



Heat Treatment Considerations Before, During & After

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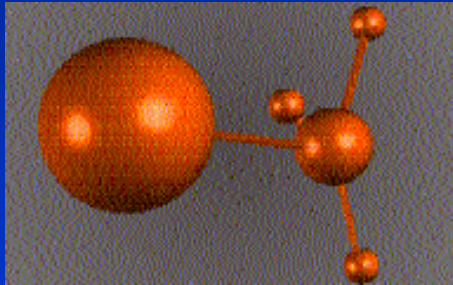


History of Heat

Early 1900's

Gaining Popularity

Considerations Evolving





Heat Treatment

- ☞ 120°F. to 140°F. Target Zone
- ☞ Lower Humidity Likely
 - As temperature increases, humidity decreases.
- ☞ Lethal Target Zone for Insects

Temperature Insect Response

<u>Zone</u>	<u>Temperature</u>	<u>Insect Response</u>
Lethal	120°F to 140°F	Death in minutes
	110°F to 115°F	Death in hours
Sub-optimum	95°F to 100°F	Development stops
Optimum	75°F to 90°F	Maximum development
Sub-optimum	65°F to 70°F	Development slows
	55°F to 60°F	Development stops
Lethal	35°F to 45°F	Death in weeks
	-5°F to 10°F	Most S.P.I's die
	-20°F to -10°F	Death in minutes, insects freeze



Heat Sterilization

- ☞ 160°F +++++
- ☞ Quicker Insect Kill
- ☞ Microbial Reduction
- ☞ Harder on Equipment & Structures



Heat Treatment Duration



☞ When temperature reaches 125°F. + for 2 hours, the mission has been accomplished.

– Ambient, internal or external ???

» **Wherever the insect is at.**

☞ Typical **structural** heat treatment duration

– Set up & heat up (8 – 12 hours)

– Hold temperature (24 – 36 hours)

– Cool down (< 8 – 12 hours)



Heat Treatment Duration



☞ When temperature reaches 125°F. + for 2 hours, the mission has been accomplished.

– Ambient, internal or external ???

» **Wherever the insect is at.**

☞ Typical equipment heat treatment duration

– Set up & heat up (4 - 6 hours)

– Hold temperature (8 - 16 hours)

– Cool down (< 4 - 6 hours)



Heat Treatment Duration



- ➡ When temperature reaches 125°F. + for 2 hours, the mission has been accomplished.
 - **Wherever the insect is at.**
 - Time is not as important as the temperature.

- ➡ Inside the walls
- ➡ Inside the equipment
- ➡ Inside the bins

Know your temperatures.

