

# WELCOME

*This event will begin soon*

Music is now  
playing.

If you are unable to  
hear the audio,  
please take a  
moment to test your  
system by clicking  
**HELP** in the  
resource box.

Interested in conducting your own webinar? Email [webinars@bnpmedia.com](mailto:webinars@bnpmedia.com)

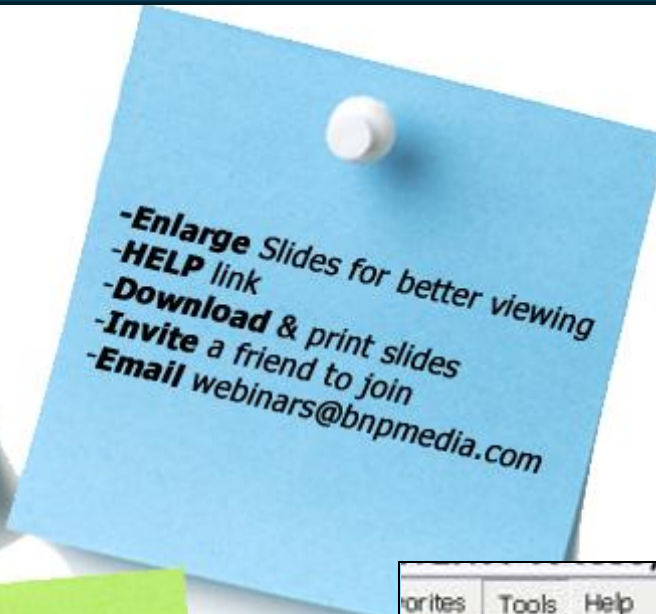
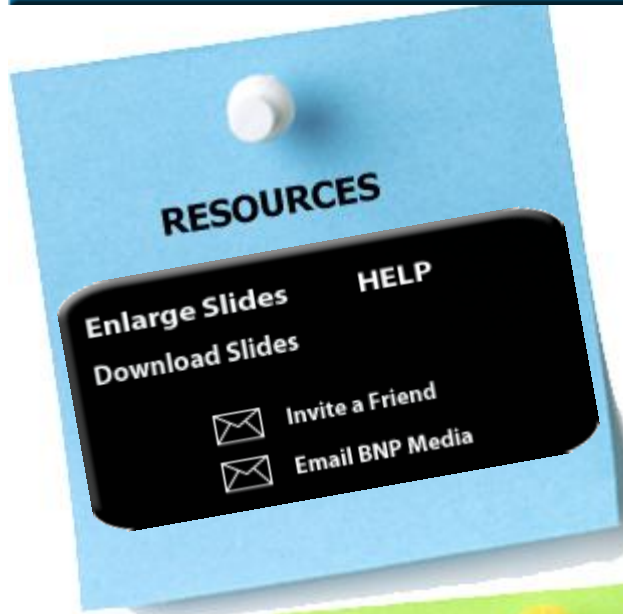


# Infrared Process Heating Seminar

IR Applications in the Real World

**ihea.org**  
MAKING **HEAT** PROCESSES WORK

# How to Use Your Console



## Disable Pop-Up Blocker



Archive  
[www.process-heating.com](http://www.process-heating.com)  
Add to your favorites

