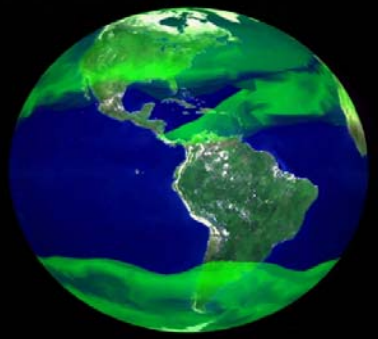


US Environmental Protection Agency

Bioreactor Workshop

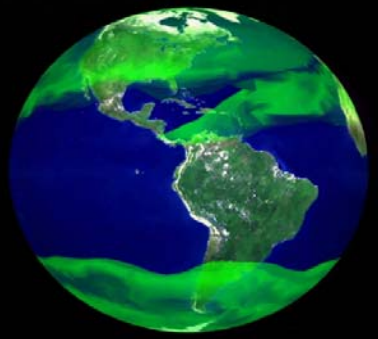
Alexandria Virginia • February 27, 2003

Bioreactors

A Public Perspective

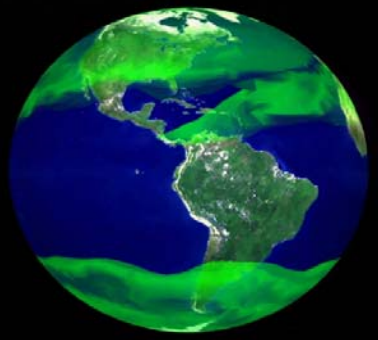
by Peter Anderson, President

RecycleWorlds Consulting



Major points

- The search for bioreactors cannot be separated from the failure of dry tomb landfills
- We need to undertake and finance corrective action for almost 10,000 legacy landfills before worrying about hundreds of impending bioreactor landfill applications
- No one has yet to demonstrate that it is possible to safely manage decomposable material in the ground.
- EPA's own integrated waste hierarchy dictates that expanded composting be given priority consideration over bioreactor landfills for handling the problematic organic fraction of waste.

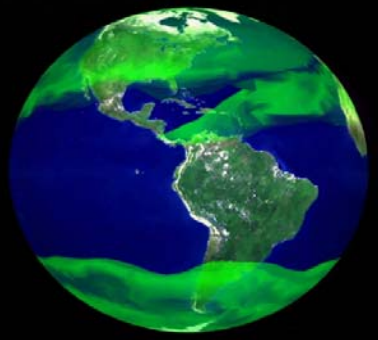


Why are we here …

- To tweak perfectly adequate landfill regulations

OR

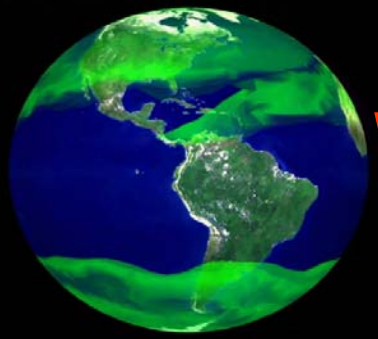
- To attempt to overhaul a fundamentally flawed approach?



Dry Tomb Landfills

What's the difference?

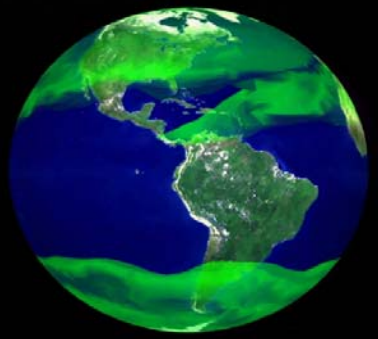
As much as a hundred billion dollars in clean up costs that must be accounted for!



What is EPA's stated policy for its rules?

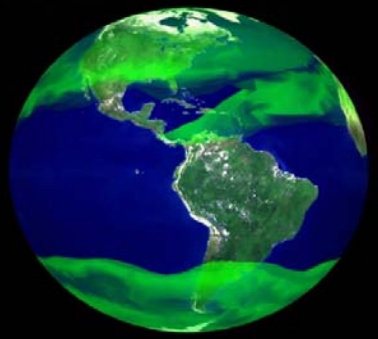
- "Washington should use its authority to set high standards – tough standards – for environmental protection. We should use strong science and solid analysis to set standards that will result in cleaner air, purer water, and better protected land."

