



Edmonton Waste Management  
Centre of Excellence

# EWMCCE OVERVIEW

Dr. Daryl McCartney P.Eng.  
University of Alberta  
[daryl.mccartney@ualberta.ca](mailto:daryl.mccartney@ualberta.ca)

**AECOM**

Compost Matters  
17 March 2010

**Edmonton** THE CITY OF  
WASTE MANAGEMENT  
AND PUBLIC WORKS

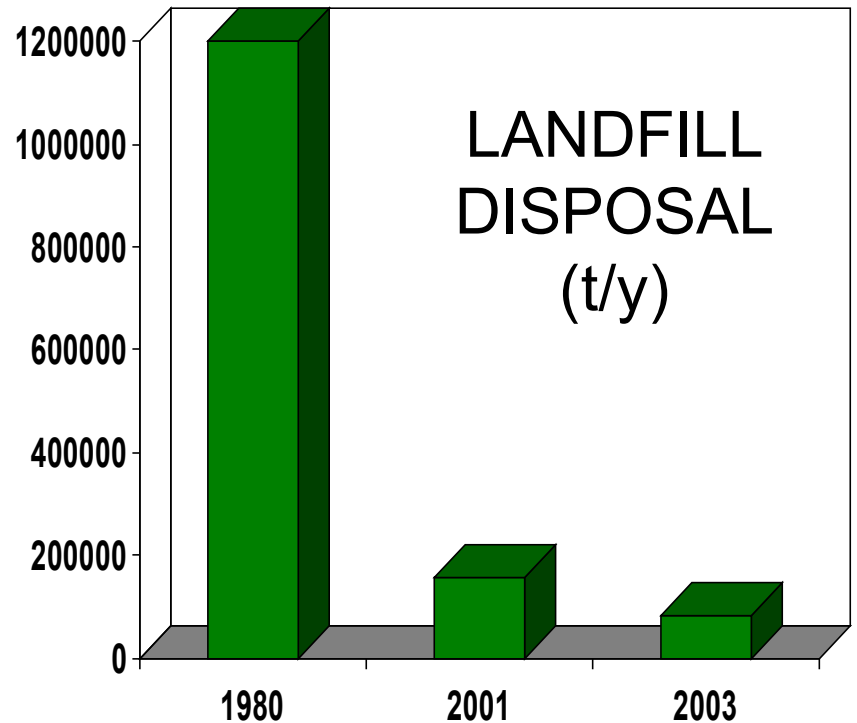
# OUTLINE

- A Brief History:
  - From facilities to a dream . . .
- Facilities
- Programs
- Summary



# History - MSW

## CLOVER BAR LANDFILL



# History - MSW

1999 - Materials Recovery Facility



2000 - Composting Facility



# History Wastewater



**Gold Bar WWTP**

# History - Foundations of Success

FACILITIES & TECHNOLOGY

GOOD  
MANAGEMENT &  
OPERATION

PUBLIC  
CO-OPERATION &  
SUPPORT

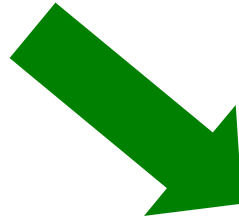
EDUCATION &  
TRAINING

CONTINUAL  
IMPROVEMENT

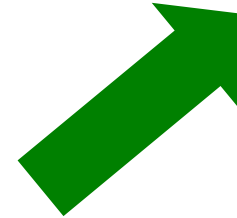
COMMITMENT TO  
RESEARCH

# History

LEADING EDGE  
FACILITIES



EDUCATION  
&  
TRAINING

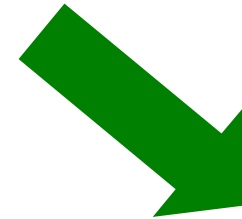


Edmonton  
Waste  
Management  
Centre of  
Excellence



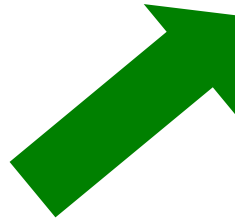
RESEARCH

KNOWLEDGE



TECHNOLOGY  
DEVELOPMENT

SKILLS



# History

NON-PROFIT CORPORATION - 2003

PARTNERS



# FACILITIES



# “Composters” available at the Centre



# PROGRAMS

RESEARCH



TECHNOLOGY DEVELOPMENT



EDUCATION AND TRAINING



ADVISORY SERVICES



# SUMMARY

- EWMCE is unique
  - Structure
  - Breadth of Scope
  - Variety of Facilities
  - Richness of Expertise
- Established programs in four areas
- Developing international partnerships

