

In Praise of Respiration

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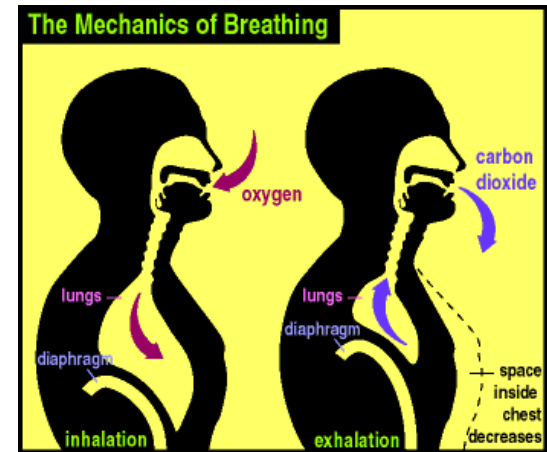
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Presentation Content

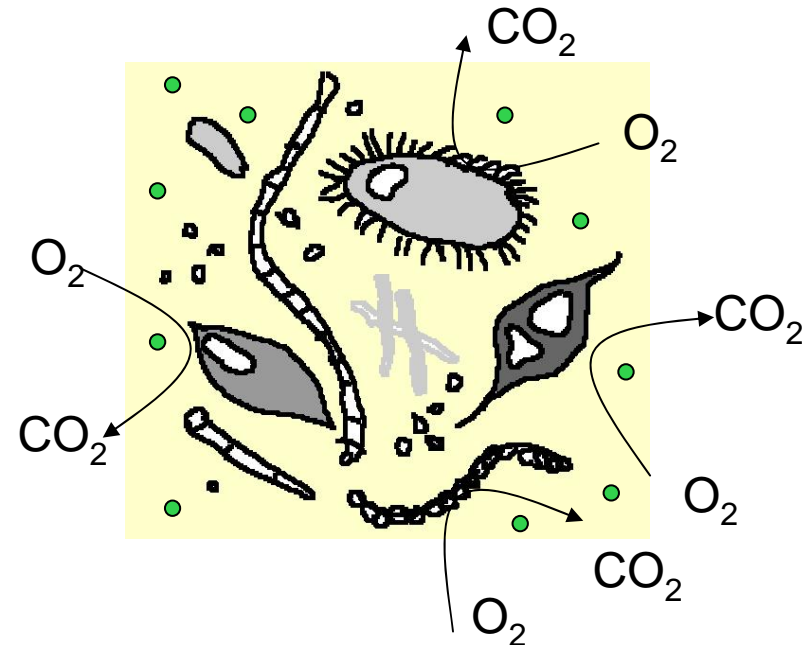
- What is respiration?
- Respiration in the compost pile
- Compost maturity
- The compost maturity-respiration link
- Demonstration
- Respirometry in the compost industry.

Respiration

- “Breathing”
- O_2 uptake or CO_2 evolution
- Applies to *all* aerobic organisms
- Measuring rate of respiration=respirometry