EPA Administrator Christine Todd Whitman
as quoted in *Fall 2002 Regulatory Plan*



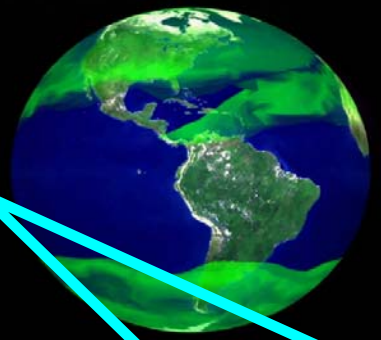
Flaws in Subtitle D

- Legacy landfills
- Small generator exception
- Barrier systems
- Large size
- Gas extraction
- Monitoring
- Financial assurance
- Post closure



What's good about bioreactors?

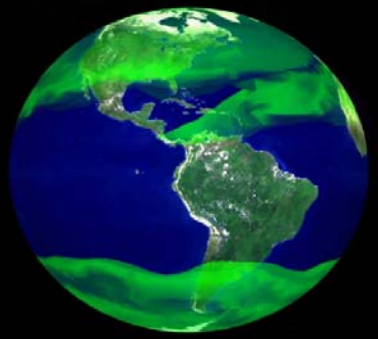
- Reverses flawed strategy for managing organic wastes in the ground and acknowledges the fatal problem with dry tomb landfills.
- Efforts to accelerate decomposition are an attempt to address the major problem with dry tombs.
- The centuries-long period when decomposition should be monitored may be partially reduced
- Recirculation can improve leachate quality
- Second wave gas emissions, during which there is no capture, should be less than in dry tomb landfills



Bioreactors

Then what's the problem?

- Cost Collar
  - The design specs are being set with a cost collar to be built and operated "on the cheap" and not increase net costs.



Then what's the problem?

(cont.)

Cost collar-*more*

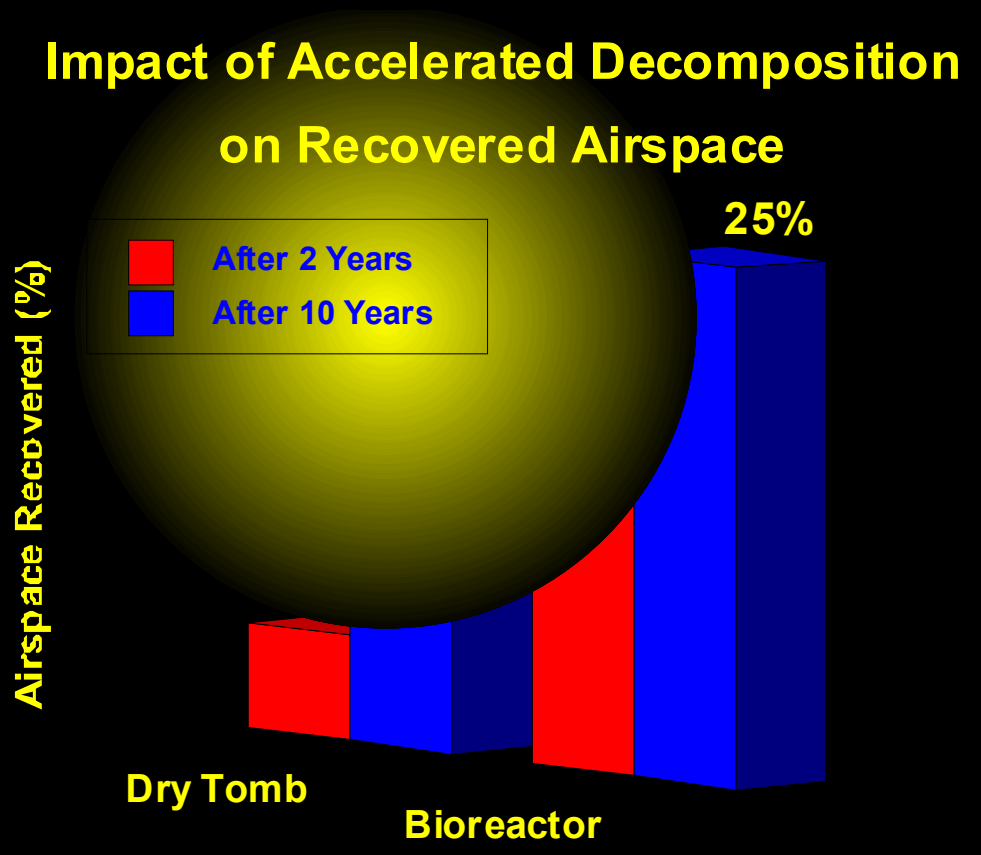
"[T]hese are some of the benefits and risks [of bioreactors] that have been intentionally excluded ... Change in slope construction from 3:1 to as much as 4:1 and the resulting loss of airspace."