# IR Applications in the Real World

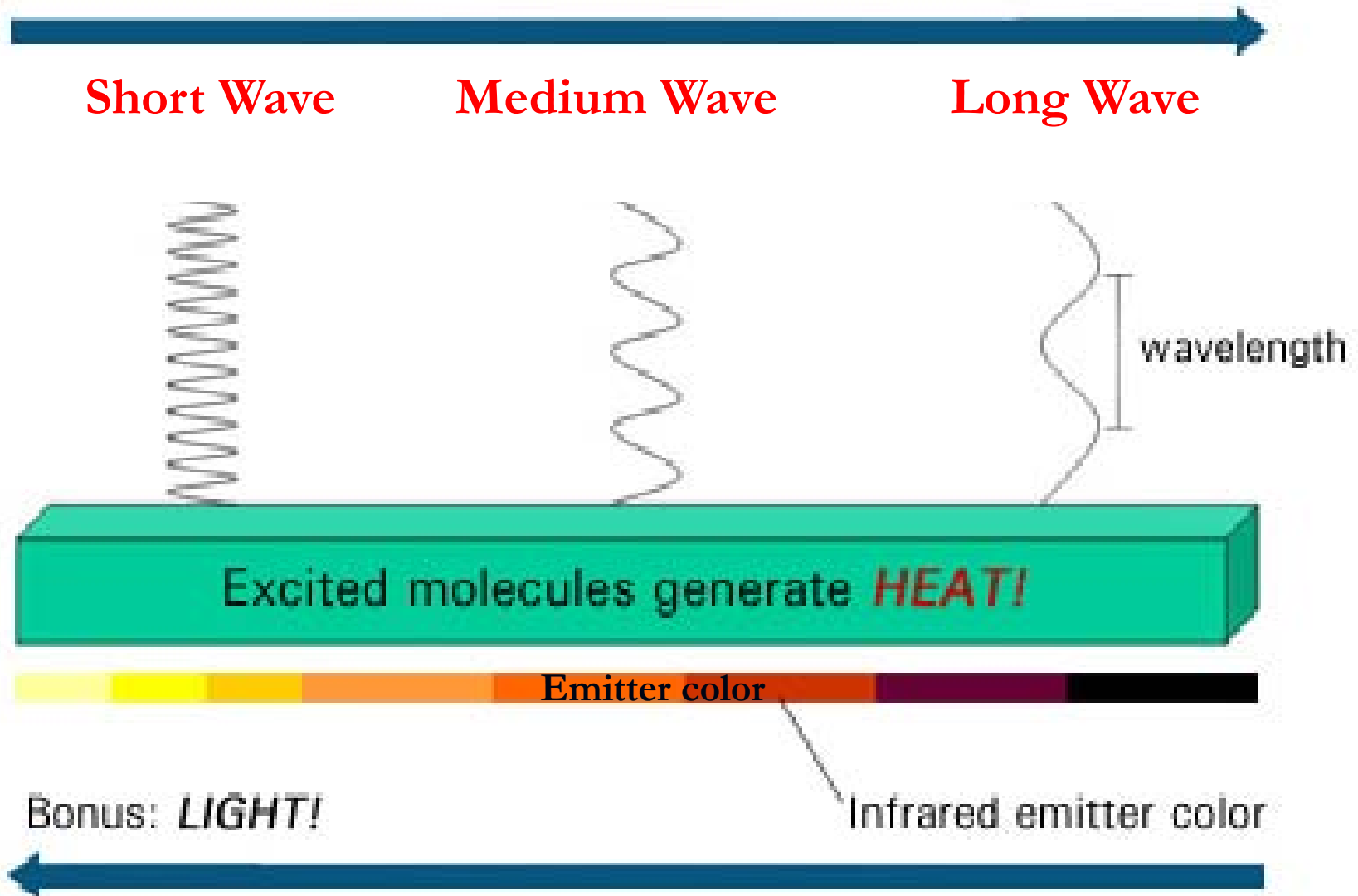
- What it is infrared?
- How does infrared work?
- Improving process heat applications with IR
- Adding infrared to an existing operation
- Energy saving ideas using infrared
- Electric & gas infrared applications
- Questions and Answers