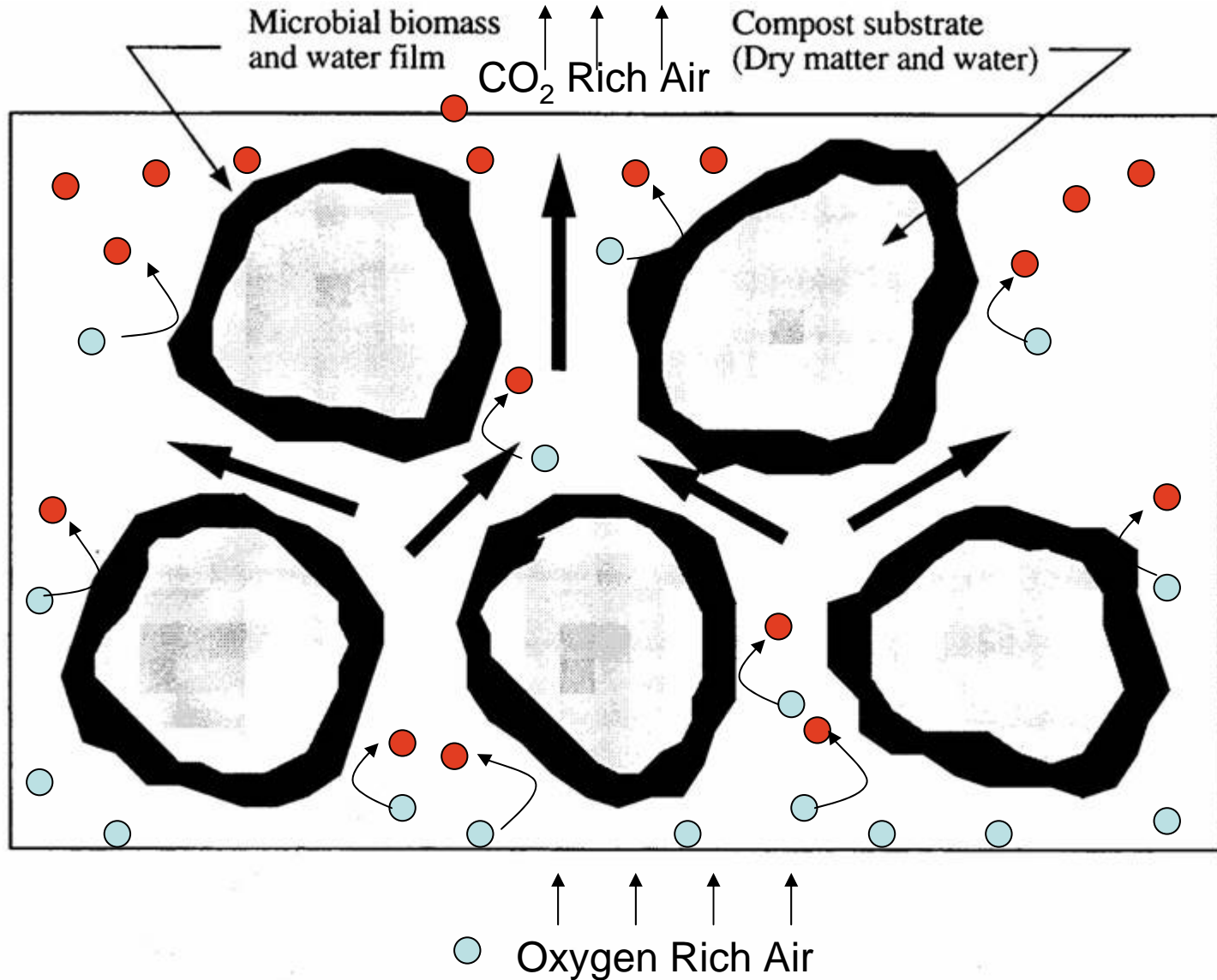


US FDA, 1999



<http://lockwoodwebs.com/composting/bacteria3.gif>

Respiration in the Compost Pile



Compost Maturity

- Is a general term defining when compost is “done”
- Maturity is a relative property
- No absolute reference, limit
- No direct means to measure maturity
- Lots of indirect methods of assessment.

