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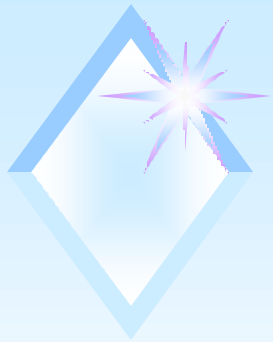
COULD REACTION FRONTS FORM IN LANDFILLS ?

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THE CONVENTIONAL MECHANISM.

Liquid-phase digestion.

Some surface reaction?

More-or-less homogeneous.

Applies to:

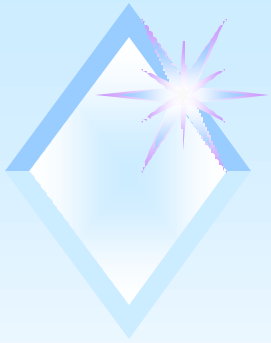
- ◆ digesters treating liquids or slurries
- ◆ some parts of some landfills



THE REACTION FRONT MECHANISM

- ◆ Heterogeneous
- ◆ Reaction **within** the solids
- ◆ Solid-phase digestion
- ◆ Separate reaction zones
- ◆ Buffer zone
- ◆ Zones form a **mobile** reaction front
- ◆ Front forms within a seed body (only)

Seed body? /.....



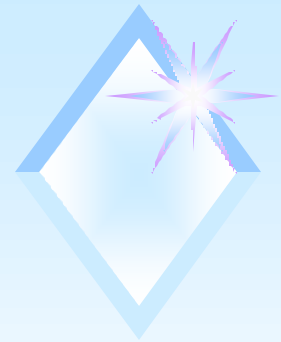
WHAT IS A SEED BODY?

- ◆ Well populated with methanogens
- ◆ Material of low biodegradability
- ◆ Minimum size (as a lump, clump or layer)

