Aerated Static Pile Composting

Hands-on Workshop

December 10 – 11, 2014

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O2Compost
Compost Systems & Training

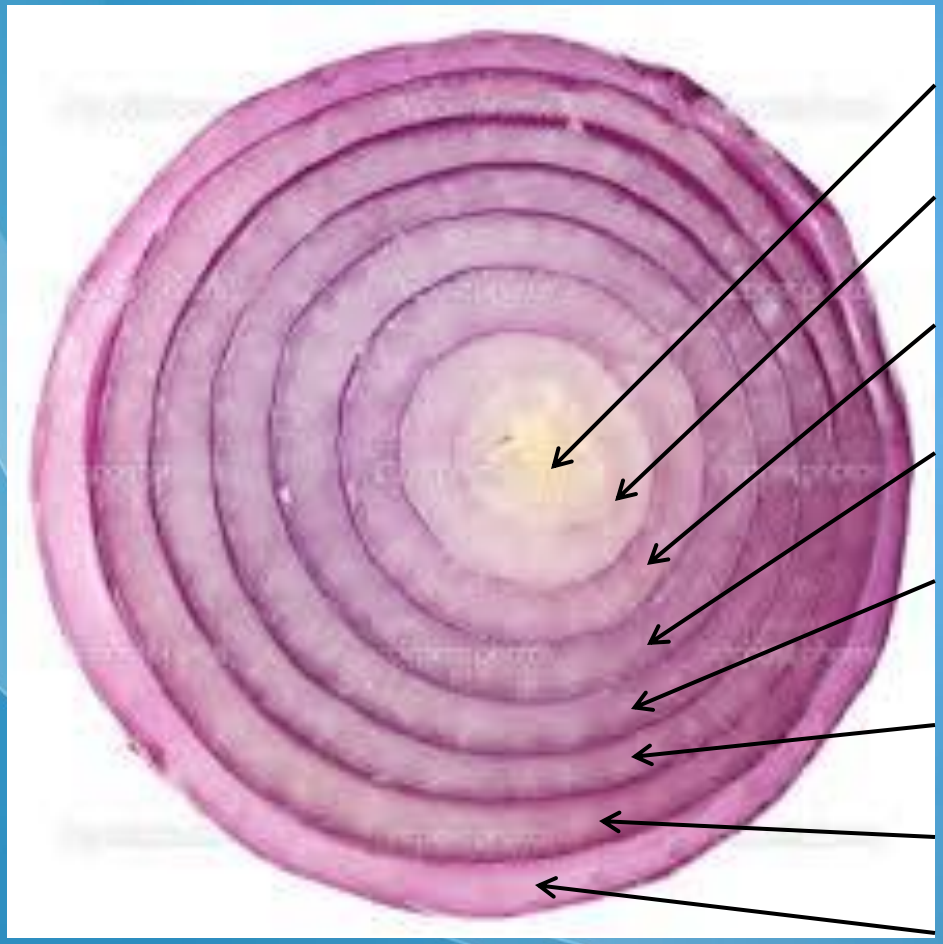
Converting Raw Feedstocks

Into High Quality Soil Amendments

The “Grouper’s” Definition of Composting

Transformation of raw organic materials into biologically-stable, humus-rich substances suitable for growing plants.

There are Many Layers to the Discussion of Composting



1. The Micro-Biology of Composting
2. Preparing a Suitable Mix
3. Methods to Optimize the Biology
4. A Manufacturing Process
5. Siting and Designing a Facility
6. Permitting a Facility
7. Full-Scale Operations
8. Marketing and Selling Compost

Turned Windrow Composting

- **Windrows:** Elongated Piles, typically ranging between 8- and 20-feet in width, 4- to 8-feet in height and hundreds of feet long.

- **Turned**: Remixed the compost pile using a front-end loader or a specialized “Windrow Turner” to remix materials and reintroduce oxygen into the pile.

Small Turned Windrow Composting

Large Turned Windrow Composting

Aerated Static Pile Composting

1. **Aerated:** We Induce Airflow into the Compost Pile to Maintain Aerobic Conditions Throughout the Active Phase of Composting (~30-days).

2. **Static:** We Do Not Turn the Compost Pile During The Active Phase of Composting.

Aerated Static Pile Composting

Sonoma Valley Stables in Petaluma, CA

The Anatomy of an Aerated Static Pile

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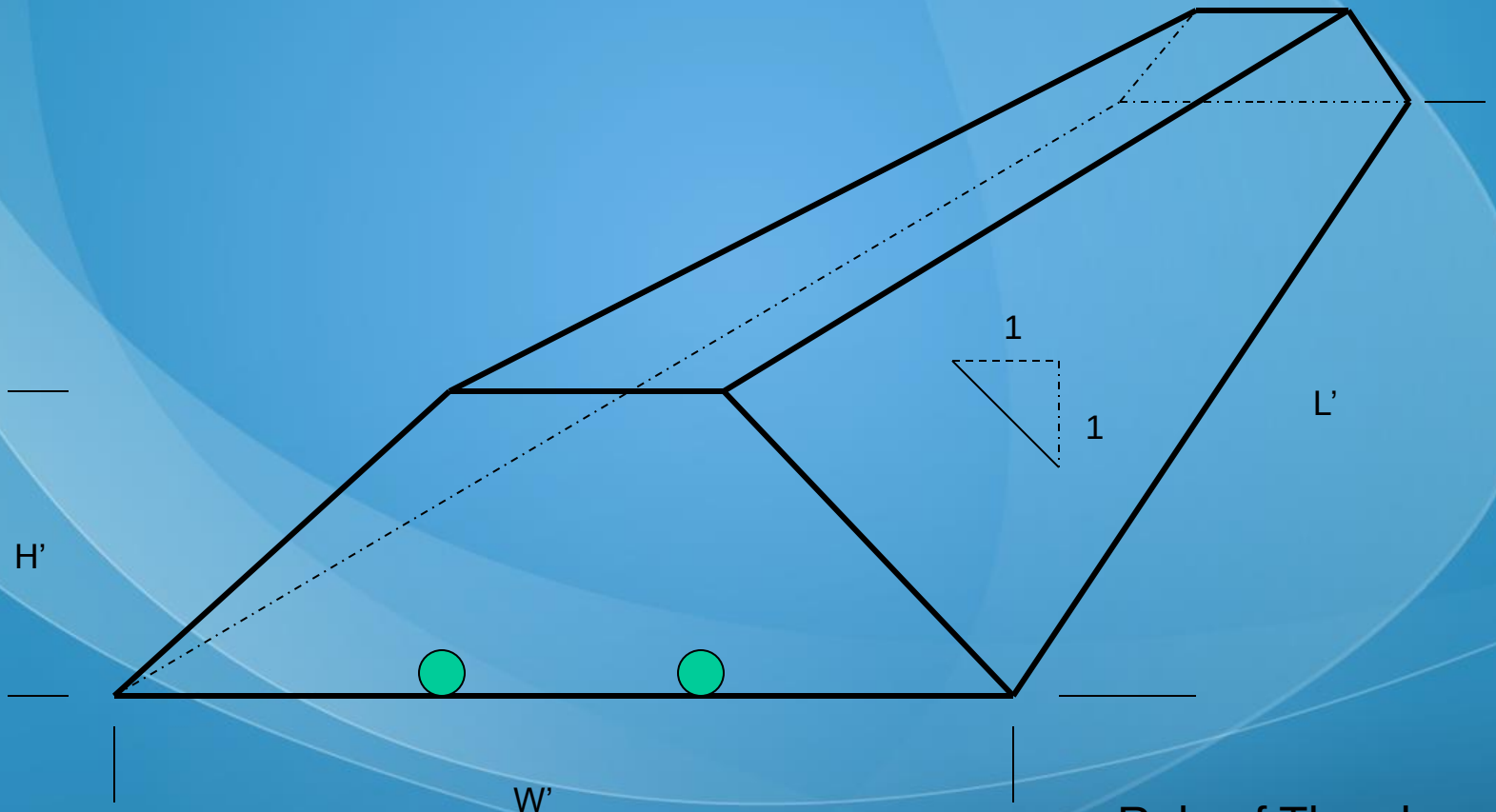
ASP Hands-on Workshop