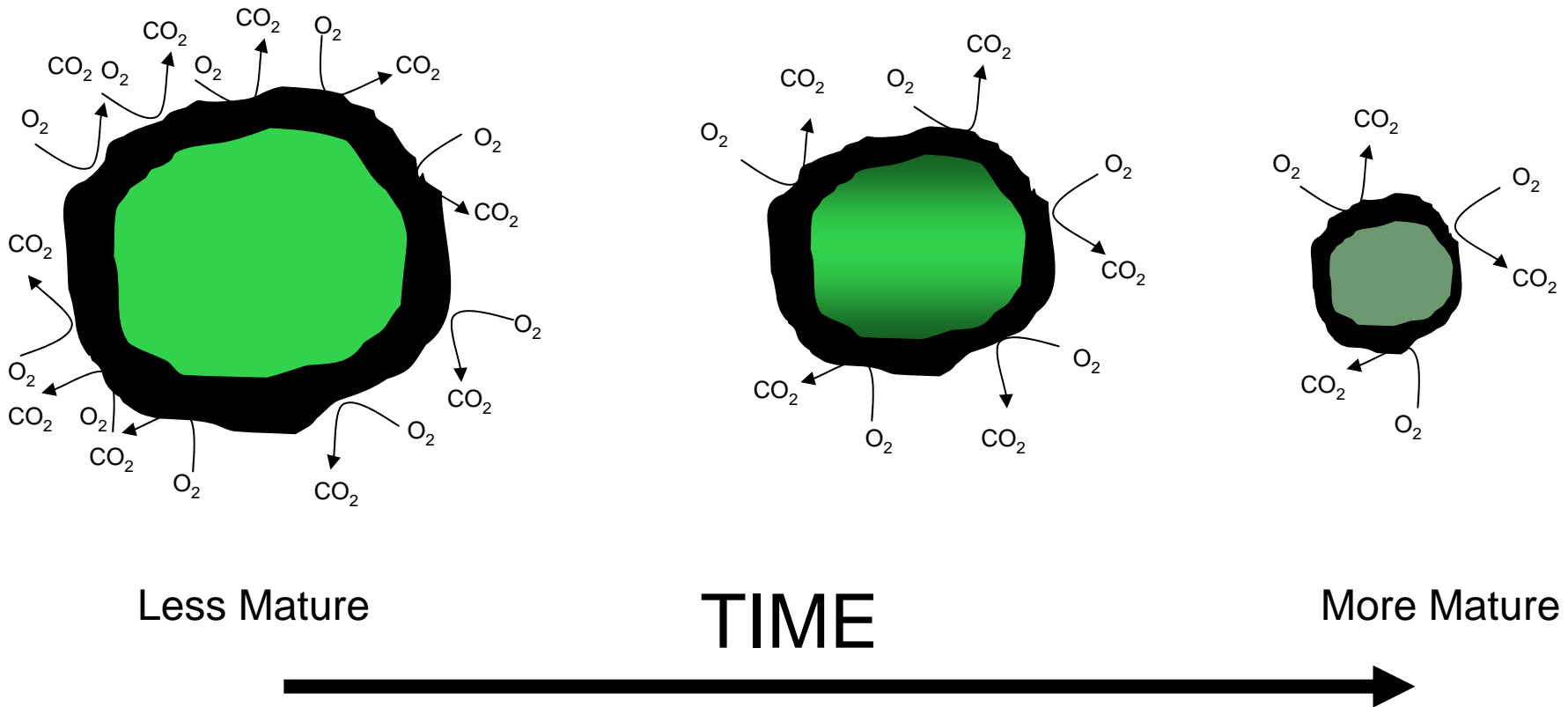
Compost Maturity Criteria (NSDOE, 1998)

One of the following sets of criteria must be met to qualify as mature compost:

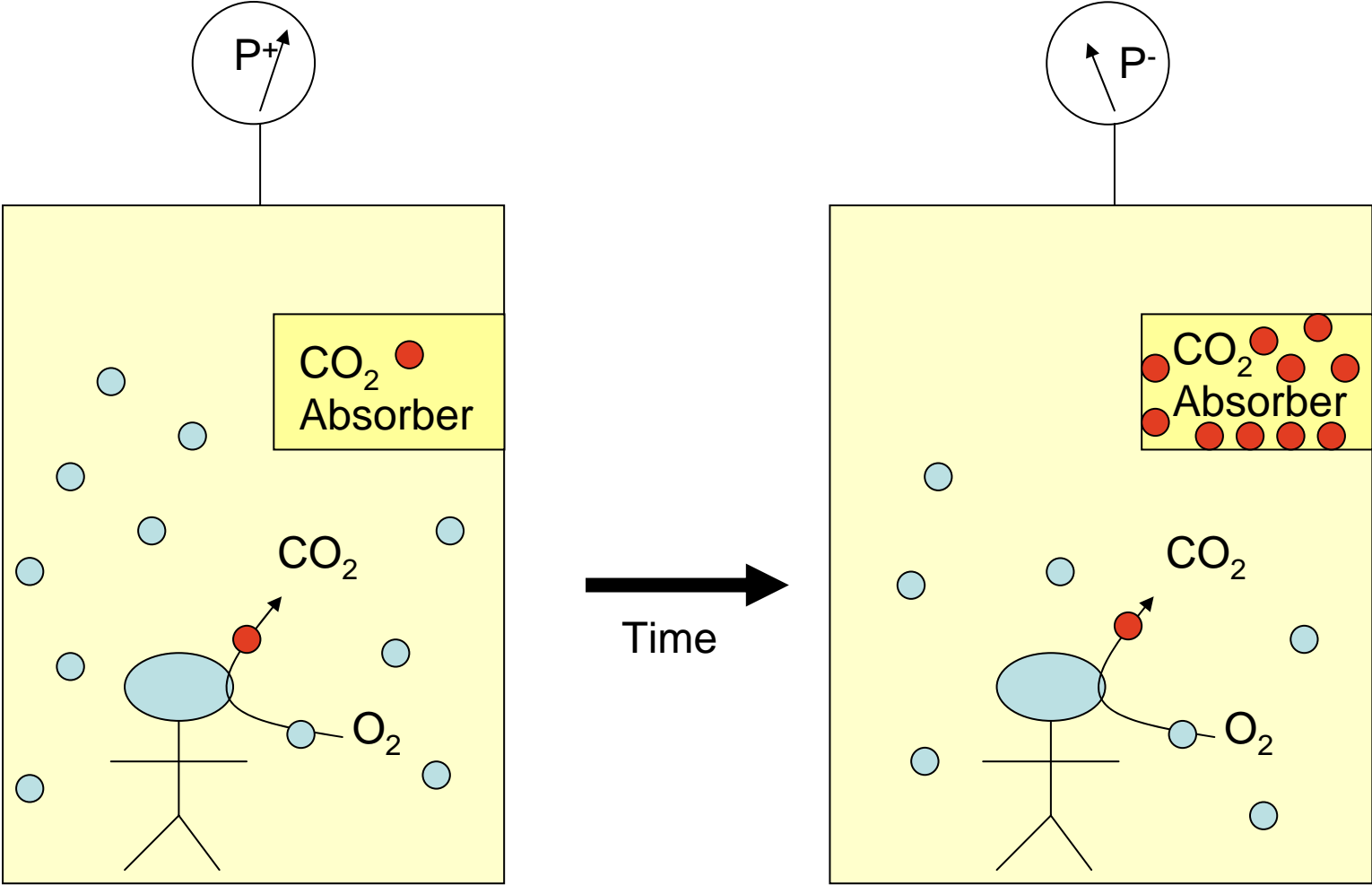
- Set 1*
- C:N Ratio \leq 25:1
 - An oxygen uptake rate of <150 mg O₂ /kg organic matter-hr
 - Cress and radish germination shall be $>90\%$ of the control sample and plant growth shall be $\geq 50\%$ of the control sample
- Set 2
- Compost must be cured for ≥ 21 days
 - Compost will not reheat to $>20^{\circ}\text{C}$ above ambient temperature
- Set 3
- Compost must be cured for ≥ 21 days
 - Organic matter reduction $> 60\%$ by weight
- Set 4
- Compost cured (post-thermophilic stage) for six months in aerobic environment