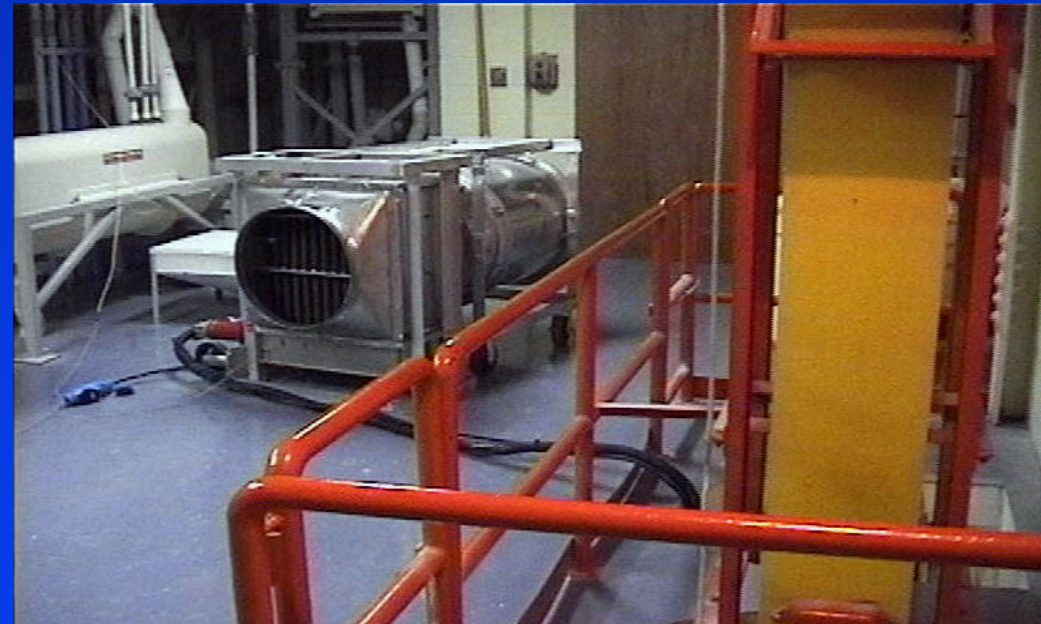


Facility Preparation For Heat Treatment



35 MINUTES OF HEATING; 122° - 124° F.

CONFUSED FLOUR BEETLES





Old Myths or Half Truths



- ➡ Heat not successful because floor level temperatures are not high enough.
- ➡ Cannot heat entire facility at once, so partial treatments are not successful.
- ➡ Heat will burn down my place.
- ➡ Heat will dry out my wood equipment.



Old Myths or Half Truths



- ➡ No such thing as one checklist for all HTs.
- ➡ No need to learn from others.
- ➡ It takes three HTs to get it right.
- ➡ No two heat treatments are alike.
 - Different facilities
 - Different geographical locations
 - Different weather
- ➡ No need to involve other departments.



Develop A Multi-Functional Heat Team

- 👉 CHAIRED BY THE “SPENDER”
- 👉 CORPORATE SUPPORT
- 👉 SANITATION
- 👉 ELECTRICIANS
- 👉 PIPE FITTERS
- 👉 MILLWRIGHTS
- 👉 PEST CONTROL SERVICE PROVIDER
 - OWNERSHIP FROM ALL DISCIPLINES!

Facility Preparation For Heat Treatment

conduct progress meetings



- ☞ The “P” Lesson
- ☞ Planning, Preparation & Practice Prevents A Pitiful Performance

“Third Time Is Usually A Charm”

- Effective
- Efficient
- And Economical



Effects On Sprinkler System



- ☞ High temperature sprinkler heads should be specified for areas which will be heated.
 - High temperature heads (286 degrees F) should be used because hot spots do develop that will prevent the accidental water release by one of the sprinkler heads.
 - Medium temperature heads (200 degrees F) will work with excellent air movement.
 - Low temperature heads (160 degrees F) are not recommended.



Effects On Controllers And Electrical Equipment




- Identify Control & Equipment Concerns
- Contact Manufacturer Supplier
 - Describe a Scenario
 - » 120 to 140 Degrees F for 12 to 24 Hours
 - Use your vendors as a resource
- Moving Air Will Minimize Damage While Improving Effectiveness.




THERMAL SHOCK

👉 90 Degree F. differential rule of thumb





Heat Effects On Equipment Lubrication



☞ Gear Boxes -

The air (and the oil) in the gear box will expand when heated. If expanded, warm air can escape through the breather, there will be no problem. If there is no breather, pressure inside the gear box may force the lubricant out of the seals. Or, if the gear box is full of oil, it will also expand, spill or be forced through seals.



Building & Equipment Heat Losses



- Close and/or seal fire doors, man doors, roof vents, wall vents, and windows.
- Areas which are not to be included must be partitioned off if the area cannot be isolated - tarps and plastic can be used as makeshift walls.
- Exhaust and intake vents should be closed.
 - Keep functional for temperature control.



Preparation Specific To Your Facility



- ☞ **Prior to Heat-up**
 - Develop guidelines and your checklist
- ☞ **During Heat-up**
 - Develop guidelines and your checklist
- ☞ **After Heat-up**
 - Develop guidelines and your checklist