# International Research of Interest

## Two or Three Topics

- Use of respirometry:
  - Ponsa et al. 2008.
- Hygienic quality assurance:
  - Brinton et al. 2009.
- Effect of physical properties on biodegradation rates:
  - Tremier et al. 2009.



# Respirometric profile through an MBT plant

(Ponsa et al. 2008)

- Mechanical-biological treatment (MBT) plant in Spain.
- Plant processes:
  - source separated organic fraction of MSW; &
  - mixed MSW.
- Separate stream for each.
- Static respirometric test used.

# Respirometric profile through an MBT plant

(Ponsa et al. 2008)

▶ Waste input: MSW or OFMSW

Mechanical pretreatment

Rejected materials to landfill or recycling

Anaerobic digestion

Biogas

Composting

Bulking agent

Mechanical treatment

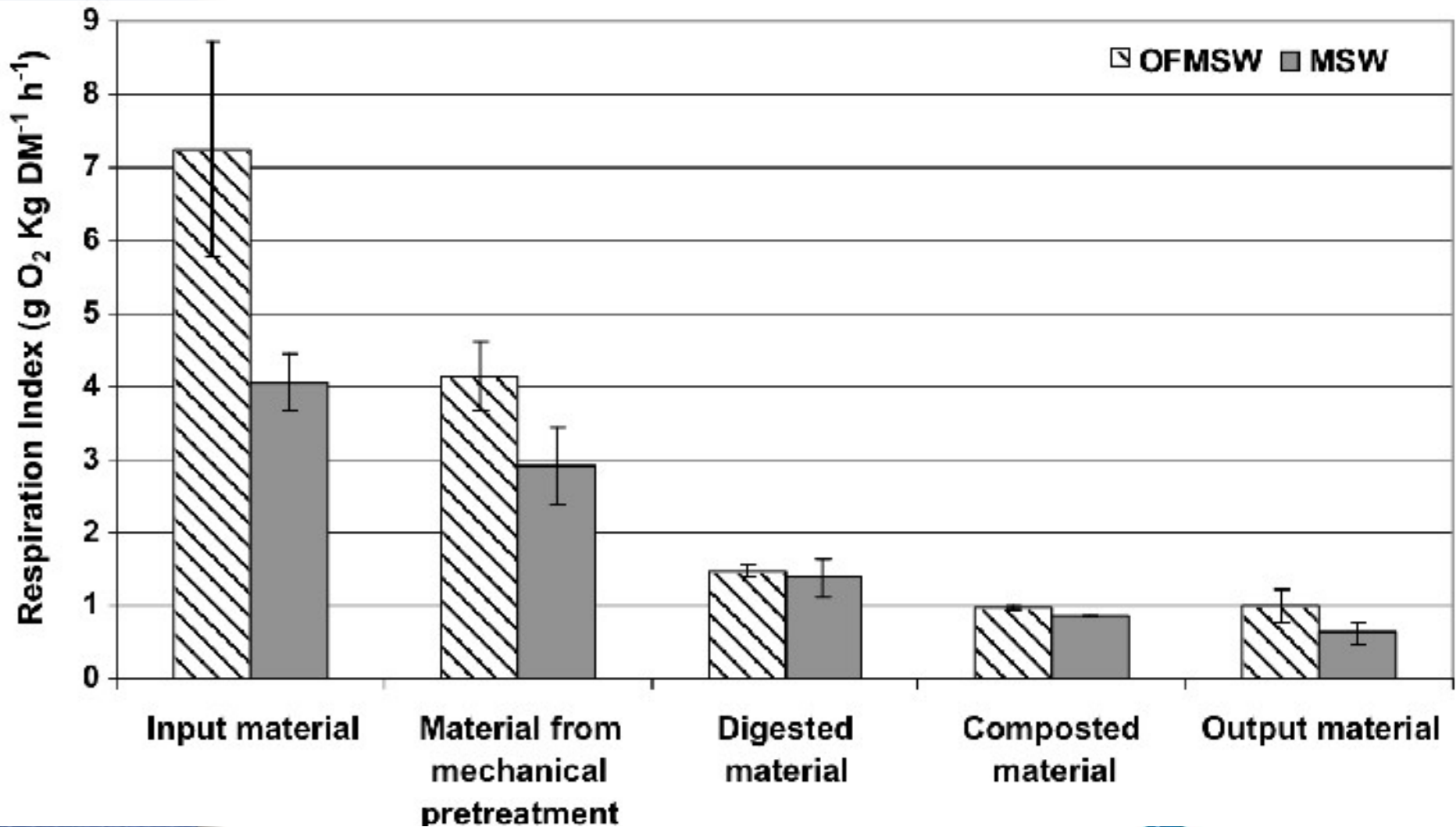
Rejected materials to landfill or recycling