Gary Hater, Economics of Eight Scenarios for Landfill Bioreactors as Compared to a Base Case Subtitle D Landfill (WasteTech 2001) (Feb. 13 2001), at p. 10.

Then what's the problem?

(cont.)

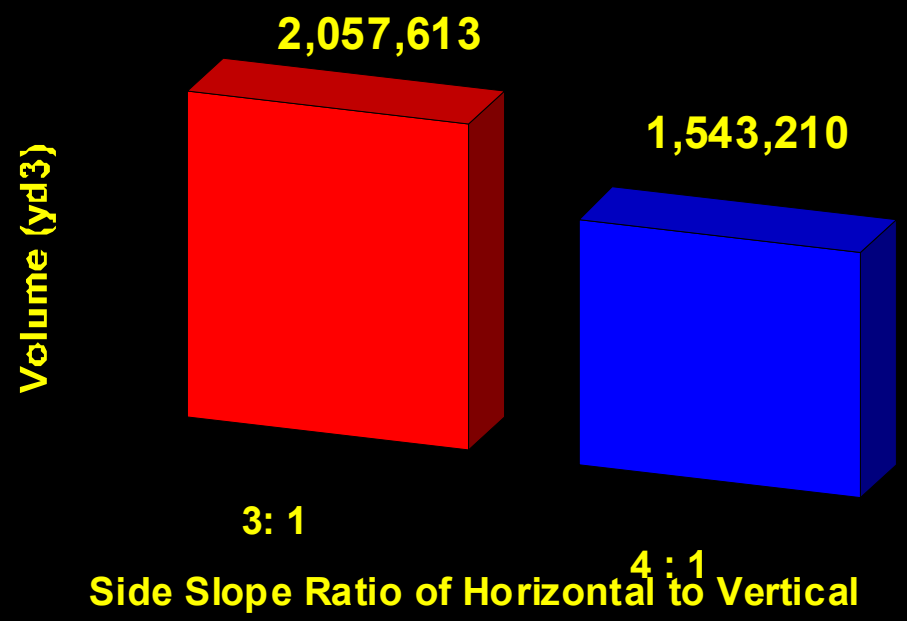
Cost collar – *more*



Then what's the problem?

(cont.)

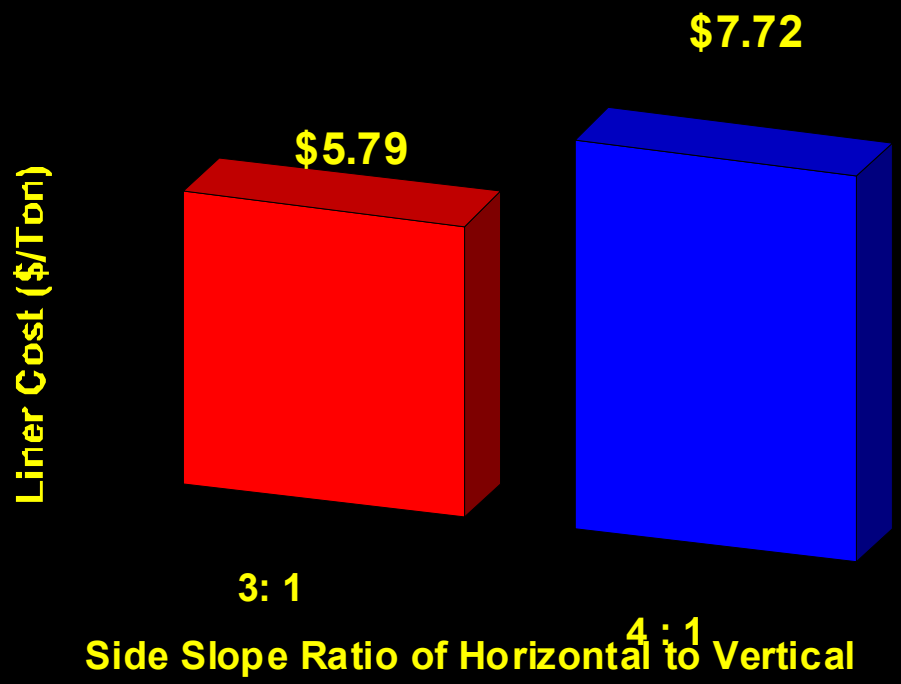
- Cost collar – *more*

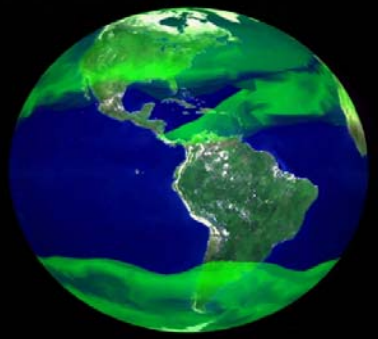


Then what's the problem?

