energy, a limited resource.
THANK YOU
FOR LISTENING