▶ Waste output: Stabilized waste (MSW) or compost (OFMSW)



# Respirometric profile through an MBT plant

(Ponsa et al. 2008)



# Recycled organic matter & food

(Brinton et al. 2009)

- Characterized fecal indicators and pathogens in 94 plants:
  - Market-ready compost only.
  - Non-sludge facilities.
  - Located in California, Oregon & Washington.

# Recycled organic matter & food

(Brinton et al. 2009)

## Organisms tested:

- Fecal coliforms and *E. coli*:
  - Interested in comparing indicators.
- *Salmonella*:
  - Common requirement.
- Fecal streptococci:
  - Resistant to die-off during composting.

# Recycled organic matter & food

(Brinton et al. 2009)

## Organisms tested (cont'd):

### – *Listeria*:

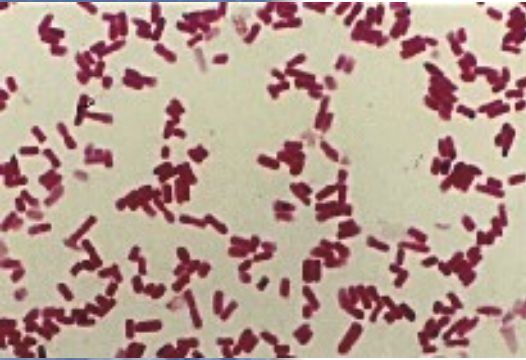
- Often considered as an indicator.

### – *Clostridium perfringens*:

- Obligate fecal anaerobe & spore former.

### – *E. coli* O157:H7:

- Presence in manure.
- Concerns about food contamination.



# Recycled organic matter & food

## Findings

(Brinton et al. 2009)

- Fecal coliforms and *E. coli*:
  - 28% exceeded hygiene limits (1,000 MPN g<sup>-1</sup>).
- *Salmonella*:
  - Only found in one compost.
- Fecal streptococci:
  - All positive.
  - 47% had >1,000 MPN g<sup>-1</sup>.