Heat Treatment Considerations Before

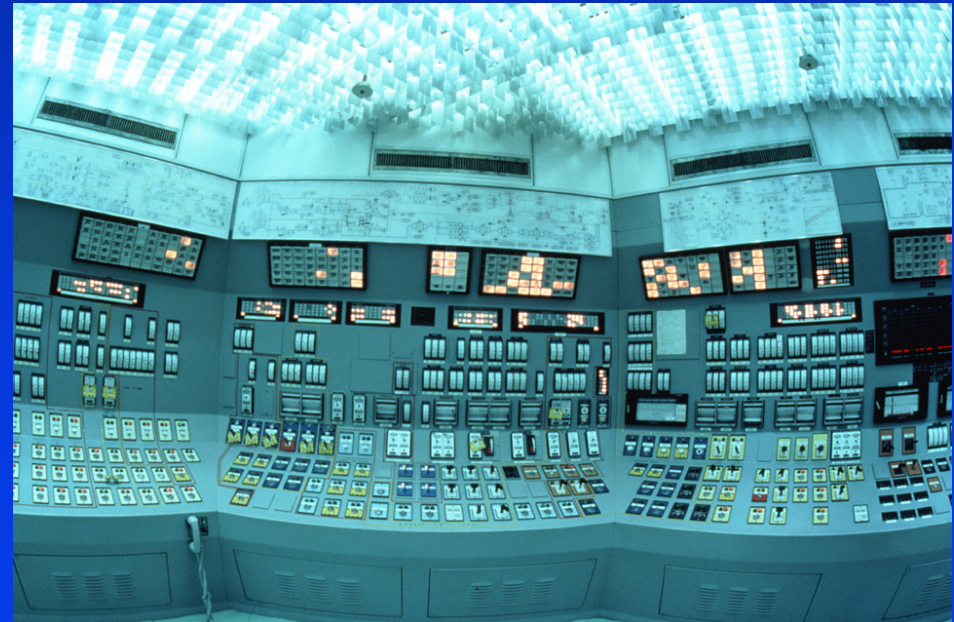


☞ Planning Team

- determine “what” to heat with “what”, and “when” monitored by “who”
- start a couple of months prior to a heat up
- identify concerns for investigation & action
 - » check with suppliers
 - get answers, make sure, do small tests

Heat Treatment Considerations Before

- ☞ Equipment considerations
 - sprinkler heads, fire protection system
 - sensitive electrical
 - » computers
 - belt drives
 - lubricants
 - wood sifters





Heat Treatment Considerations Before



- ☞ Removal of certain items
 - aerosol cans / pressured cylinders
 - fire extinguishers
 - sensitive ingredients, vitamins
 - packaging materials
 - portable computers
 - contractor materials
- ☞ A pre-heat walk through should identify any items of concern listed above.



Heat Treatment Considerations Before



➡ Remove most food products

“The performance characteristic of the food will likely change when exposed to these temperatures and time. Wheat does not mill as well. Flour does not bake as well and we know what happens to chocolate.”

➡ Things do dry out!



Additional Pre-heat Preparation



- ➡ Run equipment and bins, silos, etc. empty.
- ➡ Elevator Boots opened and cleaned.
- ➡ All sweepings and trash receptacles cleaned.
- ➡ Sacks of product removed.
- ➡ Portable containers emptied.
- ➡ Open as much processing equipment as possible - dust collectors, bins, hammer mills, feeders, screw conveyors, etc.



Heat Treatment Considerations Before



- ☞ Preparation immediate to a heat up
 - cleaning
 - seal building
 - insecticide residual application
 - placing air circulators and heaters
 - placing thermometers and hygrometers
 - placing insect test cages
 - placard warning on entry doors