(cont.)

- Cost collar – *more*





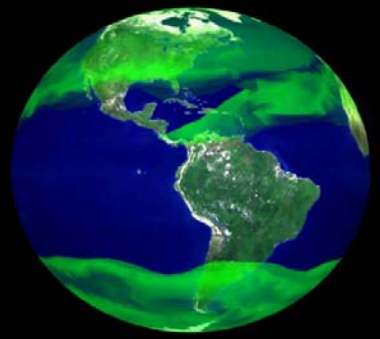
Bioreactors

Then what's the problem?

(cont.)

- Cost collar – *more*
- **Landfill prices will increase anyway**

→

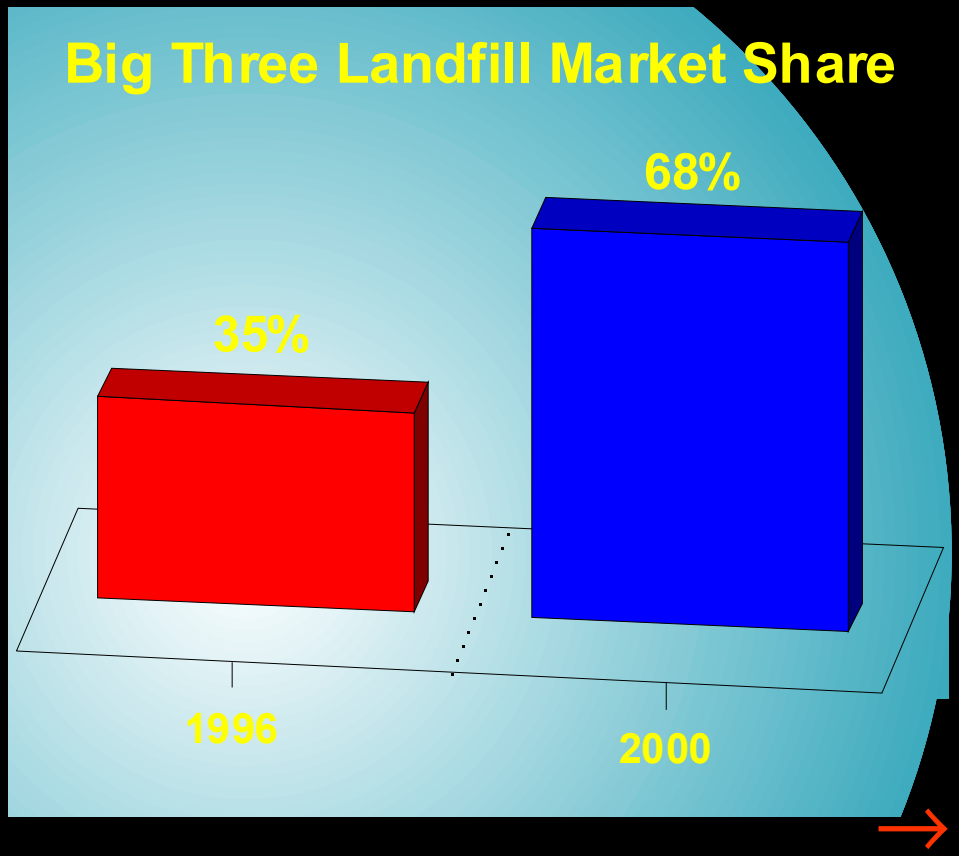


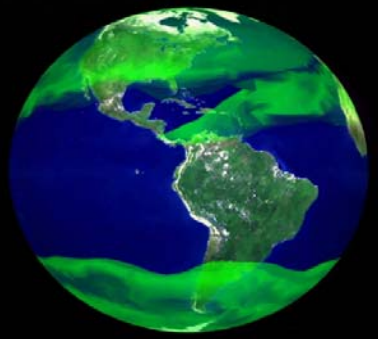
Bioreactors

Then what's the problem?

(cont.)

- Disposal costs will rise anyway





Bioreactors

Then what's the problem?

(cont.)