# Recycled organic matter & food

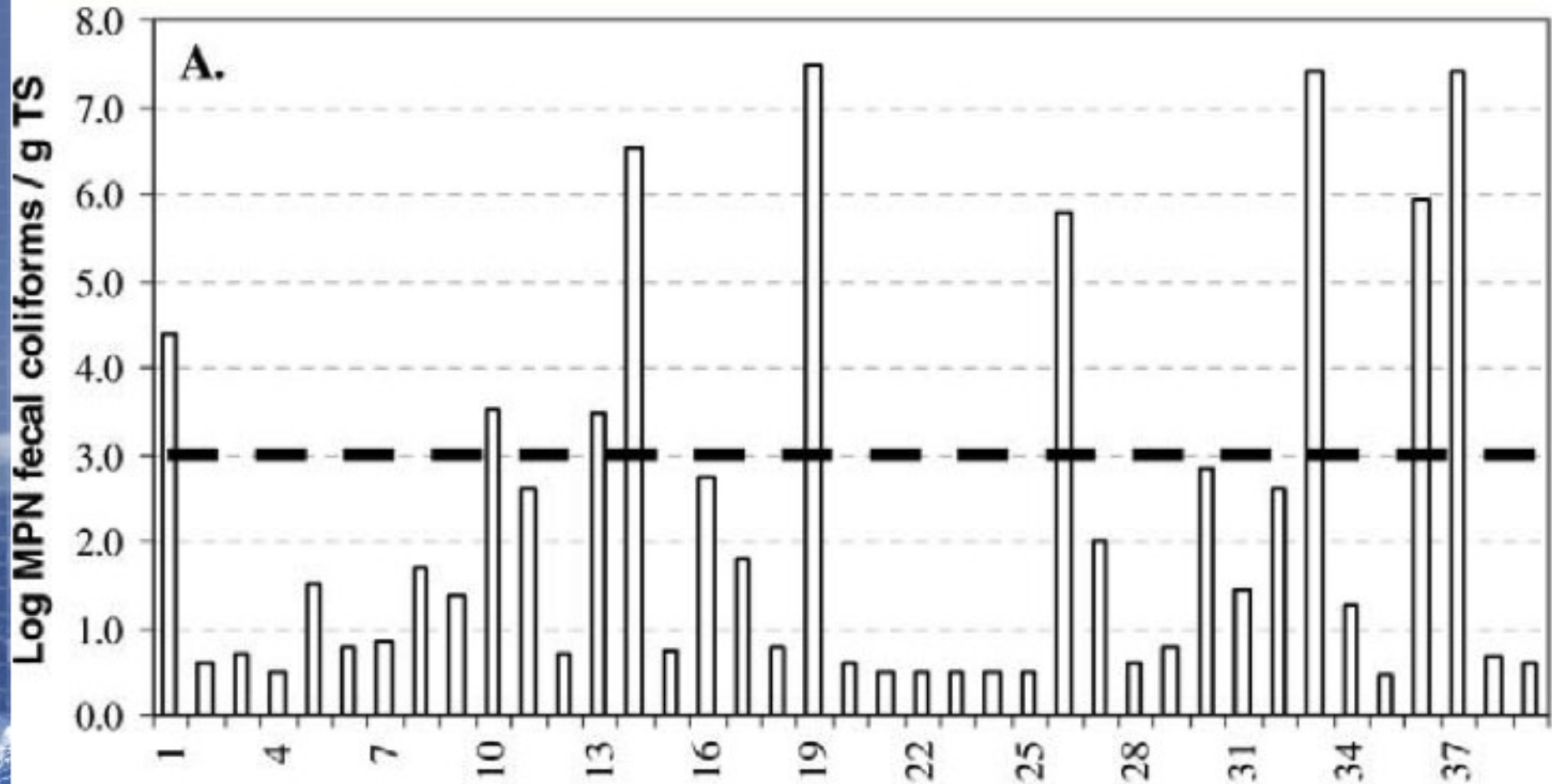
## Findings

(Brinton et al. 2009)

- *Listeria*:
  - Very low levels.
- *Clostridium perfringens*:
  - 70% positive.
  - Only 20% had levels  $>1,000$  CFU g<sup>-1</sup>.
- *E. coli* O157:H7:
  - 6% had detectable levels.