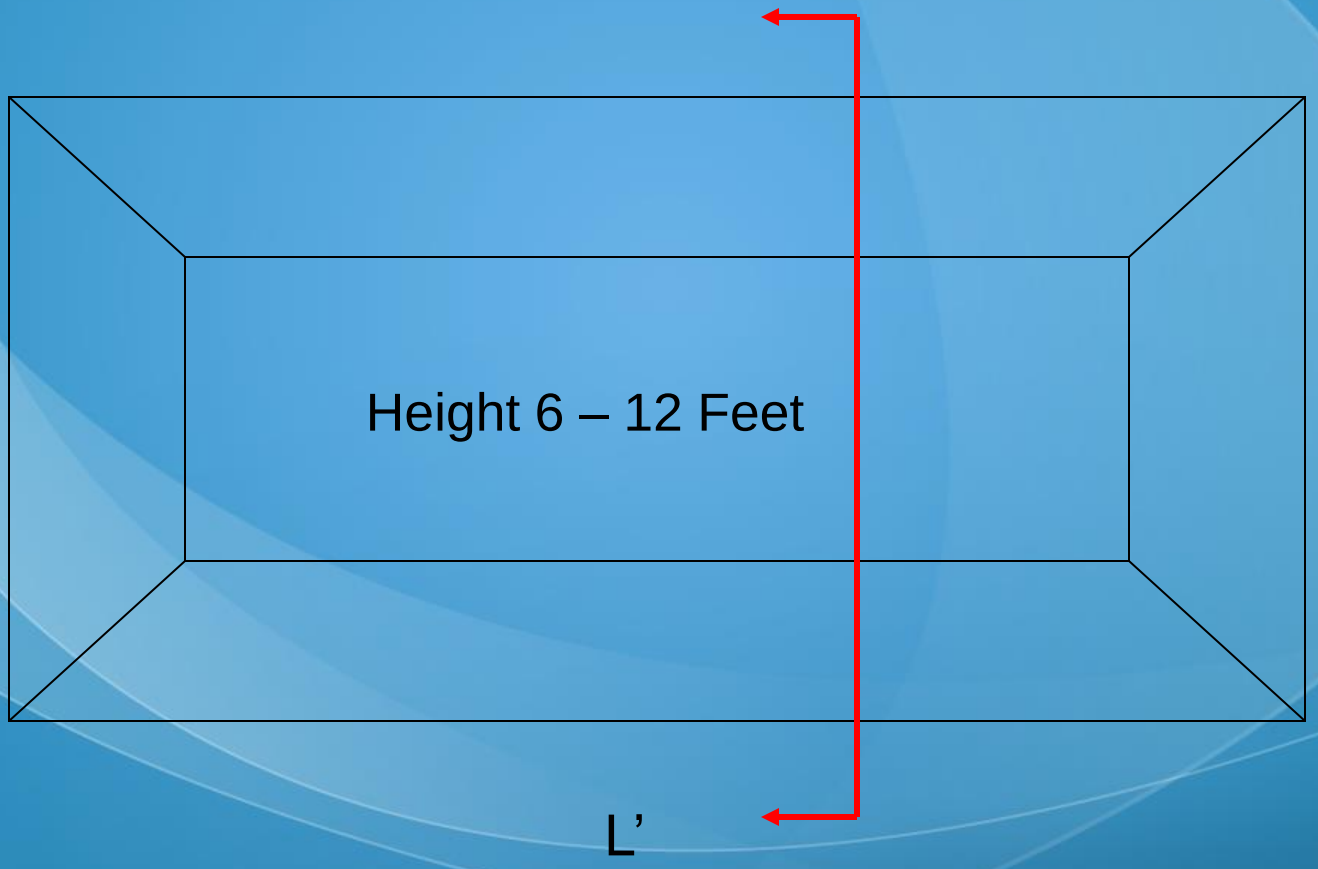
Aerated Static Pile



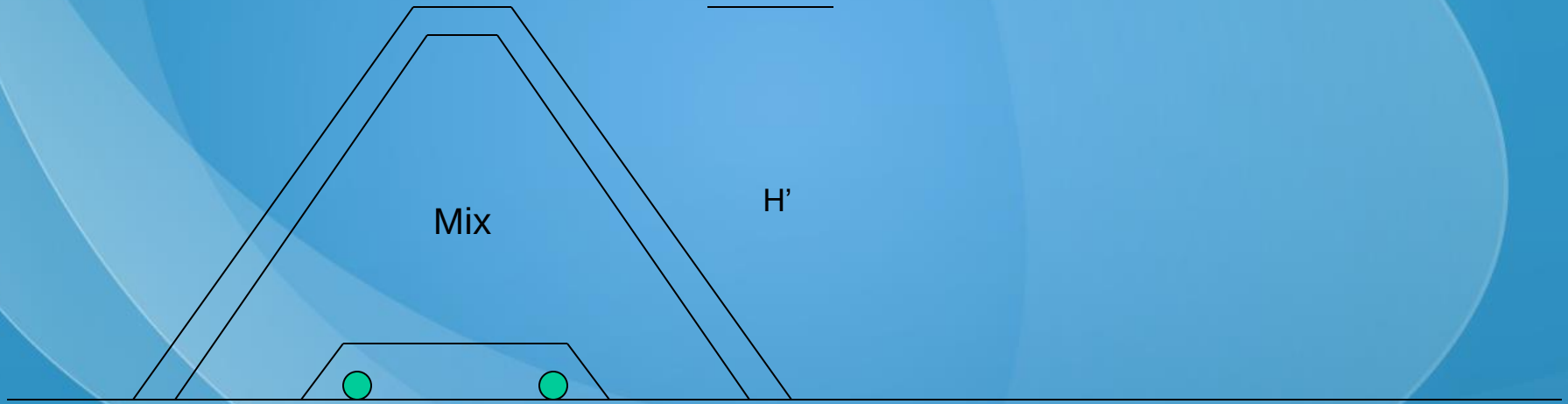
Rule of Thumb
Max Pile Length 75 – 80-feet

Plan View Dimensions

Length 75 – 80 Feet



Section View ASP



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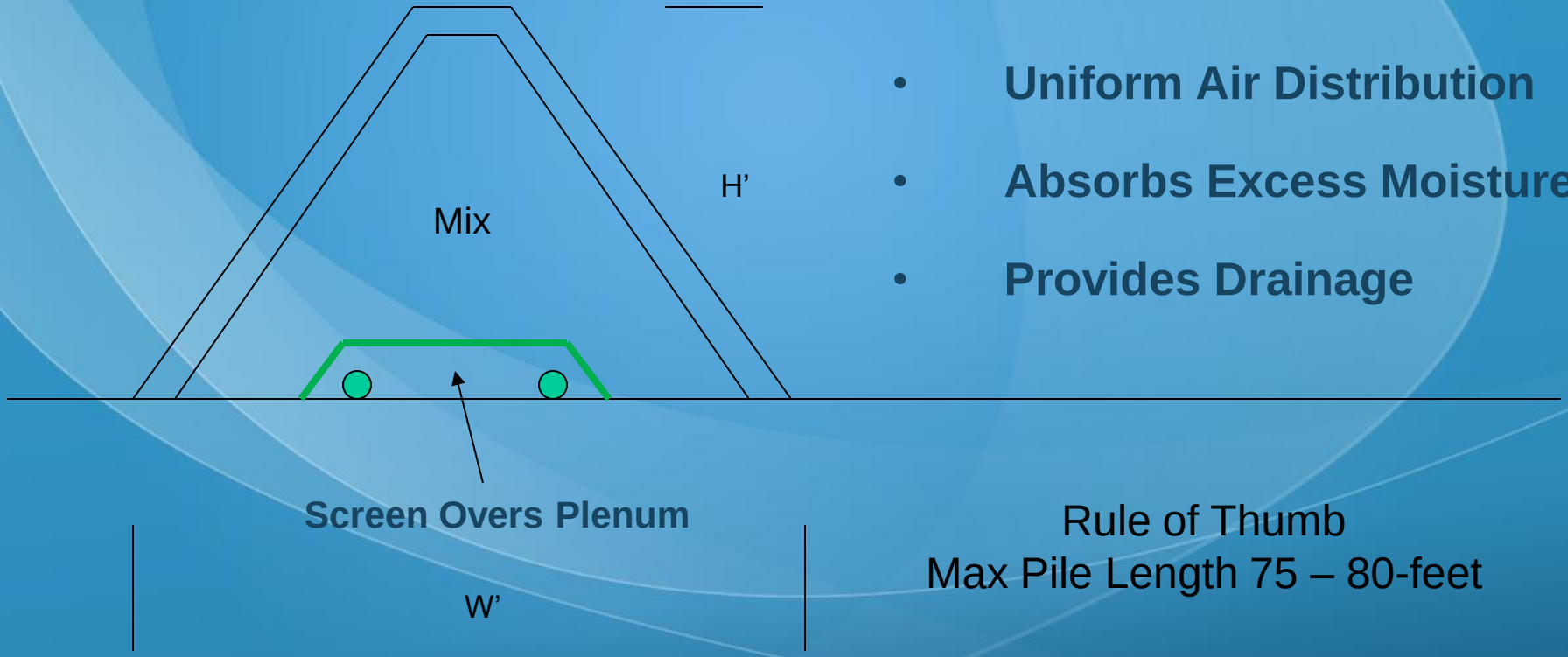
Rule of Thumb
Max Pile Length 75 – 80-feet