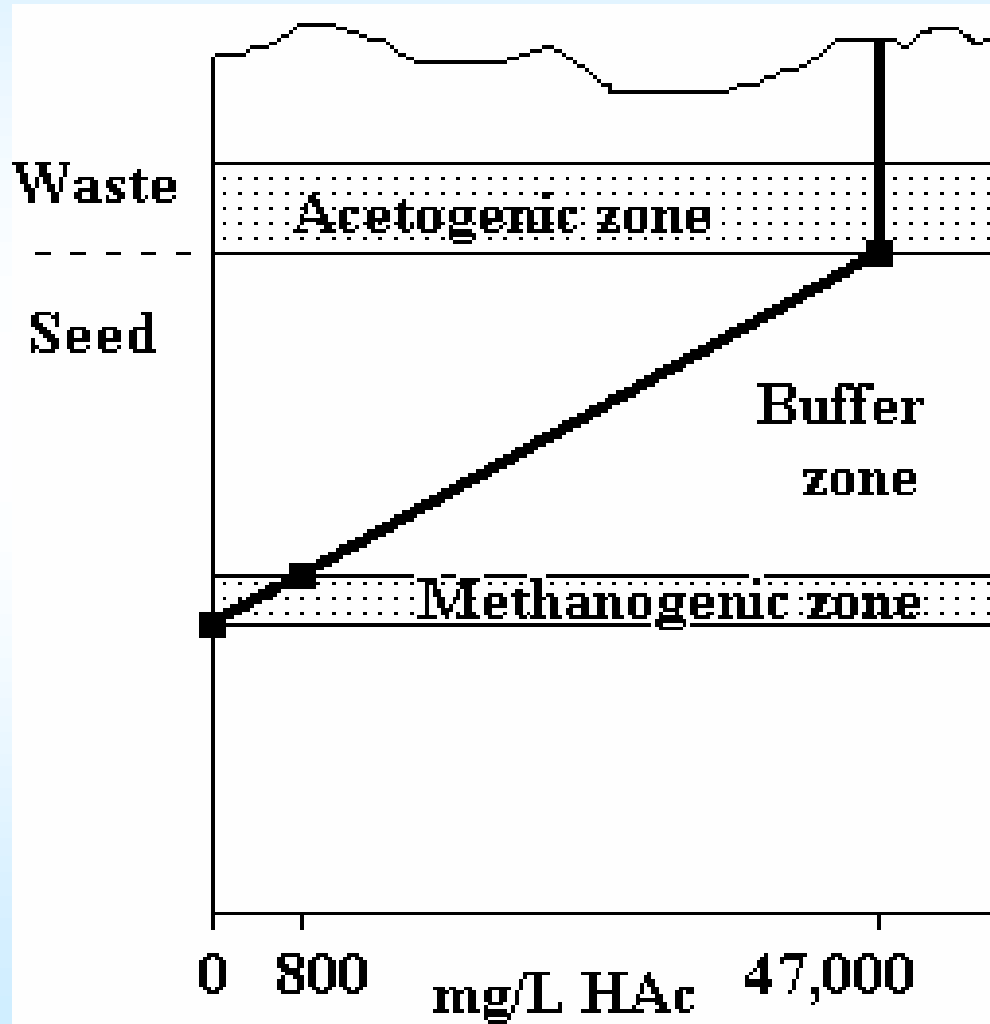
e.g. previously digested waste

Structure of front /....

Significance of mechanism /....



STRUCTURE OF THE FRONT



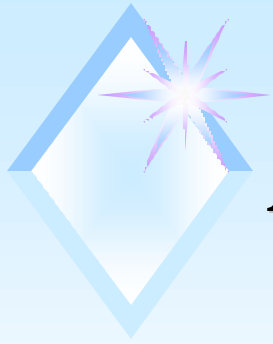


SIGNIFICANCE

The reaction front mechanism is:

- ◆ hypothetical
- ◆ alternative
- ◆ parallel (?)

Where does it apply? /....



APPLICABILITY

It applies to **beds** of solids only, so:

- ◆ semi-dry waste digesters
- ◆ some parts of some landfills

Rare at bench scale?

When could it occur? /....



DETERMINING FACTORS

- ◆ One or more viable seed bodies
- ◆ Inter-particle contact in the substrate

Both conditions must be met.

Does it actually occur ? /



DOES IT OCCUR IN PRACTICE ?

Clues:

- ◆ similar natural mechanisms are common
- ◆ semi-dry waste digestion is fast
- ◆ acidified areas in landfills can yield LFG
- ◆ compaction is stimulatory
- ◆ digested sewage sludge is a poor seed

Experimental verification /



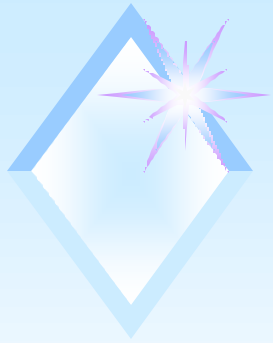
EXPERIMENTAL VERIFICATION

Tests need well-defined seed placement.

Historic data????

Bench-scale study just beginning, funded by the Lindbergh Foundation.

Uses of model /

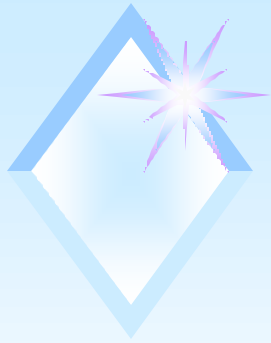


WHAT USE IS IT?

Modeling existing landfills - limited use.

Designing new bioreactor landfills - huge potential.

Questions /



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ANY QUESTIONS ?

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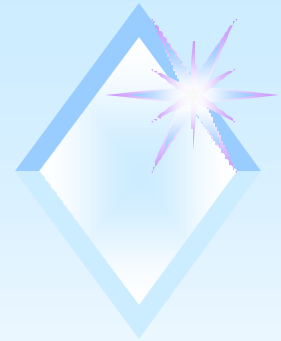
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LEACHATE RECYCLE ?

- ◆ In absence of seed bodies, flow promotes liquid-phase digestion.
- ◆ In presence of seed bodies, flow **also** transports substrate to them. So solid-phase digestion **also** occurs - but at a static reaction front.



SIMPLE BENCH-SCALE LYSIMETER

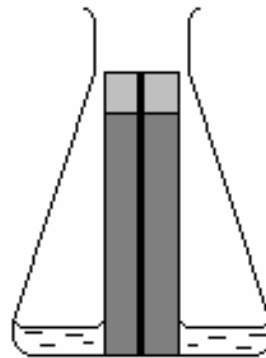


Figure 2. Placement of waste (substrate) and seed in digesters