# Recycled organic matter & food Findings (Washington)

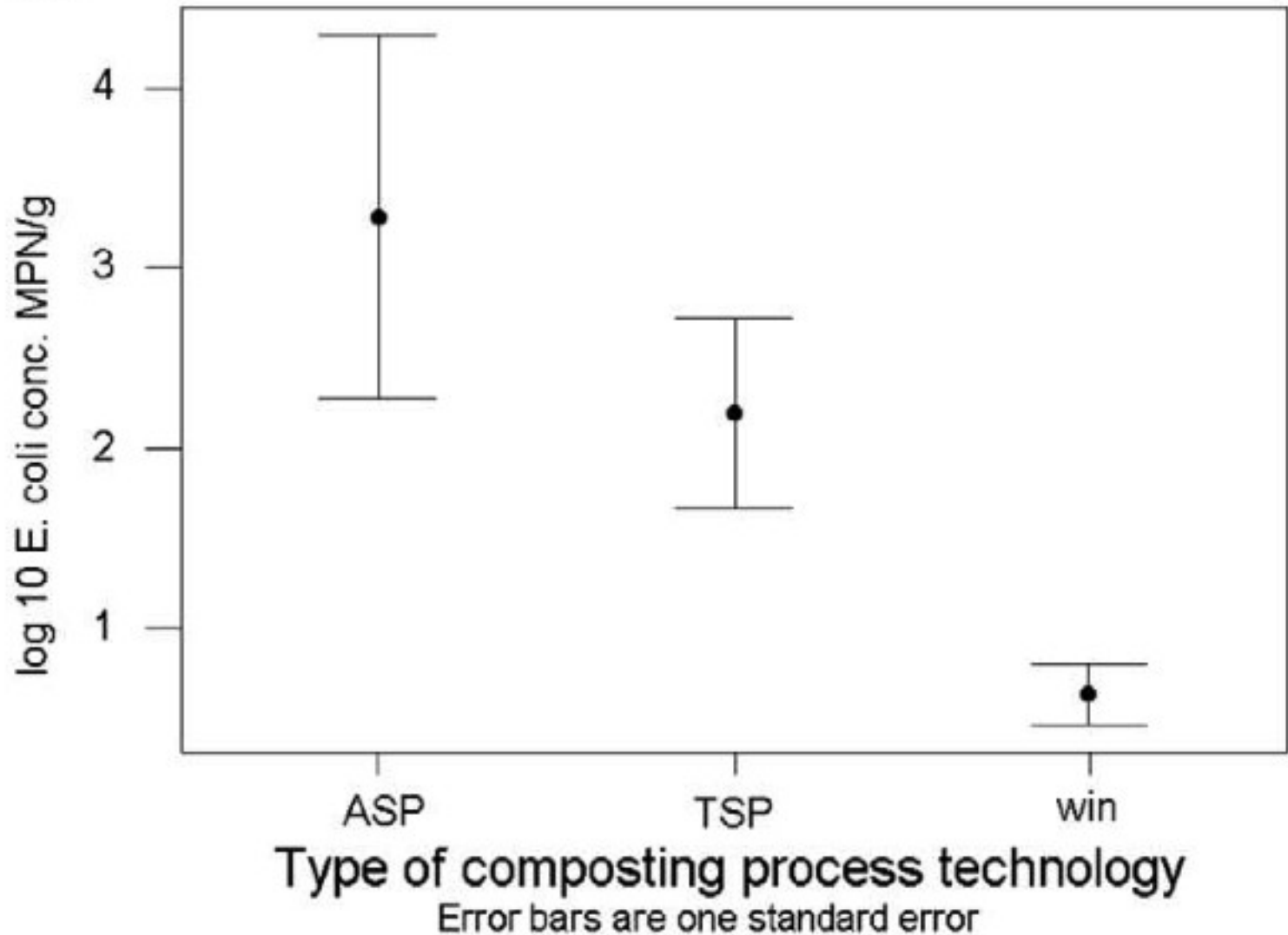
(Brinton et al. 2009)