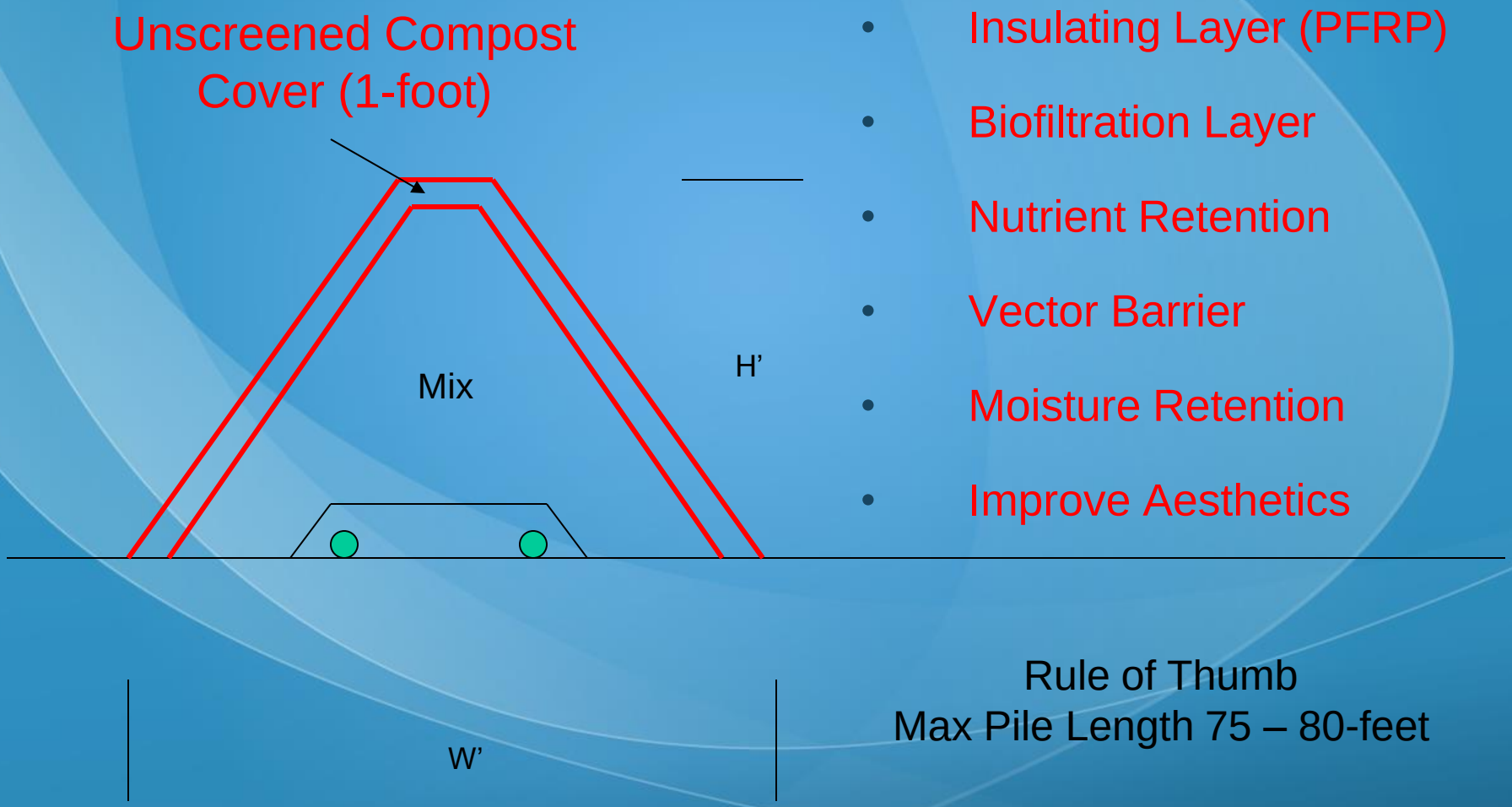
Section View ASP



- **Uniform Air Distribution**
- **Absorbs Excess Moisture**
- **Provides Drainage**

Rule of Thumb
Max Pile Length 75 – 80-feet

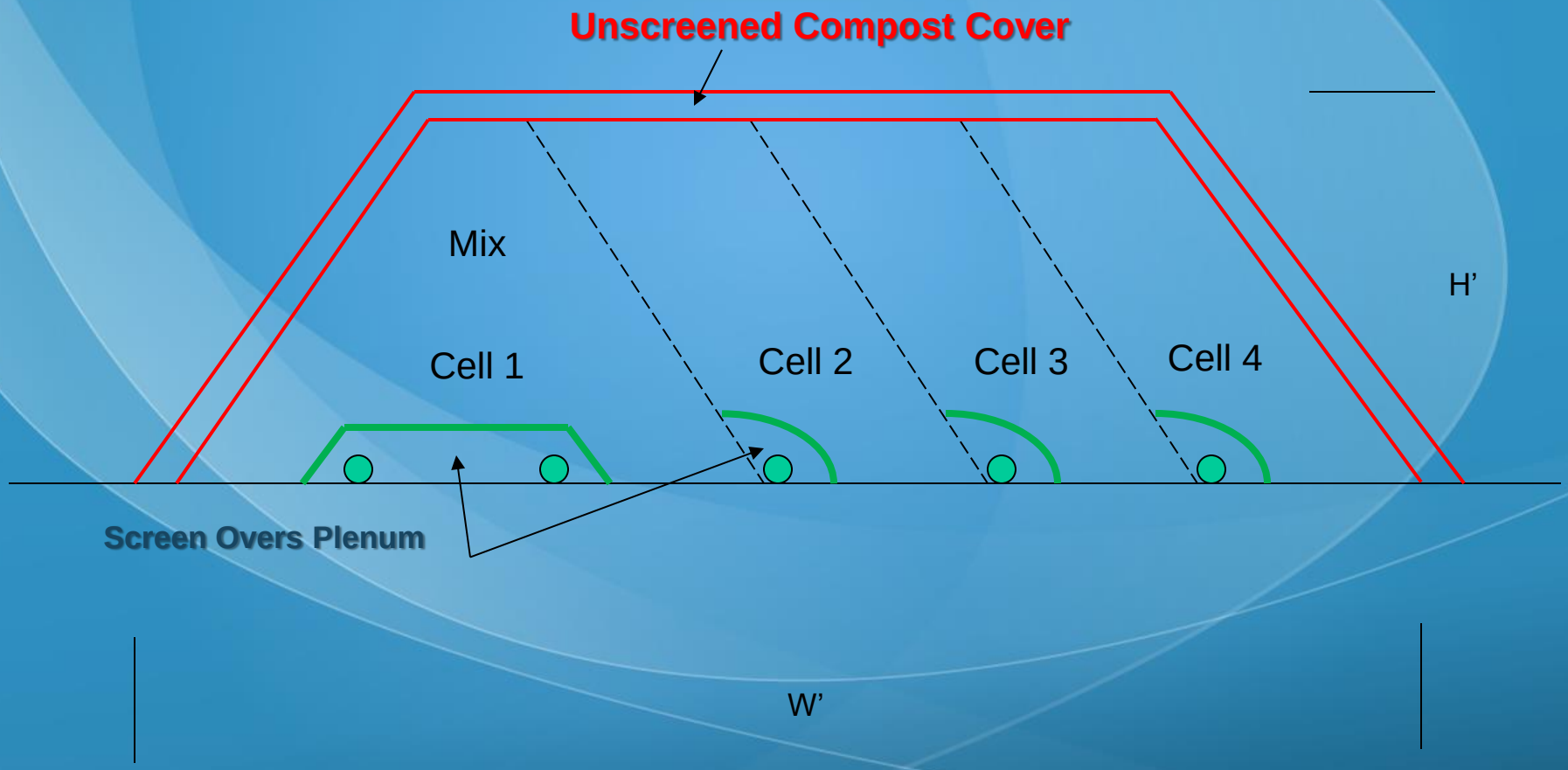
Section View ASP



- Insulating Layer (PFRP)
- Biofiltration Layer
- Nutrient Retention
- Vector Barrier
- Moisture Retention
- Improve Aesthetics