# What is Infrared (IR)?

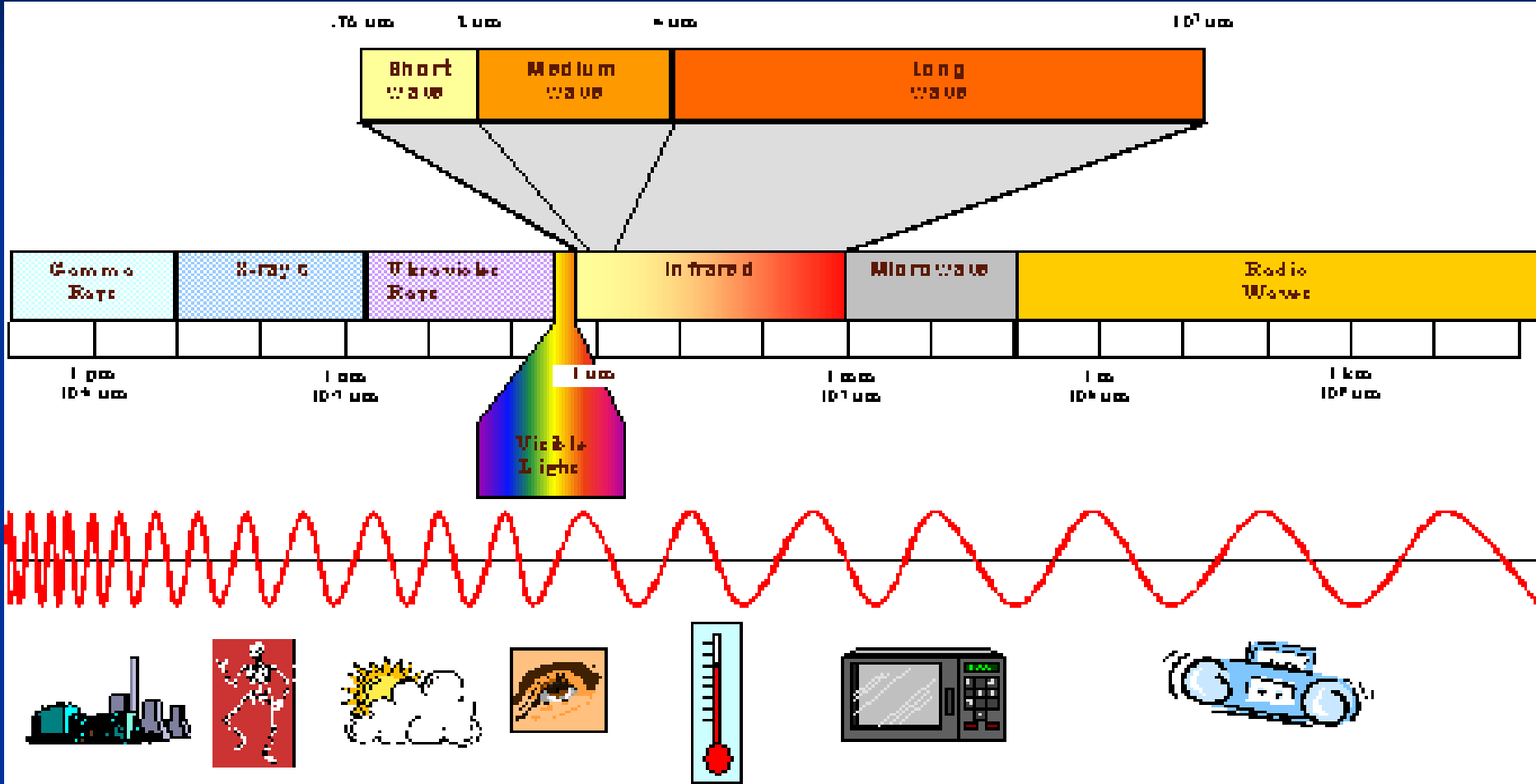
- **Infrared** – comes from Latin roots that means “below red”. Infrared is a form of energy with a frequency and wavelength that lies below the visible spectrum at its red end. Infrared is radiant energy that is converted to heat when it strikes an opaque object.

# What is Infrared (IR)?

## Three Common Wavelength Terms

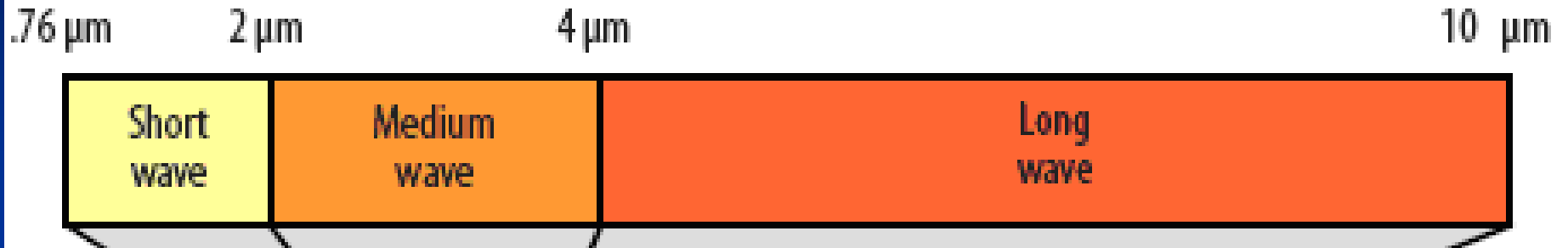


# Electromagnetic Spectrum





# The Infrared Spectrum



Infrared Type	Source temperature	Peak wavelength
Short Wave	Up to 4000°F (2200°C)	1.2 μm
Medium Wave	Up to 1800°F (980°C)	2.3 μm
Long Wave	Up to 1000°F (540°C)	3-5 μm