# Recycled organic matter & food Findings – Type of Facility

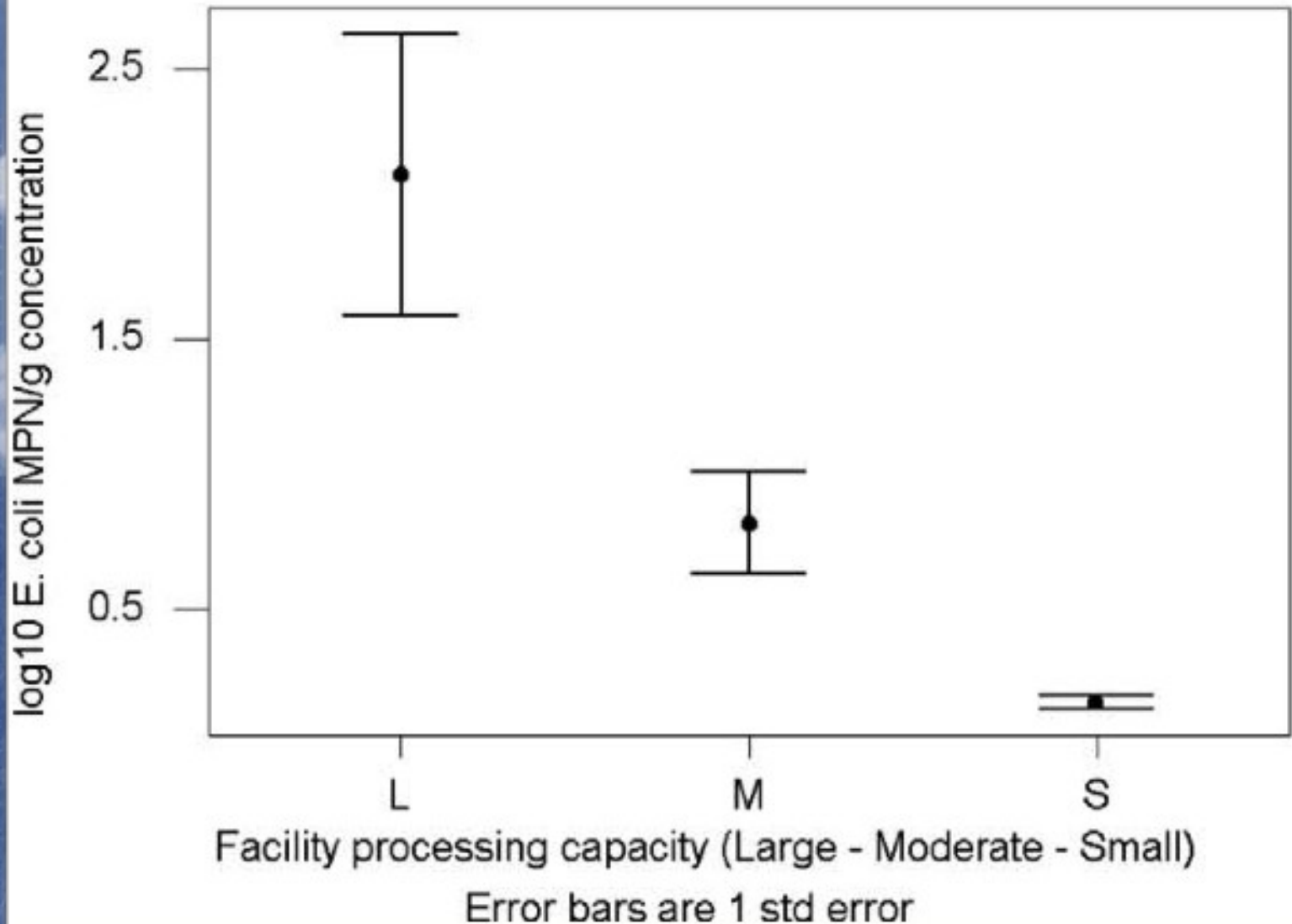
(Brinton et al. 2009)

## B



# Recycled organic matter & food Findings – Size of Facility

(Brinton et al. 2009)



A photograph of a pod of orcas swimming in the ocean. The orcas are dark grey/black with white underbellies. They are seen from behind, with their dorsal fins visible above the water. The water is a deep blue-grey color. In the background, there are large, rugged mountains with significant snow cover under a cloudy sky. The text "Questions??" is overlaid in the center of the image in a large, white, sans-serif font.

Questions??



# Key Physical Factors Impacting Air Flow

(Tremier et al. 2009)

- Free air space (air-filled porosity).
- Specific surface area of particles.
- Particle size distribution.
- Moisture content.
- Bulk density.
- Air permeability & distribution throughout the matrix.



# Key Physical Factors Impacting Air Flow

(Tremier et al. 2009)

- Three key parameters to be controlled:
  - MC.
  - Specific surface area.
  - FAS.
- Latter two parameters modified by manipulating the bulking agent particle size and bulking agent to wet substrate ratio.



# Key Physical Factors Impacting Air Flow

(Tremier et al. 2009)

- Three objectives to optimize system:
  - High organic matter degradation rate (high oxygen consumption rate).
  - Minimize compaction, which maintains oxygen dispersion preventing anaerobic conditions.
  - High air flow dispersion (maintain homogenous system).