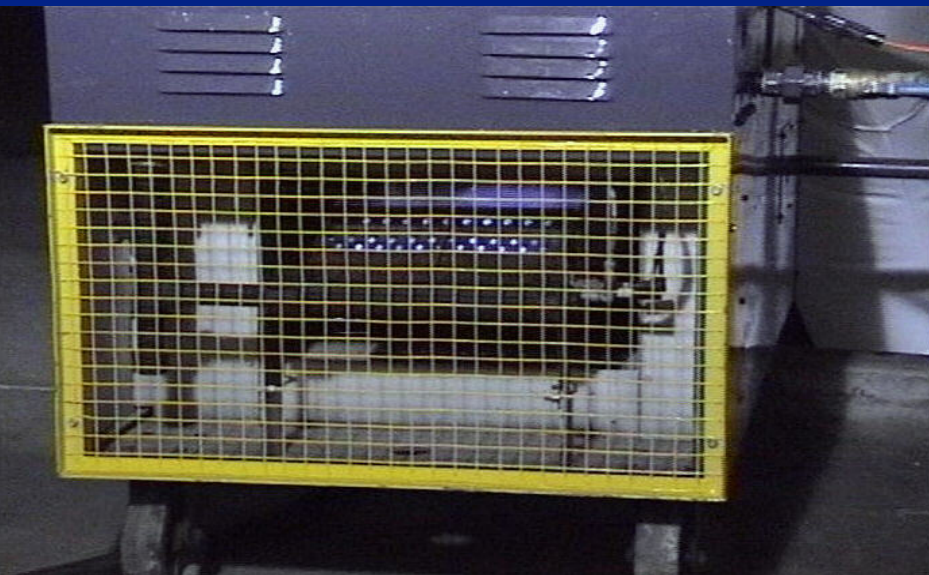


WARNING

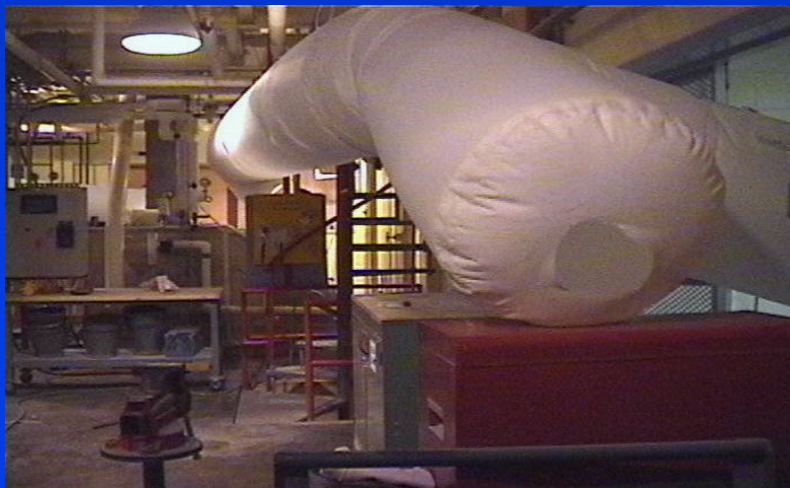
HEAT STRESS

AREA

Heat Treatment



Hot Air Is
Available
From Many
Sources





Heat Treatment Sources



☞ Electric

- Excellent for smaller treatment areas.

☞ Propane/Gas-fired

- Excellent for large structural applications.

☞ Steam Heat

- If boiler capacity is sufficient, excellent for large and small applications.
- If boiler capacity is small, good for smaller treatment areas and a good to supplement other applications.



Heat Treatment Considerations During



☞ Worker Safety Provisions

- clothing, no metal
 - » buttons, glasses, etc.
- established routes with flashlights
- rest area with first aid, emergency phone numbers
- cool vests available for emergencies

☞ Monitoring, adjusting heaters, fans and reporting activities are necessary



Heat Treatment Considerations During



- ☞ Monitoring during a heat treatment
 - Buddy system - pairs
 - » **Keep an eye on the place AND each other.**
 - Data collection
 - » Temperature and Humidity
 - Remote minimizes time in the heat
 - » Insect mortality

Buddy System





Heat Treatment Considerations After



- ☞ Cool down
- ☞ Collection of monitoring equipment
- ☞ Operational start up
 - Process flush out ... insect fragments may be high
- ☞ Look for **Document for Future Reference**
 - plastic material sagging
 - leaks - lubricants, seals
 - peeling of old paint
 - dead insect accumulations lead to unknown sources



Resources


☞ Internal

☞ Outside Services
– “Think Outside The Box”





Heat Treatment



Why heat treat 3 million cubic feet, if the insect problem is only in 3 thousand cubic feet?