- Disposal costs will rise anyway-*more*

WASTE NEWS

March 01, 1999

WMI Raises Tip Fees

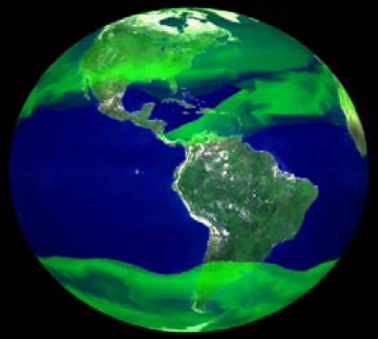
by Bob Brown

HOUSTON – Eye-popping spot market price hikes at Waste Management Inc.-owned landfills and incinerators across the country left customers scrambling to cope with higher costs or to find alternate disposal sites. In Pennsylvania, tipping fees at 13 company landfills jumped an average of more than 40 percent to $33.62 per ton starting March 1, according to Douglas Augenthaler, an analyst for CIBC Oppenheimer in New York.

Rates at the Arden, Pellegrene and Valley landfills nearly doubled to $28.

Prices at the massive Brambles landfill in Virginia leap 84 percent to $25 per ton on March 15 from $13.58, while Waste Management boosted fees at its Charles City County landfill to $25 from $17.19, a 45 percent jump, Augenthaler said.

Tipping fees at Waste Management's American landfill in Ohio skyrocketed 138 percent to $28 per ton from $11.75. ...