Rule of Thumb
Max Pile Length 75 – 80-feet

Section View Extended ASP



Extended ASP Composting

Two Particular Acres, Royersford, PA

A Brief History of the Aerated Static Pile Method

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Beltsville, Maryland

- USDA Research Project – Starting in 1974
- Small group of scientists & engineers (Dr. Elliot Epstein)
- Develop a better means of managing biosolids
- Used biologic principles borrowed from WWTP

Beltsville, Maryland

- Trial & Error Process, evaluating failures – (many)
- Negative aeration w/ compost cover
- Developed criteria for pathogen reduction >> PFRP
- Resulted in current methods and standards

The ASP Process with a 3-Bin System

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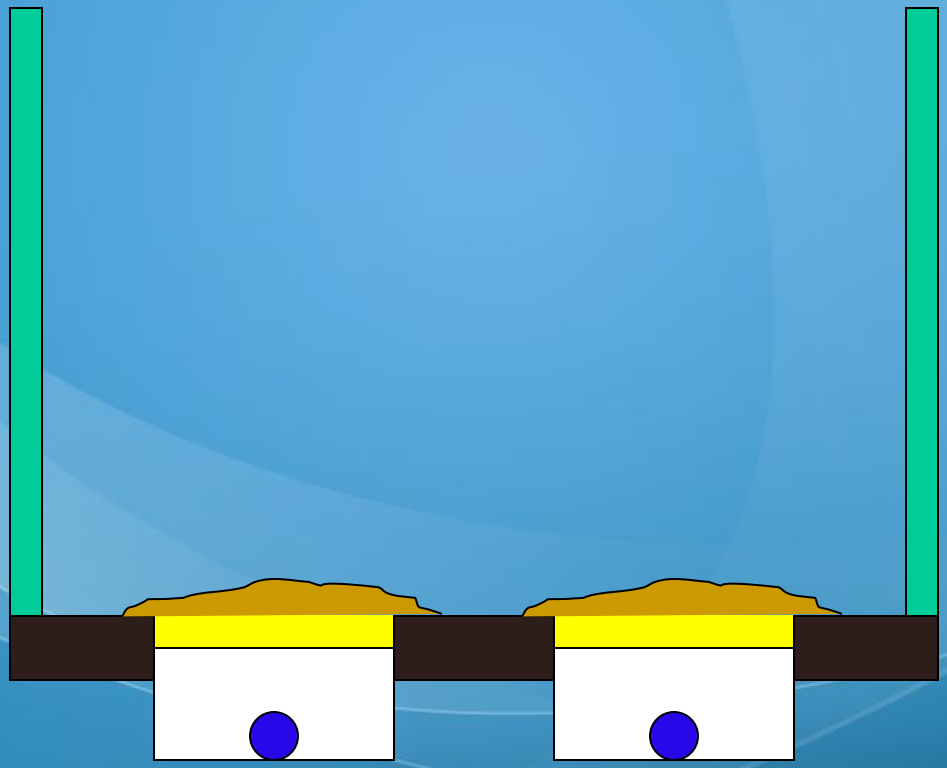
3-Bin Top Down Compost System