Heat Treatment Considerations

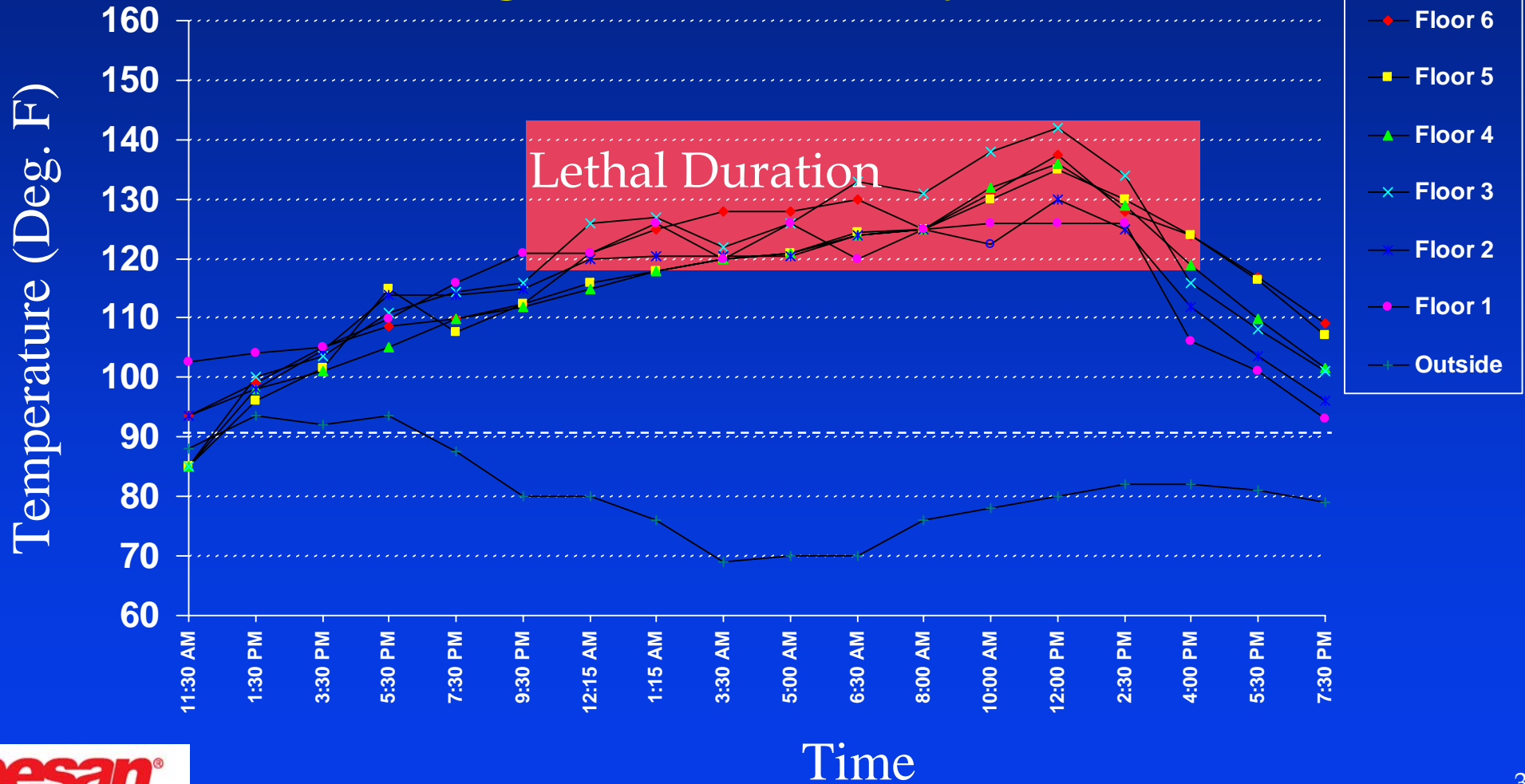


☞ Rule of the “E’s”

- 1. Experiment and Learn
- 2. Become Effective and Efficacious
- 3. Become Efficient and Economical