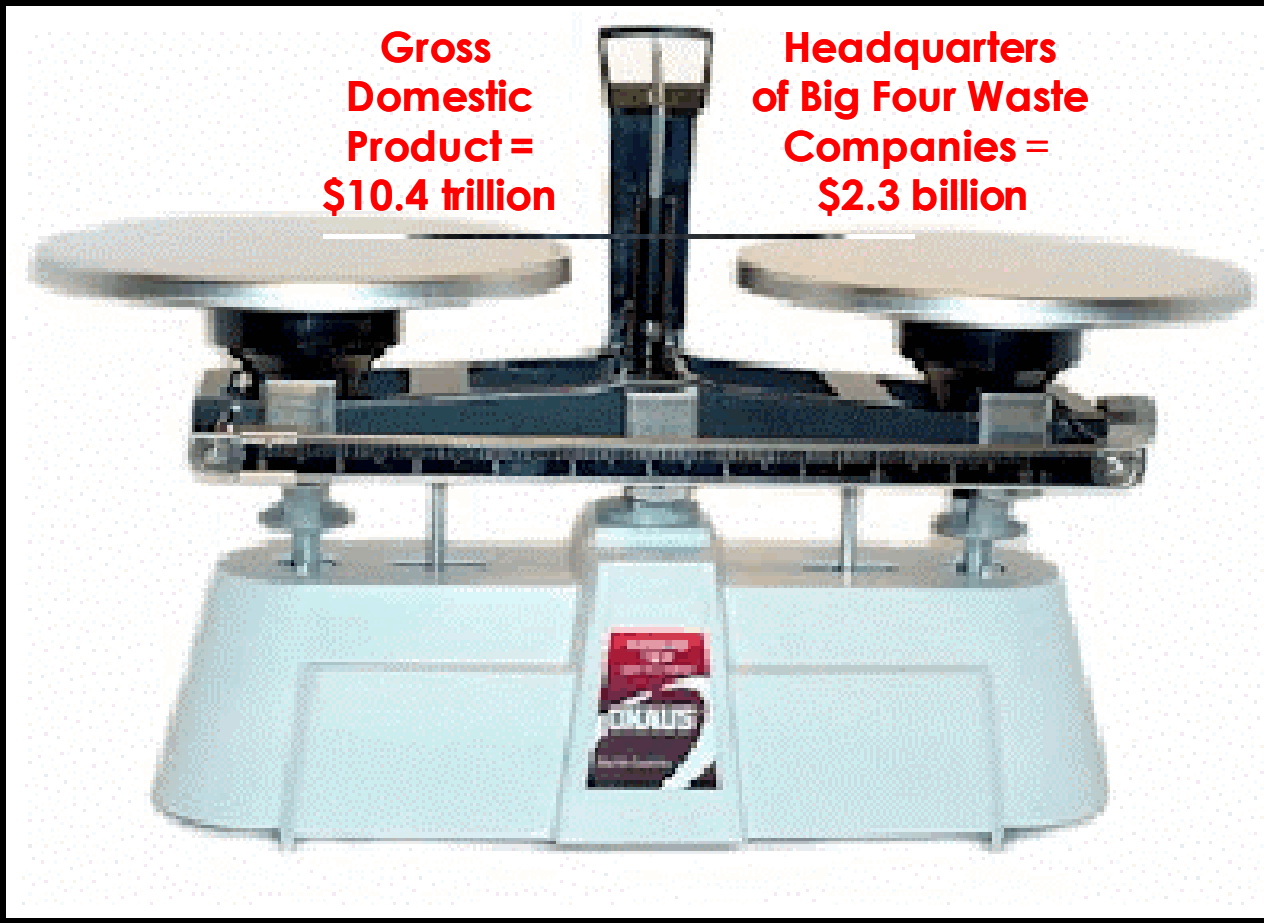


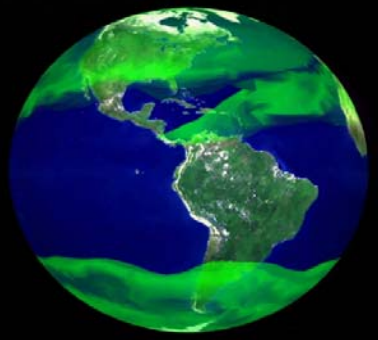
Bioreactors

Then what's the problem?

(cont.)

- Disposal costs will rise anyway-*more*

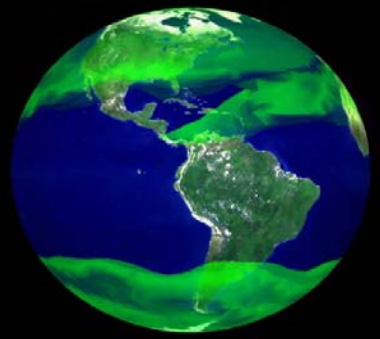




What's not so good about bioreactors?

- Composting ignored
- Leaking legacy landfills ignored
- Long term problems are palliated, but not resolved
- New set of major short term problems are created

→



What's not so good about bioreactors?

(cont.)

Composting ignored-*more*

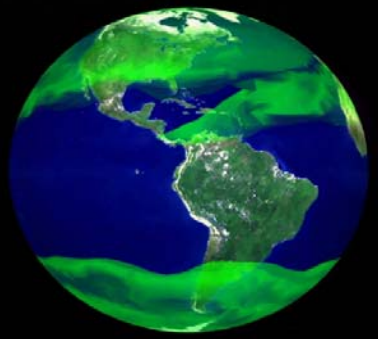
EPA's Waste Hierarchy in *Agenda for Action*

Reduce and Reuse

Recycle and Compost

WTE and Landfill

→



Composting

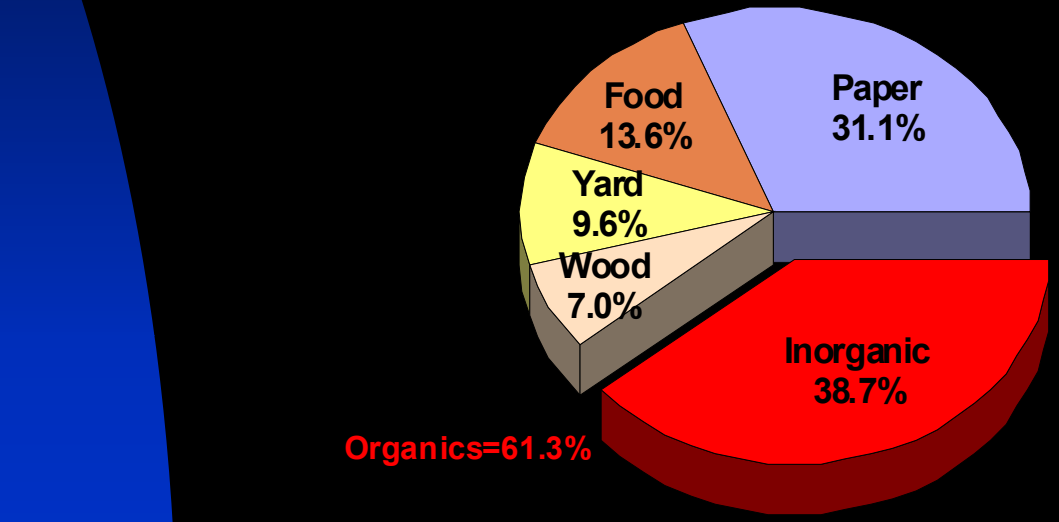
What's not so good about bioreactors?

(cont.)