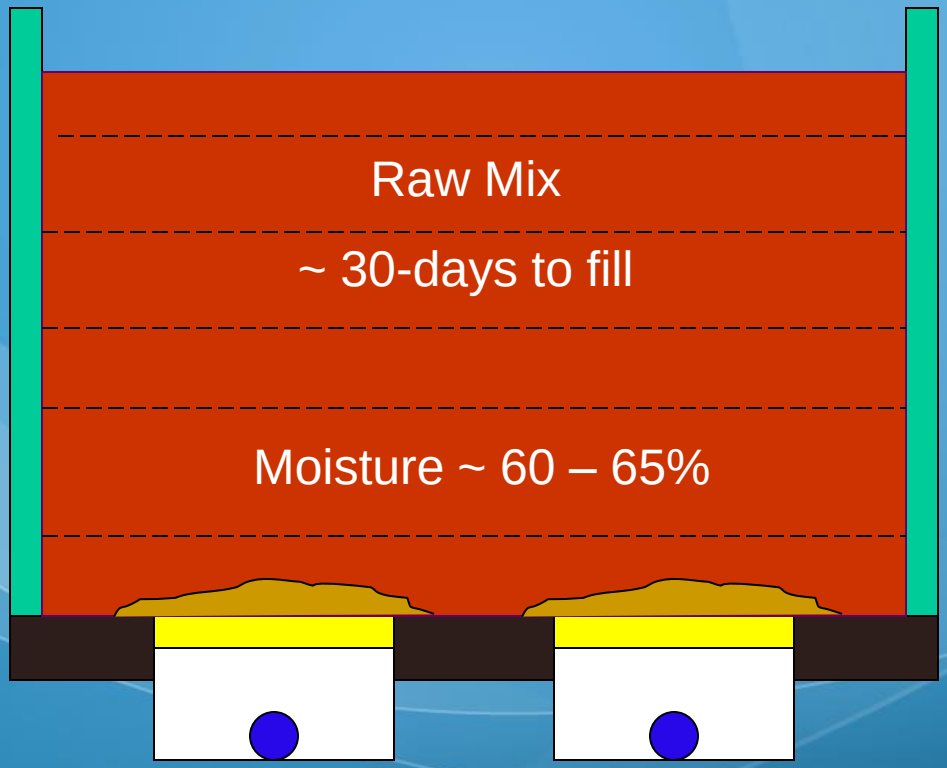
Liberty Bell Farm, Snohomish

Completed Aeration System

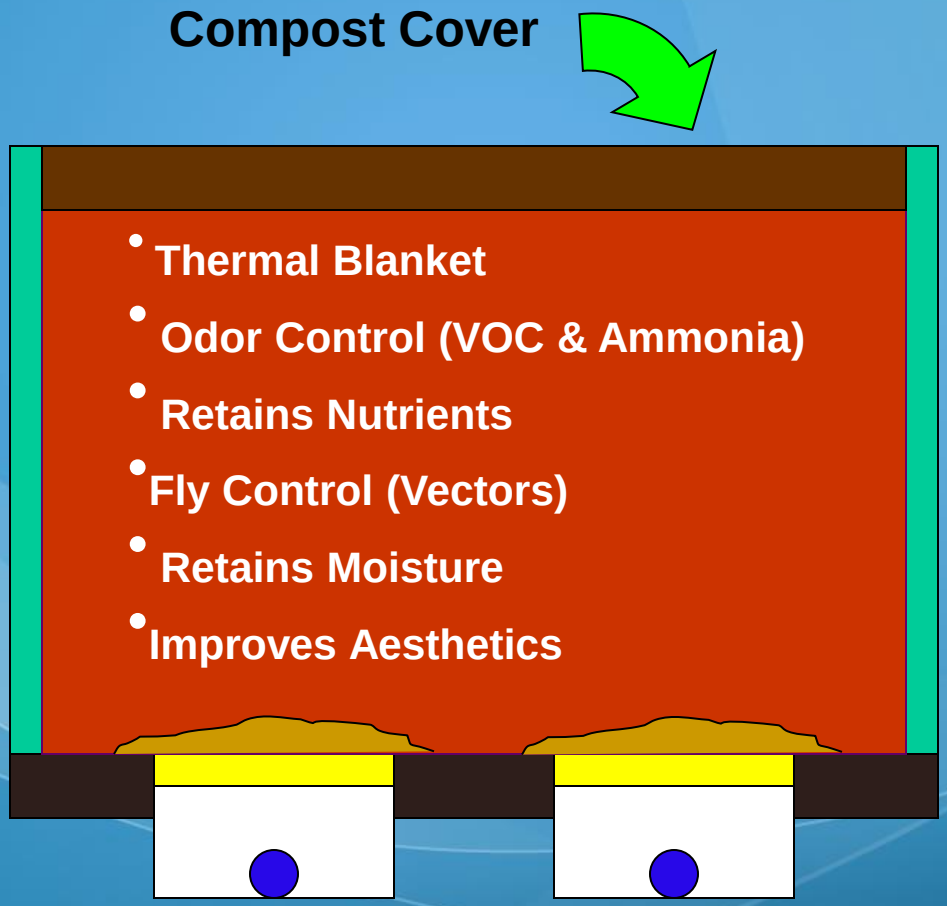
Cross Section of an Aerated Bay



Filling the Bin

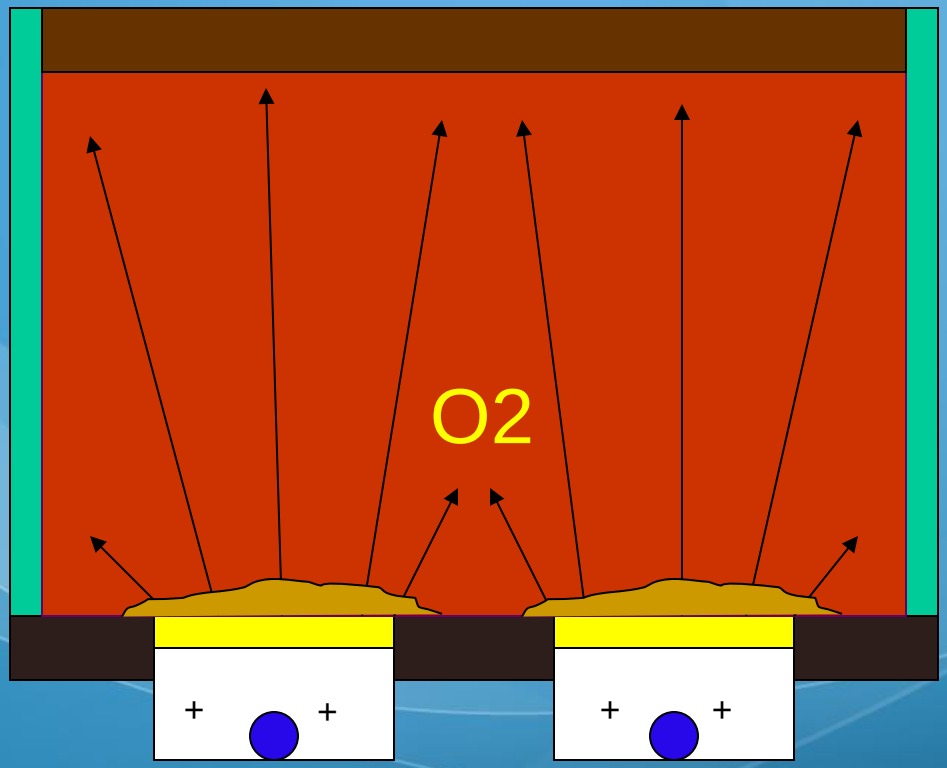


Placing the Compost Cover



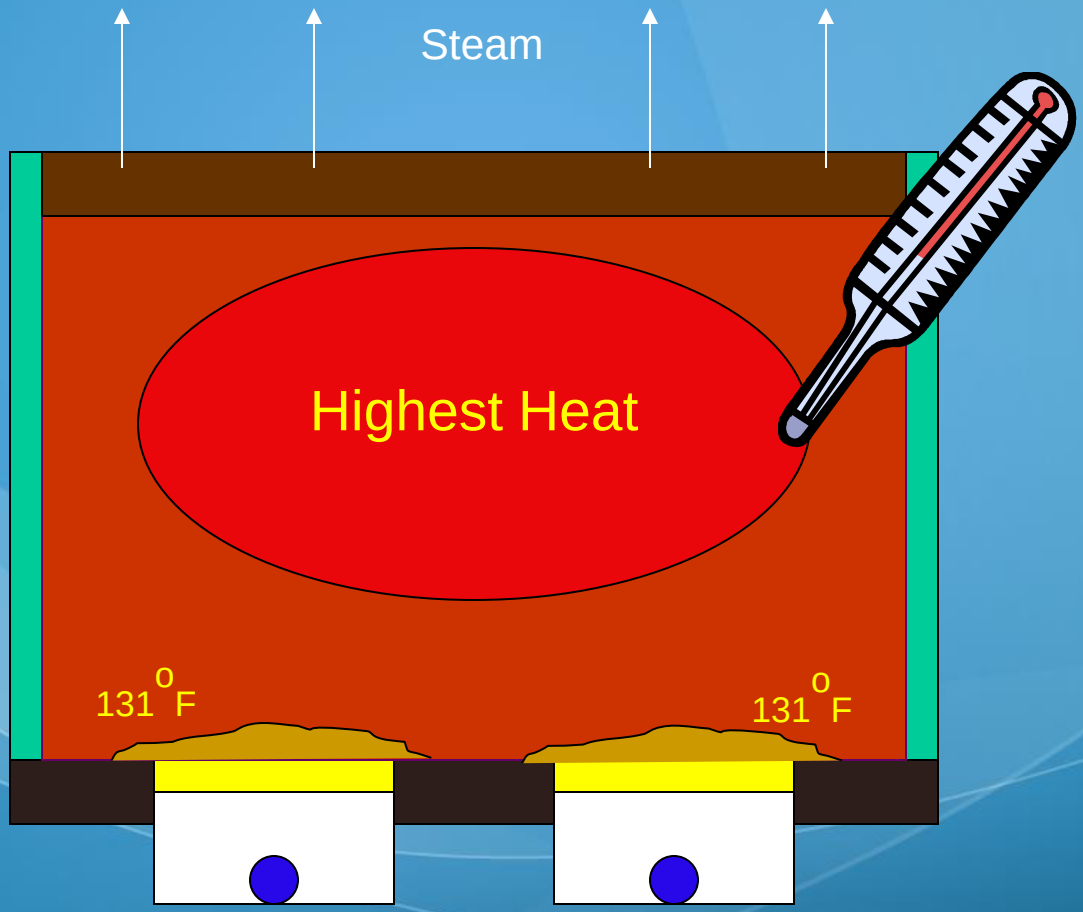
Turning On the Airflow

Typical Aeration Cycle: 2-min ON & 30-min OFF



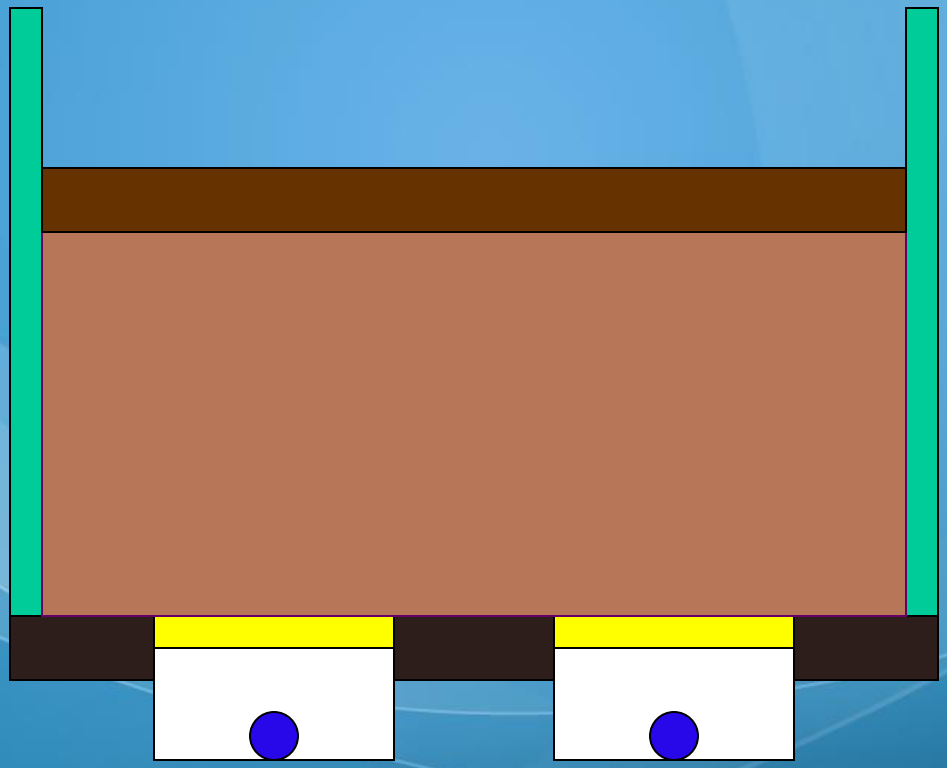
No Turning!