A Heat Treatment Profile

Average temperature by floor





Heat Treatment Considerations

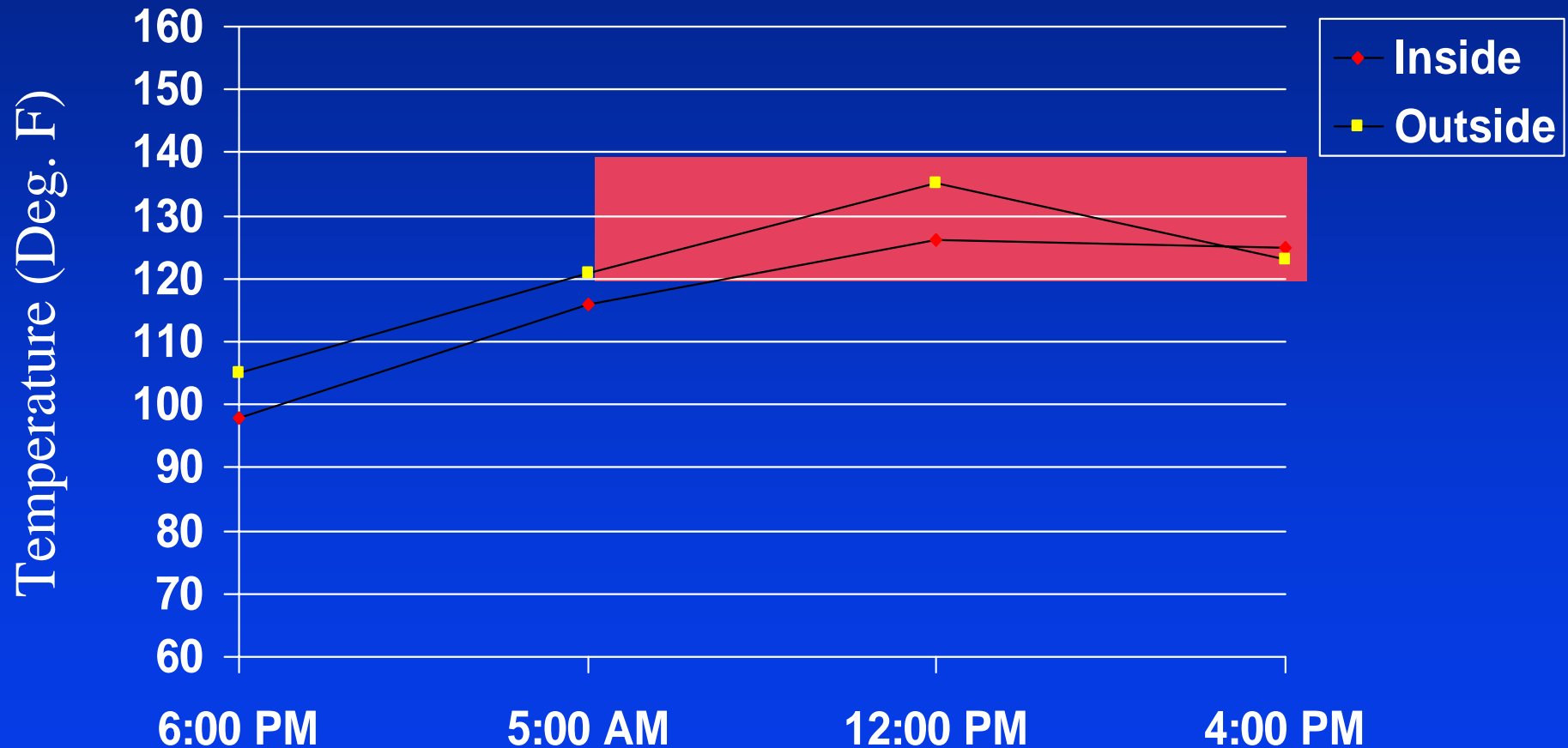
Is there a temperature difference inside equipment during a heat treatment?

A slight difference and a cool down delay does exist.