- Composting ignored–*more*

Components of MSW

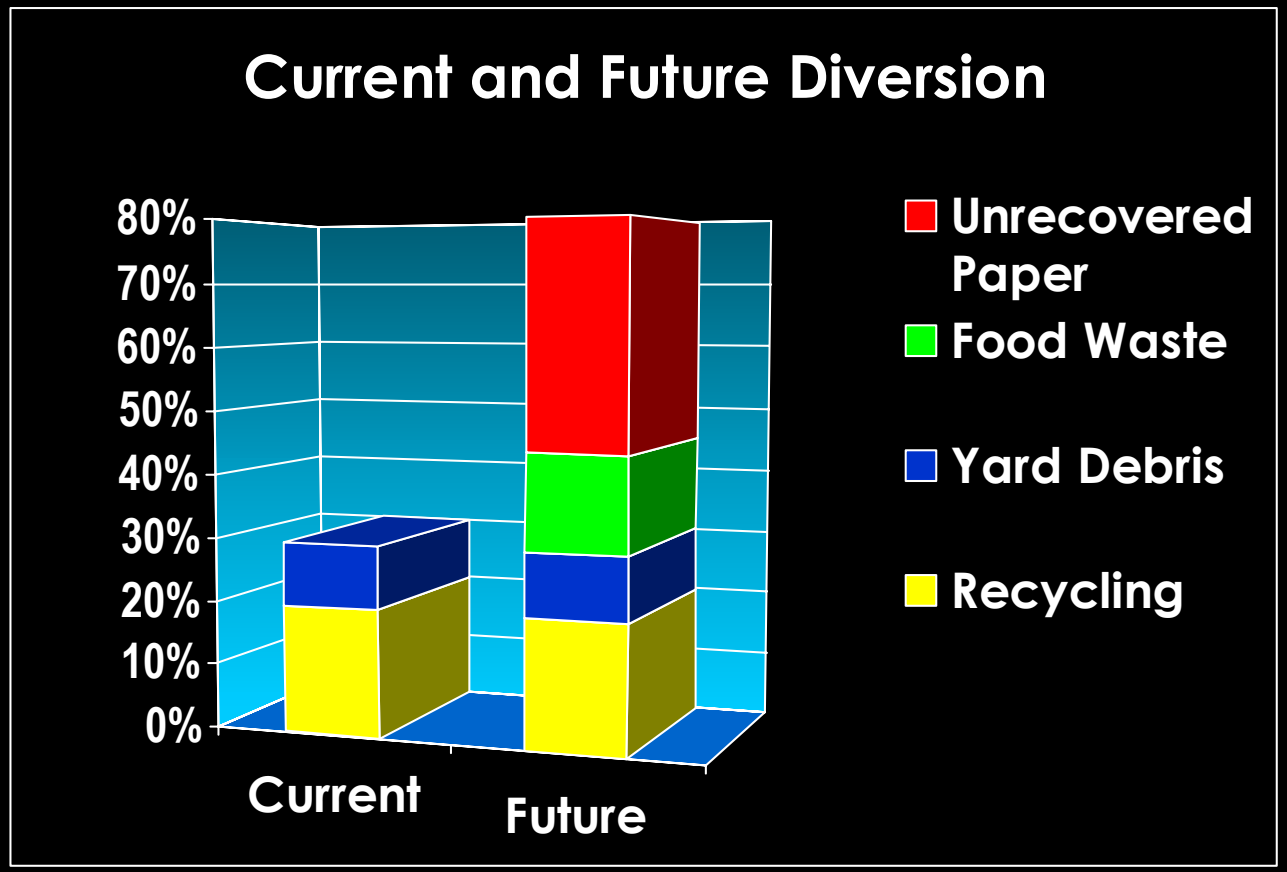
in U.S. in 1998

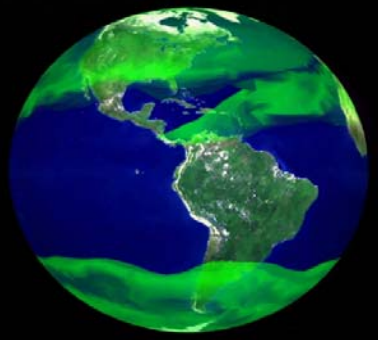


What's not so good about bioreactors?

(cont.)

- Composting ignored-*more*

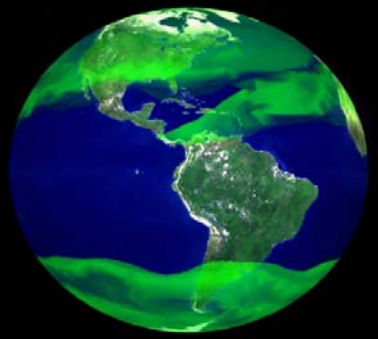




What's not so good about bioreactors? (cont.)

- Long term palliated, not resolved
  - Decomposition will be accelerated but largely incomplete
  - Accelerated deterioration of leachate collection system

→



What's not so good about bioreactors? (cont.)