Monitoring Pile Temperatures



Active Composting to Curing

Volume Loss 25% – 40% in 4 weeks



Stall Management

Removing Solid Manure

Moisture Conditioning the Mix

Dumping Cart into Compost System

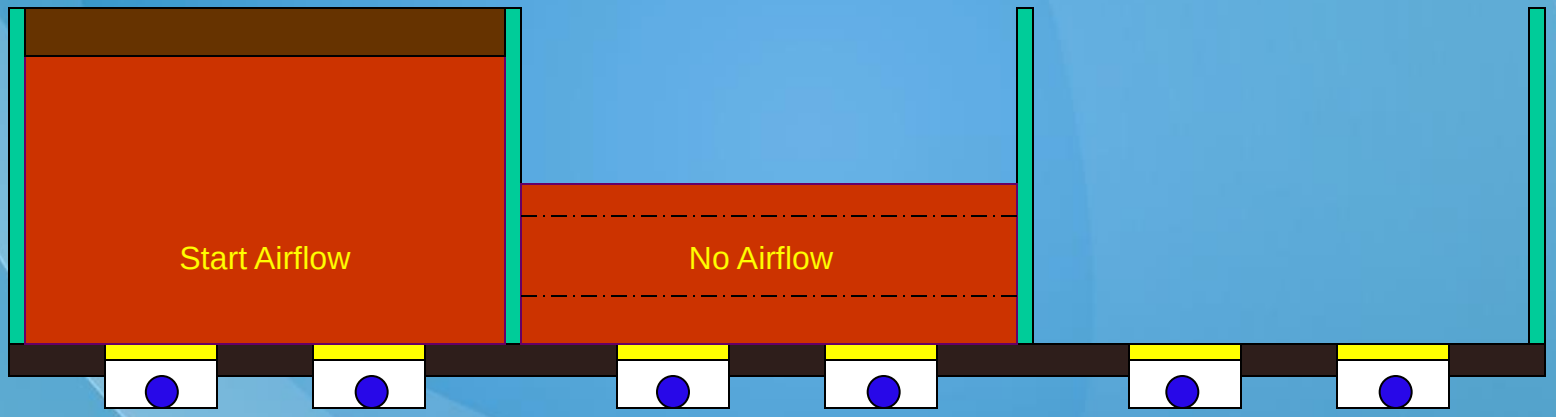
Adding Final Cover Layer

Adding the Final Touch

Monitoring Compost Temperatures

Cross Section of a 3-Bay System

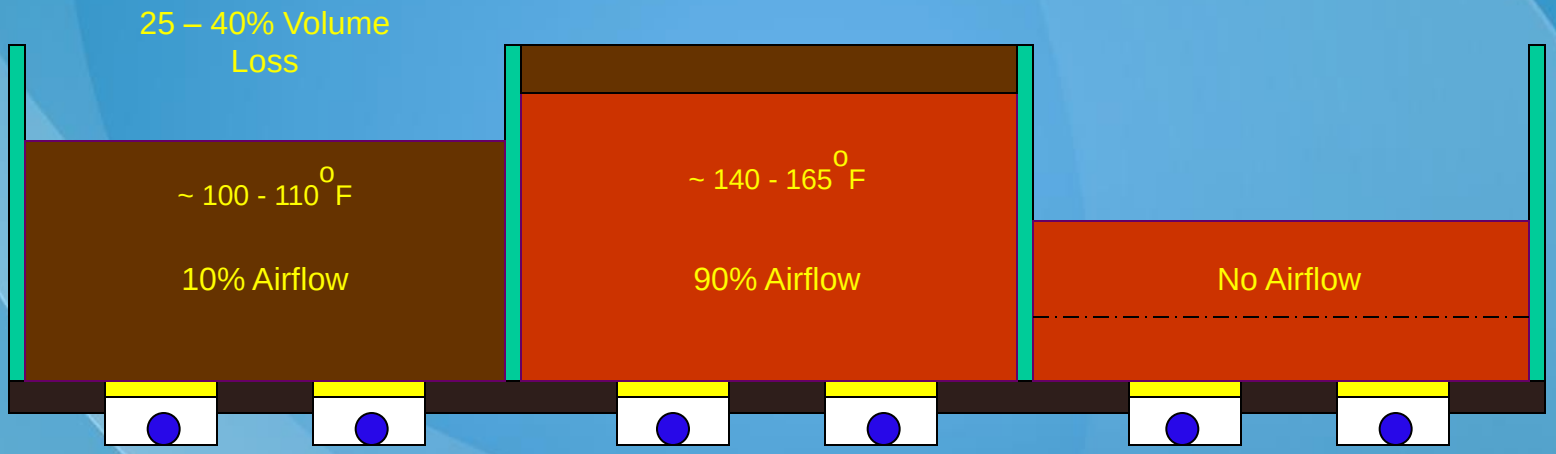
Stage 1



Bin #1	Bin #2	Bin #3
Active Phase	Filling	Empty

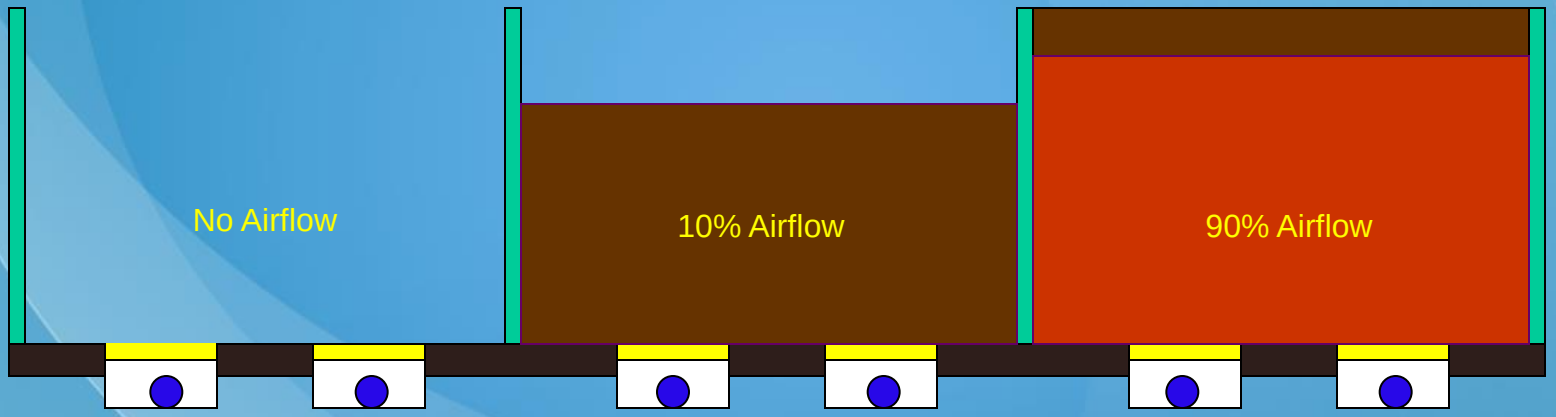
Cross Section of a 3-Bay System

Stage 2



Cross Section of a 3-Bay System

Stage 3



Bin #1
Ready for Batch #4

Bin #2
Curing Phase

Bin #3
Active Phase

What Can Be Composted?

Organic Wastes
or
Natural Resources?

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Agricultural

- Livestock Manure
- Zoo Manure
- Crop Residuals
- Waste Feed
- Paunch Waste
- Mortalities

Municipal / Institutional

- Green Waste
- Food Waste
- Biosolids
- Septage
- “Night Soil”
- Garbage
- Road Kill

