

# How do we develop methods to determine the mobility of metals in CUBs?

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# Everybody is Right

- Regulatory bodies want to know how much Hg/TM will be mobilized from all CUBs, under all conditions
- Utilities want to know can they sell/dispose of their product, thus will it pass the requirements for the end use
- End user wants to know if there will be mobility of the Hg/TM from the CUBs under their specific conditions and which raw material is the 'safer' one to purchase



# Final Application

- Is sometimes well defined in scope
  - Wall board production
  - Cement production
    - Defined temperature conditions specified by the industry
- Is sometimes not well defined in scope
  - Landfill and embankment
    - Different groundwater make-up
    - Different mixed microbial communities

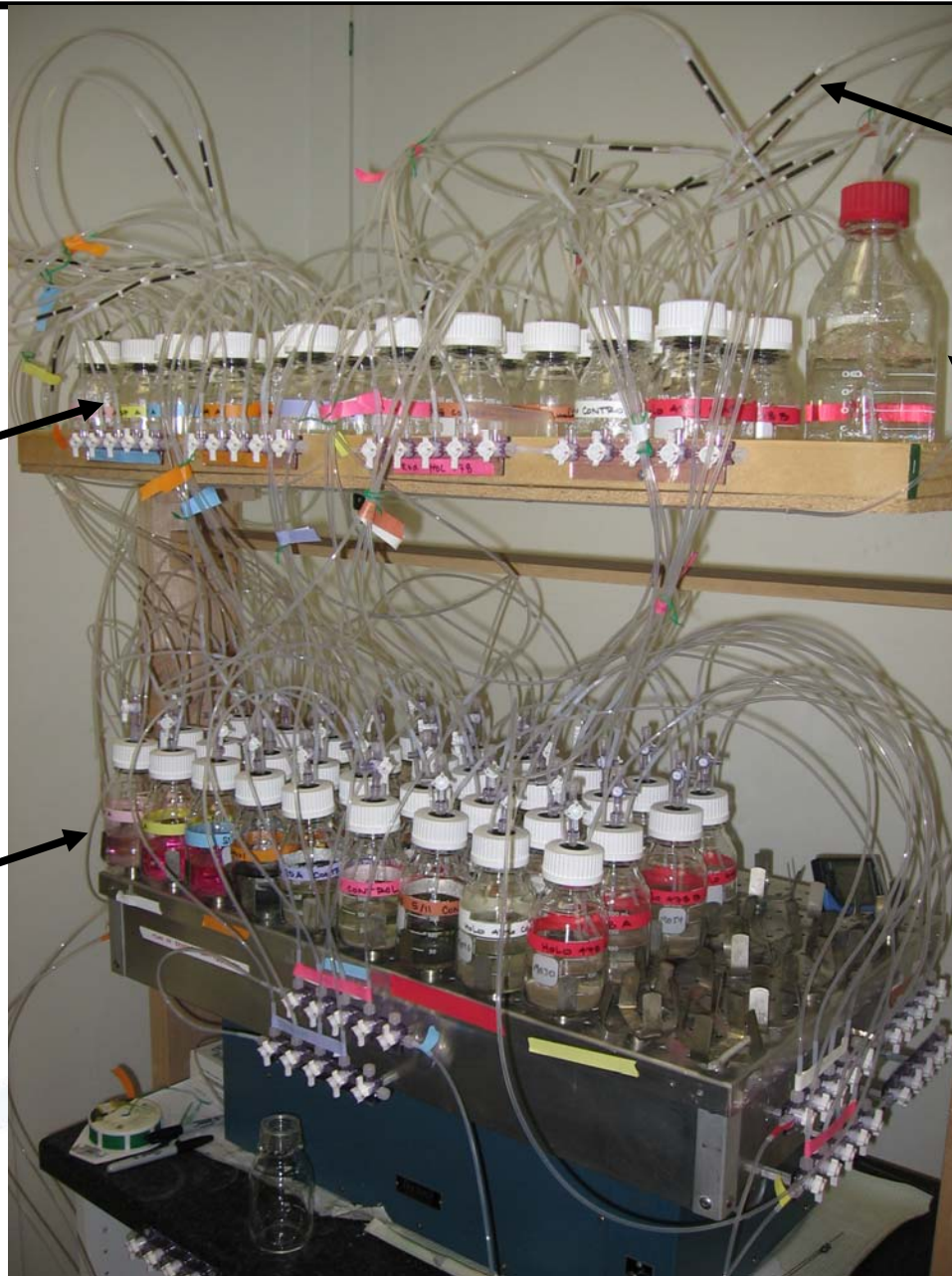


# Leaching

- *“Current efforts to integrate all of the results into one consistent view of the Hg leachability have been only partially successful” - Karl Schroeder*
- Batch leaching, TCLP, SPLP, SGLP, LTL etc.
  - Equilibrium information
- Sequential batch leaching
- Column leaching
  - Kinetic information



# Microbial Studies



Modified  
M-29 Traps

FSTM Traps

Humidifier

Reaction Vessels



# Microbial Timeline

- May 2005 - Originally proposed slurry reactor system to simulate methylating anaerobic sediments
- August 2005 - Moved to cell suspension with pre-enriched mixed SRB culture from WSRC
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- April 2006 - Moved to pure culture:  
*Desulfobulbus propionicus*
- August 2006 - Moved to new pure culture:  
*Desulfovibrio desulfuricans*
- December 2006 - Setup first microbial exposure experiments with CUBS



# Microbial Studies

- A highly alkaline fly ash in a non-buffered, lean media using a mixed culture will kill the bacteria and result in no methylation
  - Why prove a known zero value?
- A highly alkaline fly ash in a buffered rich media with a pure culture known to methylate Hg strongly will result in excessive methylation
  - Why place an unrealistic constraint on the CUB?



# Microbial Mobility - Hg

- “Methylation potential”
  - Use the highly methylating pure culture in the rich, buffered media to demonstrate the possibility that Methyl-Hg may be evolved
  - Eliminate concern for samples that do not evolve methyl-Hg under these ideal conditions
  - Contact the Methyl-Hg-positive samples with a mixed culture and under conditions more suitable to the final use.





# Microbial Studies – 2 stage approach

- As a single method using a fixed media and single SRB is developed apples can be compared to apples at a high level
- This results in an artificial ‘methylation potential’ number that can be used in modeling
  - Application data can be used to redefine models
- The more granular level environmental impact appropriate testing only needs to be conducted on the samples that may demonstrate Methyl-Hg evolution