- New short term problems created
  - Catastrophic side wall failure
  - Gas capture more failure prone

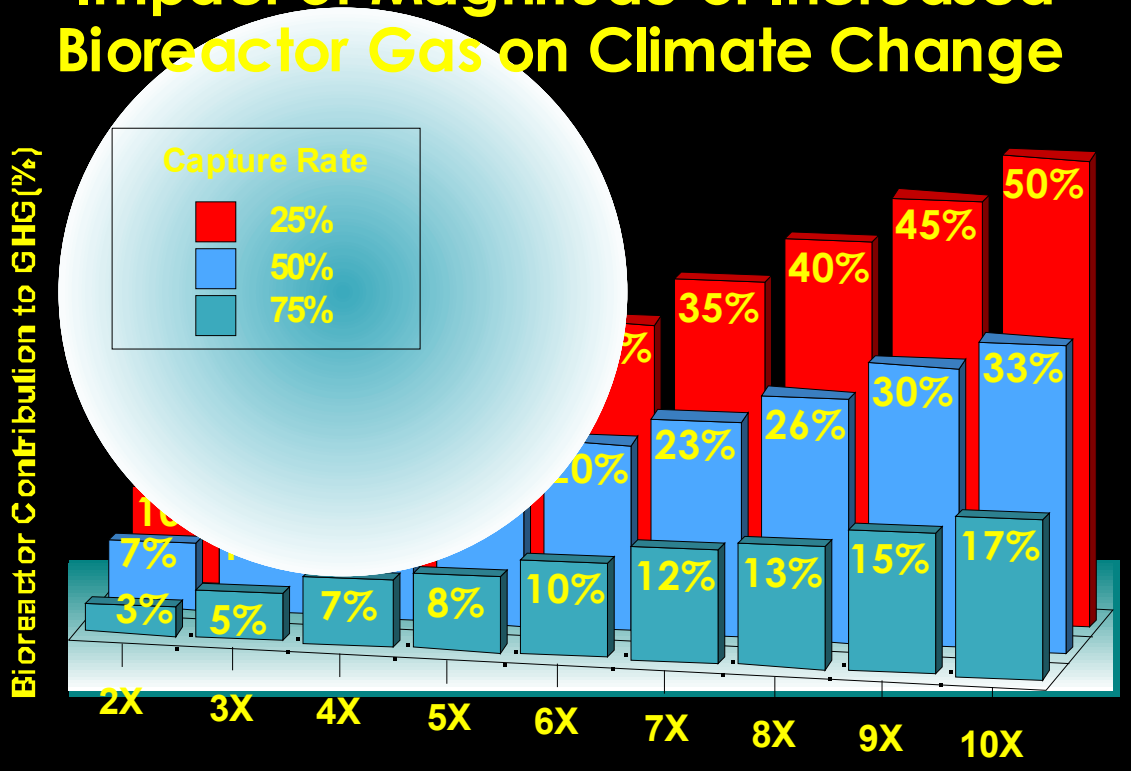
→

What's not so good about bioreactors?

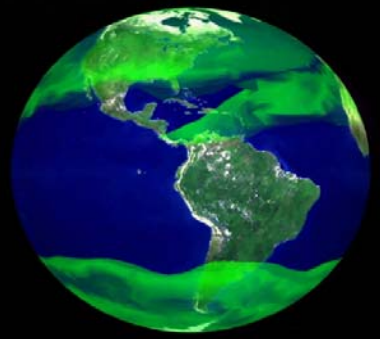
(cont.)

Gas capture-*more*

Impact of Magnitude of Increased Bioreactor Gas on Climate Change



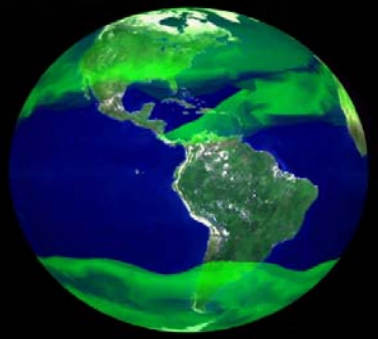
When Bioreactor Gas Increases by Factor of-



What needs to be done to restore integrity?

Safety measures to test– (cont.)

- Pre-shred and mix incoming waste
- Above ground in-vessel MSW digestor
- 4:1, instead of 3:1, sideslopes
- Restrict in-place density to 1000 lbs./cu.yd
- Restrict wetting from at least 15' of the interior, and 30' of the exterior, side wall
- Double composite liner/double leachate collection system no longer than 1000' long
- Leachate collection lines 60', instead of 120', apart
- Advanced landfill gas removal system, including 25' maximum separation of horizontal gas piping
- Eliminate co-utilization of piping for gas extraction and recirculation



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