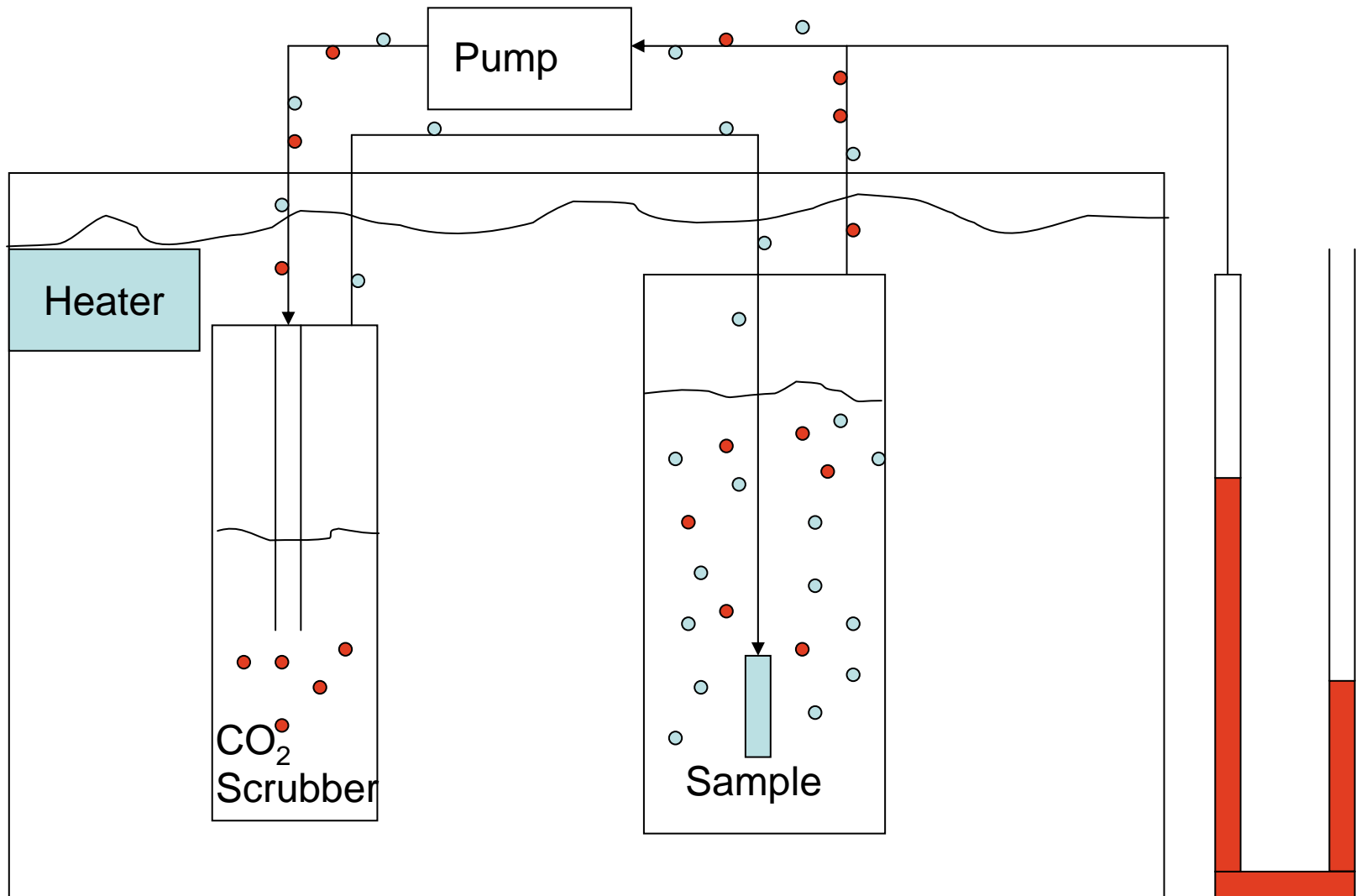
* Two of three required

Compost Maturity-Respiration Link



Demonstration: Analogy

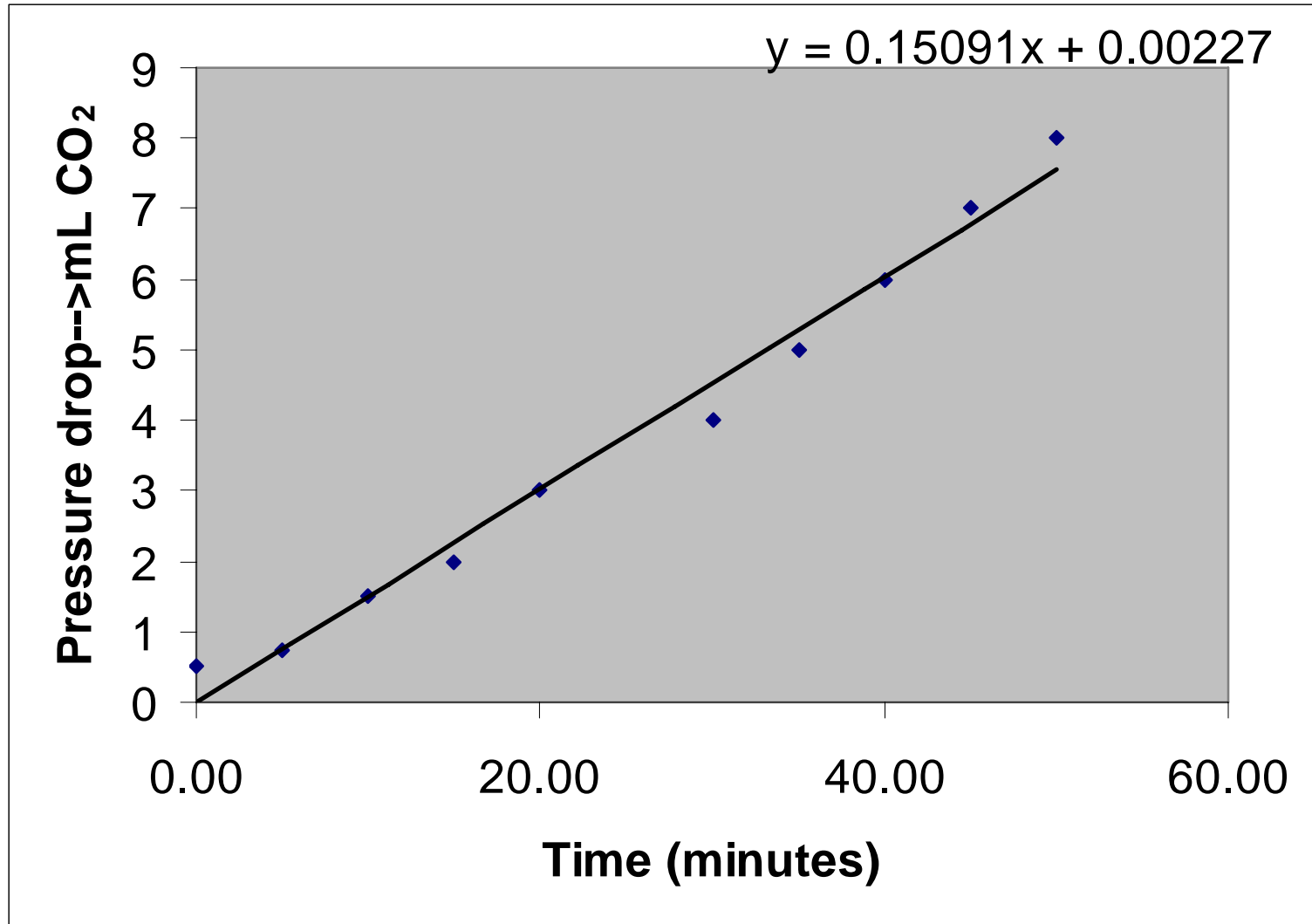




Demonstration: Respirometer Flow Diagram

Time vs. CO₂ Production

(5 g sample)



mL CO₂/minute/g compost sample → mg O₂/kg OM-h

Respirometry in the Compost Industry

- Most rigorous and direct test to assess maturity, less “fudging”
- Tool to quantify microbial “health”
- Produces an obvious and measurable sign of oxygen demand
- Indicates degree of stability within process
- Indicates “optimum compost temperature”.

Summary

- Respiration tests are most effective means of measuring compost maturity and evaluating composting process efficacy
- Adoption of respiration rate as the stability criterion of choice will place a greater burden on present systems
- Adoption of respiration rate will indirectly improve compost quality and advance the industry.