Industrial

- Fruit Pomace
- Vegetable Culls
- Fish Waste
- Nursery Waste

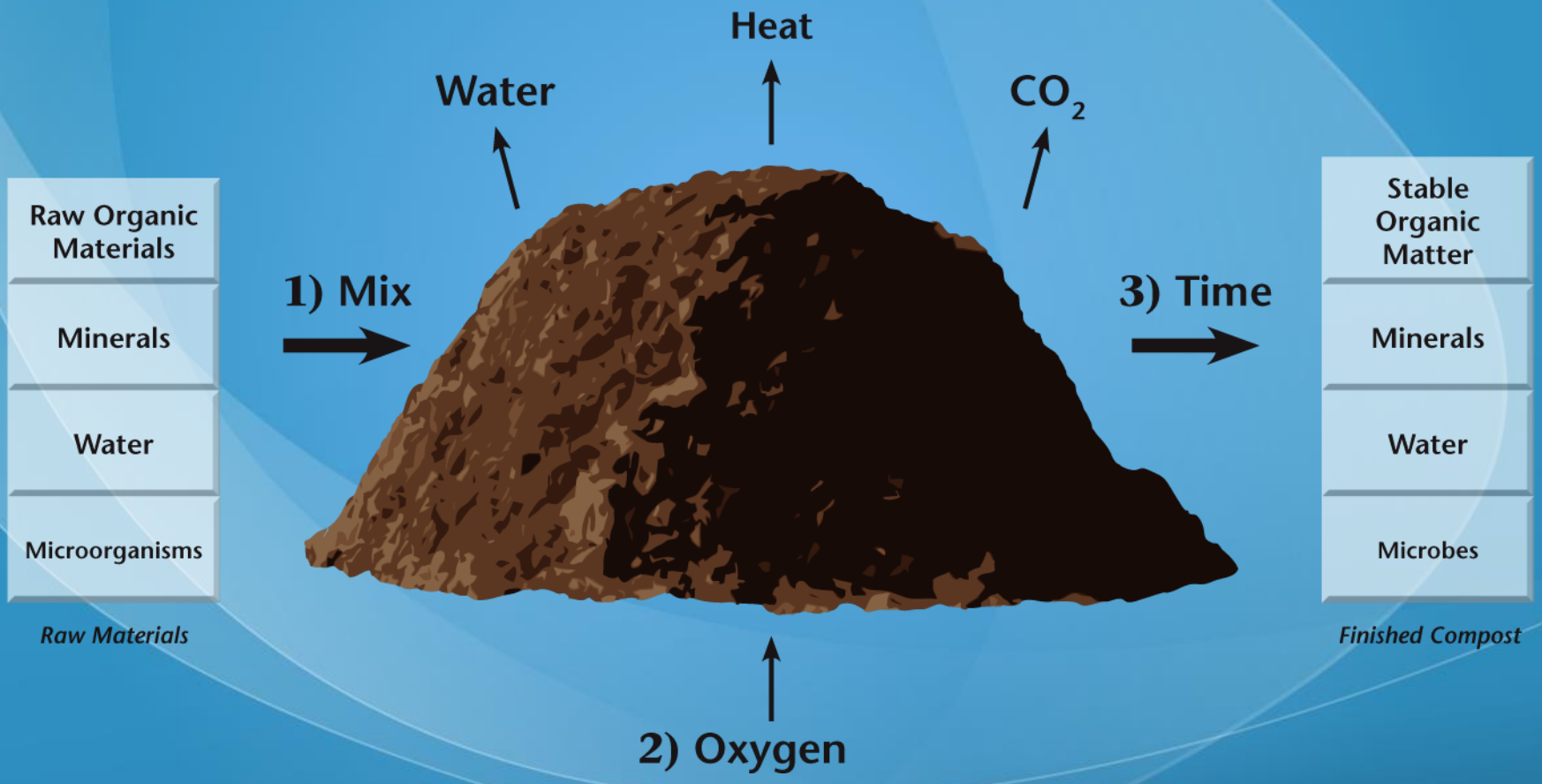
What is Food Waste?

What is Food Waste?

What is Food Waste?

“Vegetable Soup”

The Composting Process



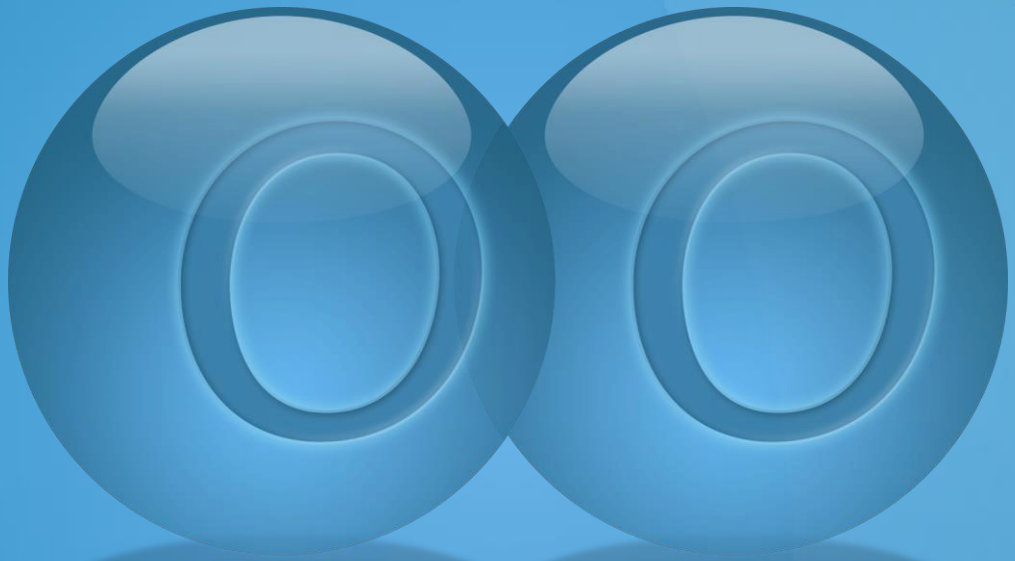
Compost Mix
3 Critical Parameters

1. Carbon to Nitrogen Ratio (C:N ~ 30:1)

2. Porosity: Volume of Void Space
    1. Bulk Density: 550 – 950 pounds per cubic yard
    2. Free Airspace: 35 to 60%

3. Moisture Content (60 – 65%)

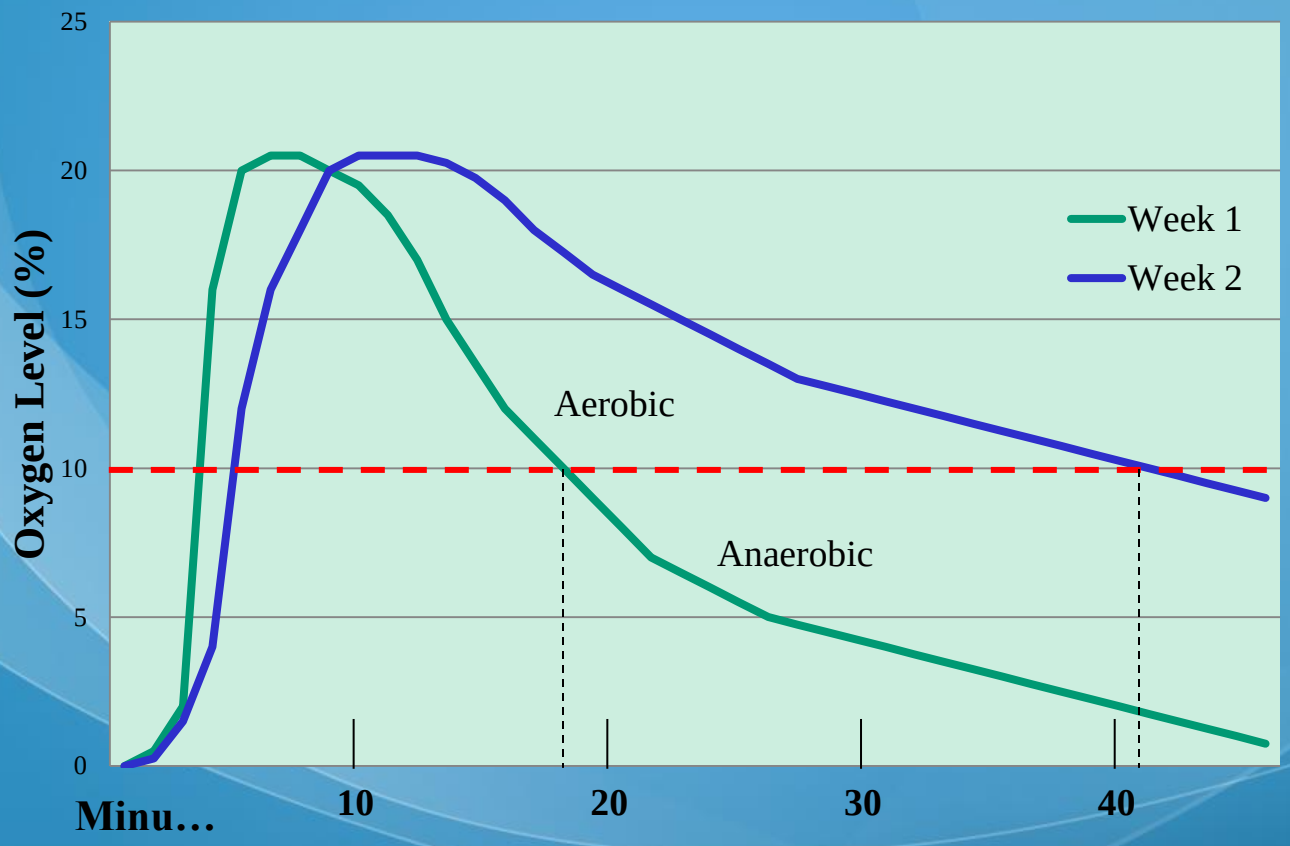
The Secret to Composting is…



Oxygen!