# Apparatus to Measure FAS, Permeability & Respiration

(Richard et al. 2004)

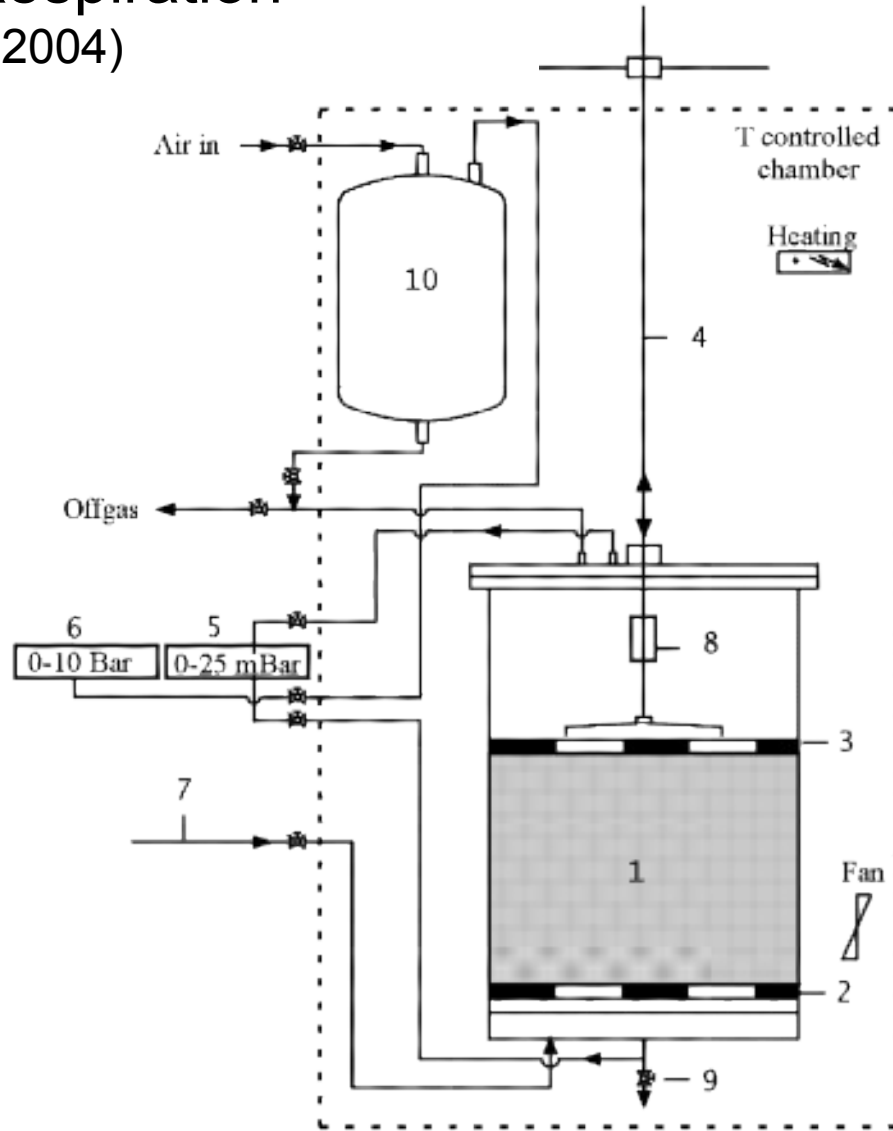


Figure 1. Schematic representation of the CPP measurement device (numbers are explained in the text).

# References

- Tremier, A., C. Teglia, & S. Barrington. 2009. Effect of initial physical characteristics on sludge compost performance. *Bioresource Technology*. 100:3751-3758.
- Ponsa, S., T. Gea, L. Alerm, J. Cerezo, & A. Sanchez. 2008. Comparison of aerobic and anearobic stability indices through a MSW biological treatment process. *Waste Management*. 28:2735-2742.
- Brinton, W.F., P. Storms, & C. Blewett. 2009. Occurrence and levels of fecal indicators and pathogenic bacteria in market-ready recycled organic matter composts. *J. Food Protection*. 72:332-339.