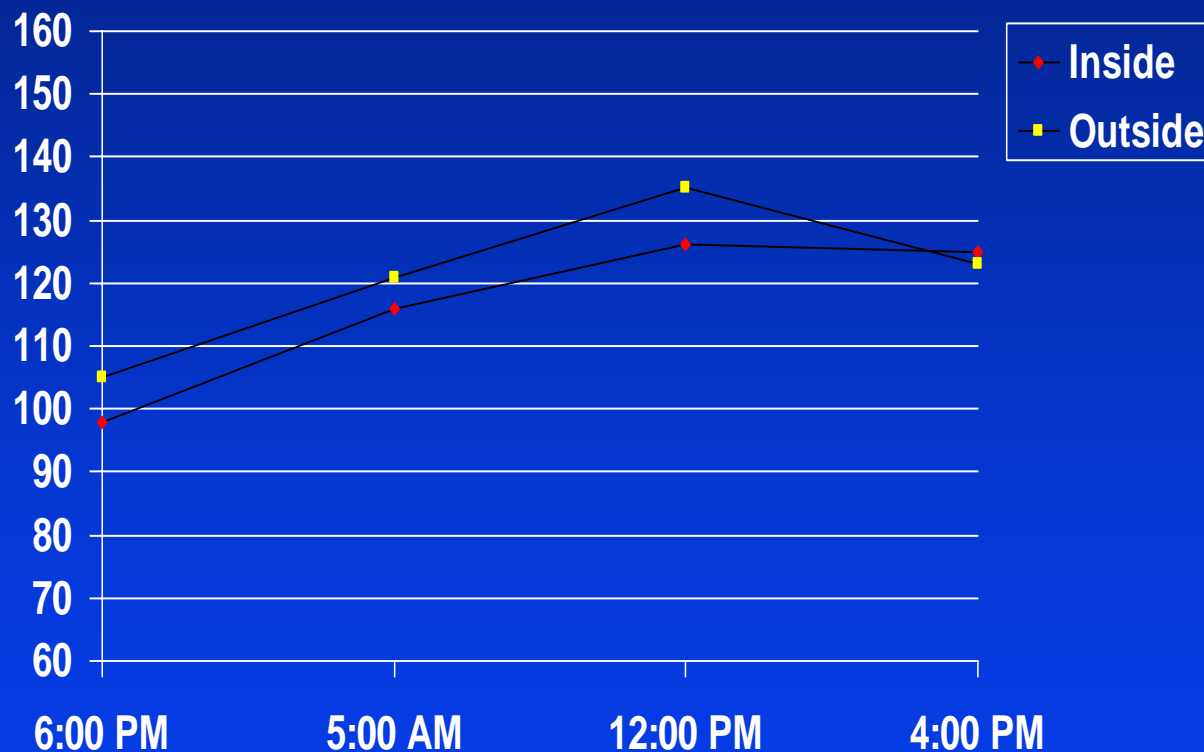
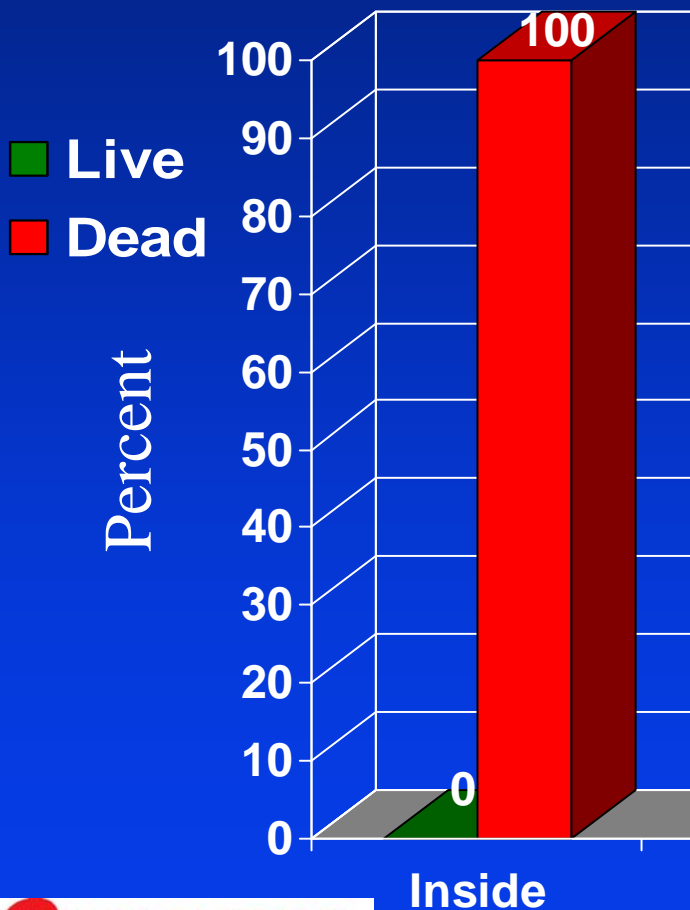