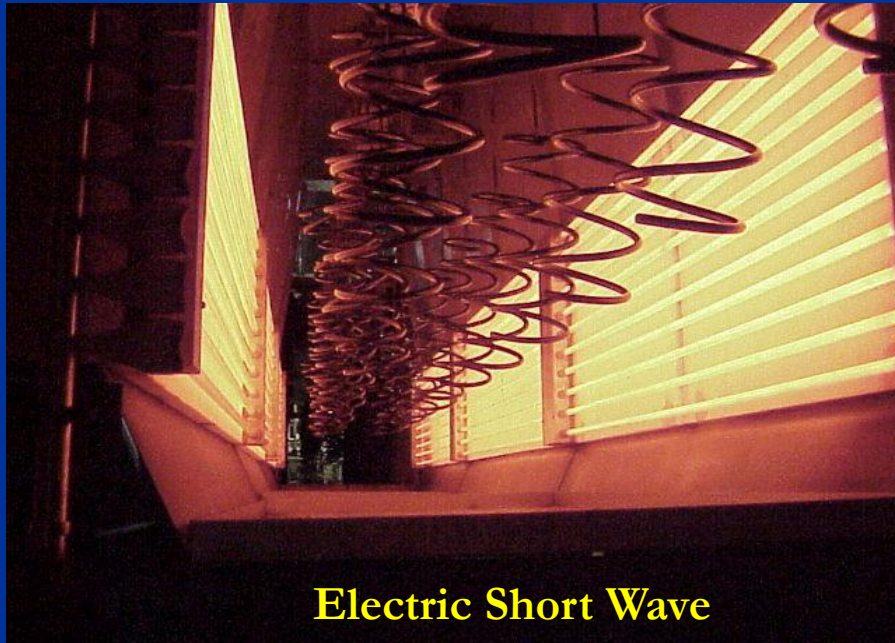
# Infrared Emitters



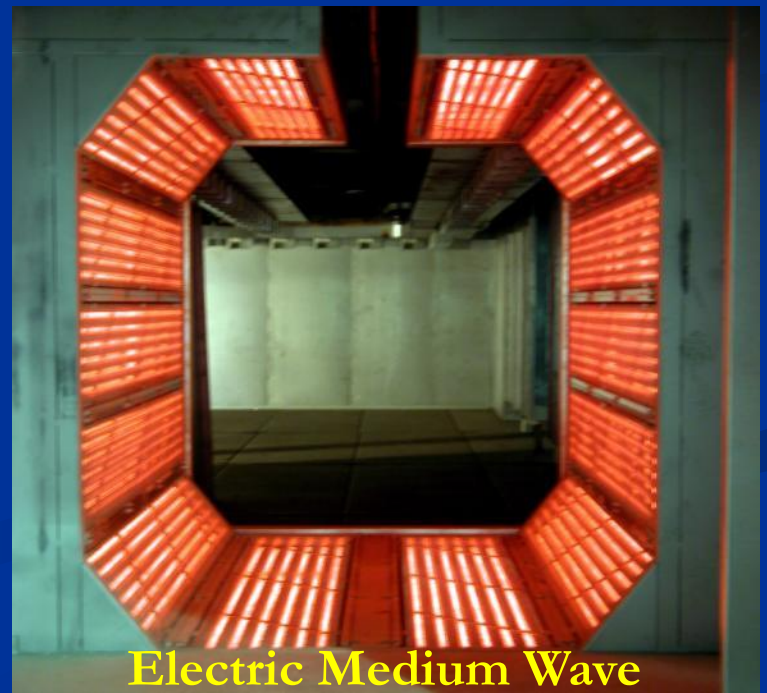
Gas Medium Wave



Gas Catalytic Long Wave



Electric Short Wave



Electric Medium Wave

# Short Wavelength Emitter

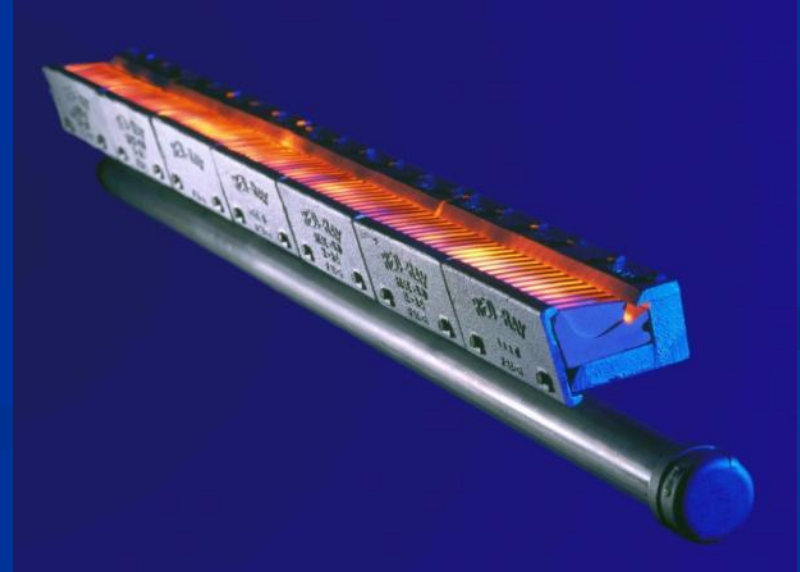
- Sealed Quartz filled with Halogen gas
- Filament temperature approx 4000 degrees F
- Heat up in 1 second
- Fast response
- 5,000 hr. life @ rated voltage