Will this be on the test? **Absolutely!**

Oxygen Depletion in Compost Pile



Aeration

Allows the Operator to:

- Maintain Aerobic Conditions
- Mitigate Impacts from Objectionable Odors
- Manage Pile Temperatures
- Reduce the Loss of Nutrients
- Expedite the Rate of Composting & Curing
- Produce Superior Compost Products

Rate of Aeration

Maintaining Desired O_2 Levels in the Compost Pile:

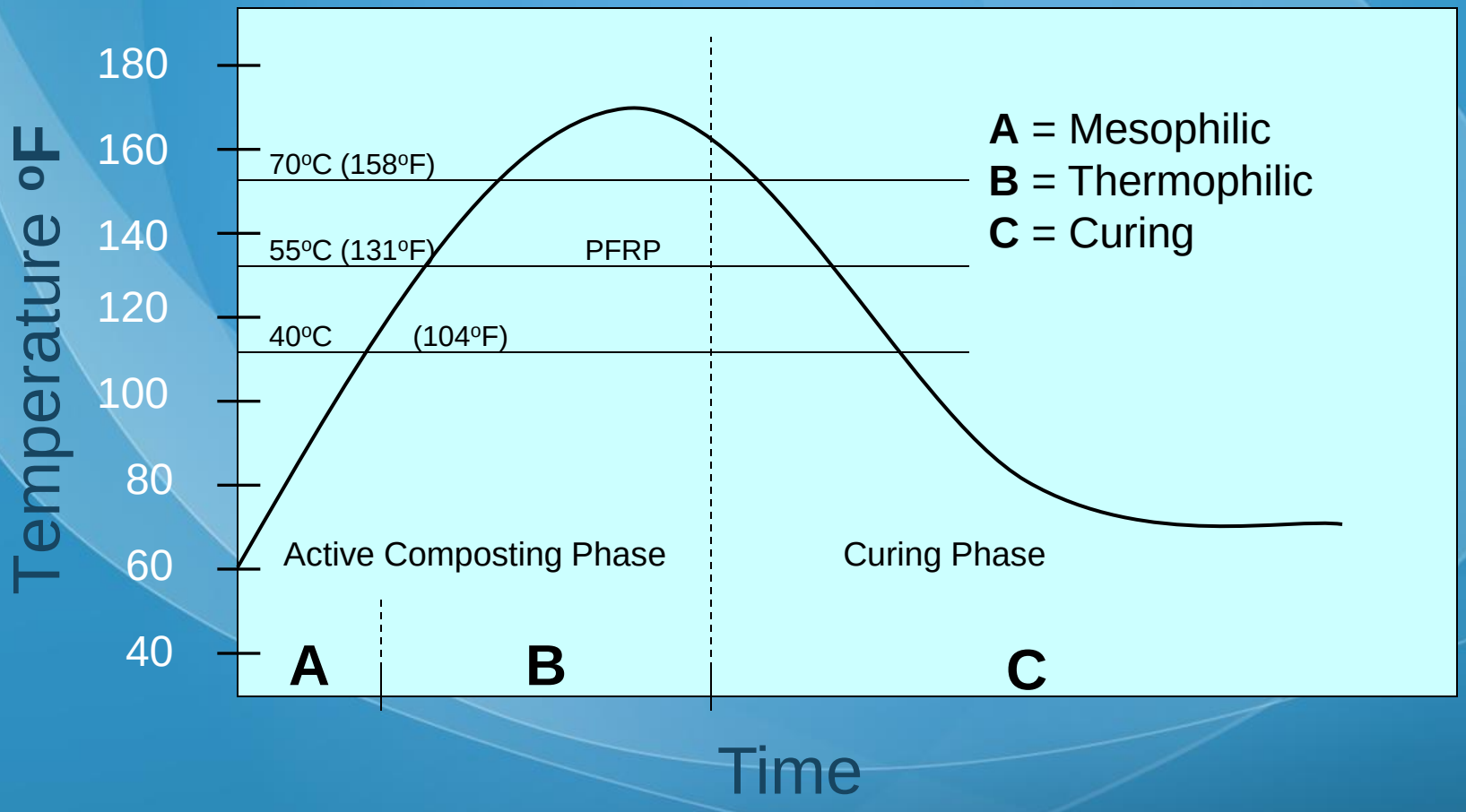
1. Frequency
2. Duration

→ On / Off Cycles / Continuous Flow

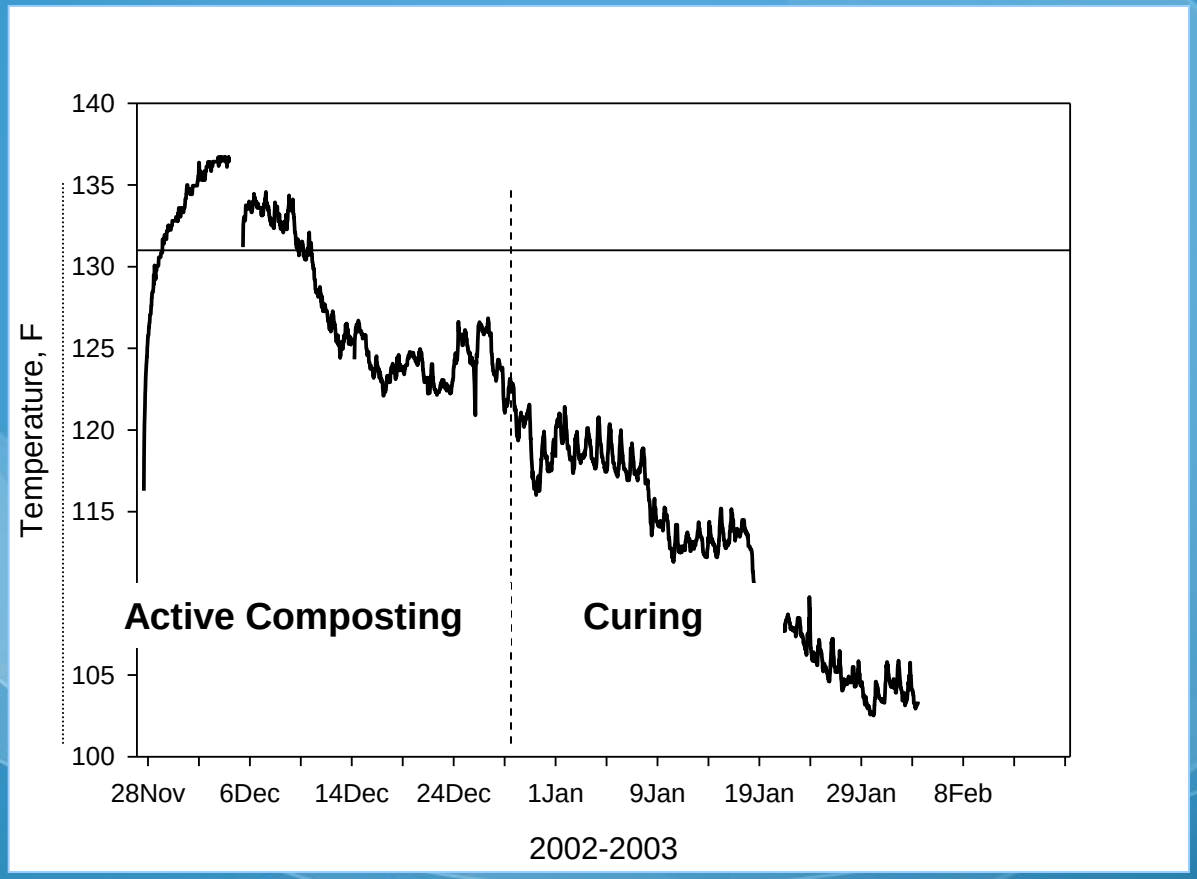
3. Volume

→ Blower Output (Size & VFD)
→ Size of Manifold & Lateral Pipes
→ Number of Lateral Pipes
→ Valves & Dampers

Temperature Change in a Typical Compost Pile



Actual Temperature Data Curve



Simple Field Tests for Evaluating the Initial Compost Mix

- Bulk Density – Bucket Test
- Free Air Space
- Moisture Content
- pH

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Checking Initial Mix Parameters

Pop Quiz

- The secret to composting is _____.
- After turning, Oxygen is depleted in a turned windrow in roughly _____ to _____ minutes.
- The desired Oxygen content in a pile is _____ % or greater.
- The three critical parameters in a compost mix include: _____; _____; and _____.
- PFRP means: A Process to _____ .
- With ASP Composting, PFRP requires that the entire pile reach temperatures of _____^{o}F or greater for a minimum of ____ days.