A Heat Treatment Experiment

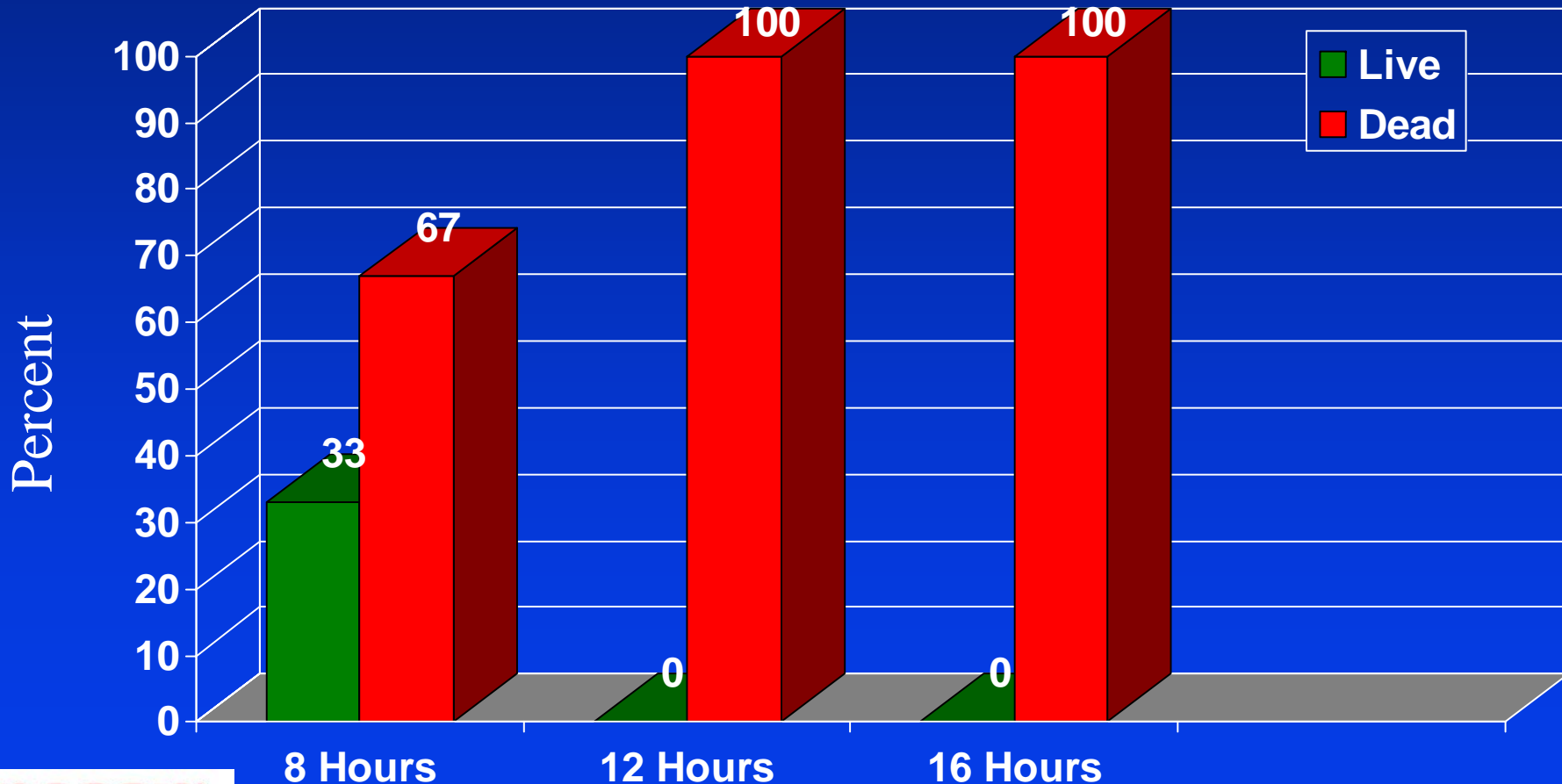
Average temperature inside and outside sifters



Heat Treatment Experiment Flour Beetle Mortality Inside sifters



Heat Treatment Experiment Flour Beetle Mortality Inside Sifters





Heat Treatment Considerations Summary



- 👉 Heat is Effective!
- 👉 Heat Supports IPM!
- 👉 Heat is a Back to Future Concept!
- 👉 Be Prepared!

- 👉 Better Than Some Alternatives =>



Maybe

Are there any other questions?

Are We Done Yet?