- Require external reflectors





# Medium Wavelength Emitter

- Ceramic tube
- T-2 lamp
- Corrugated metal ribbon
- Stamped serpentine element
- Gas Fired Burners



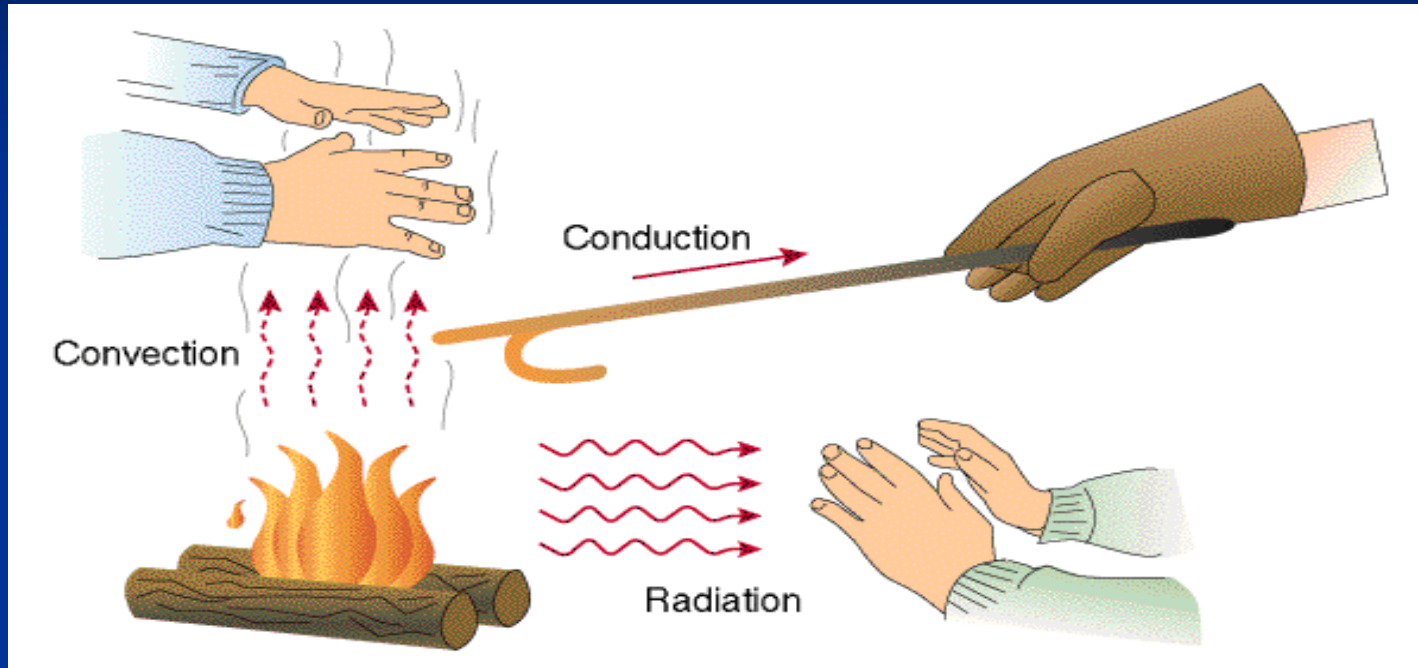
# Long Wavelength Emitter

- Quartz Tubes with resistance wire coils
- Quartz Tubes with carbon ribbon elements
- Gas Catalytic Heaters
- Open Coil



# How Does Infrared Work?

## Heat Transfer Methods



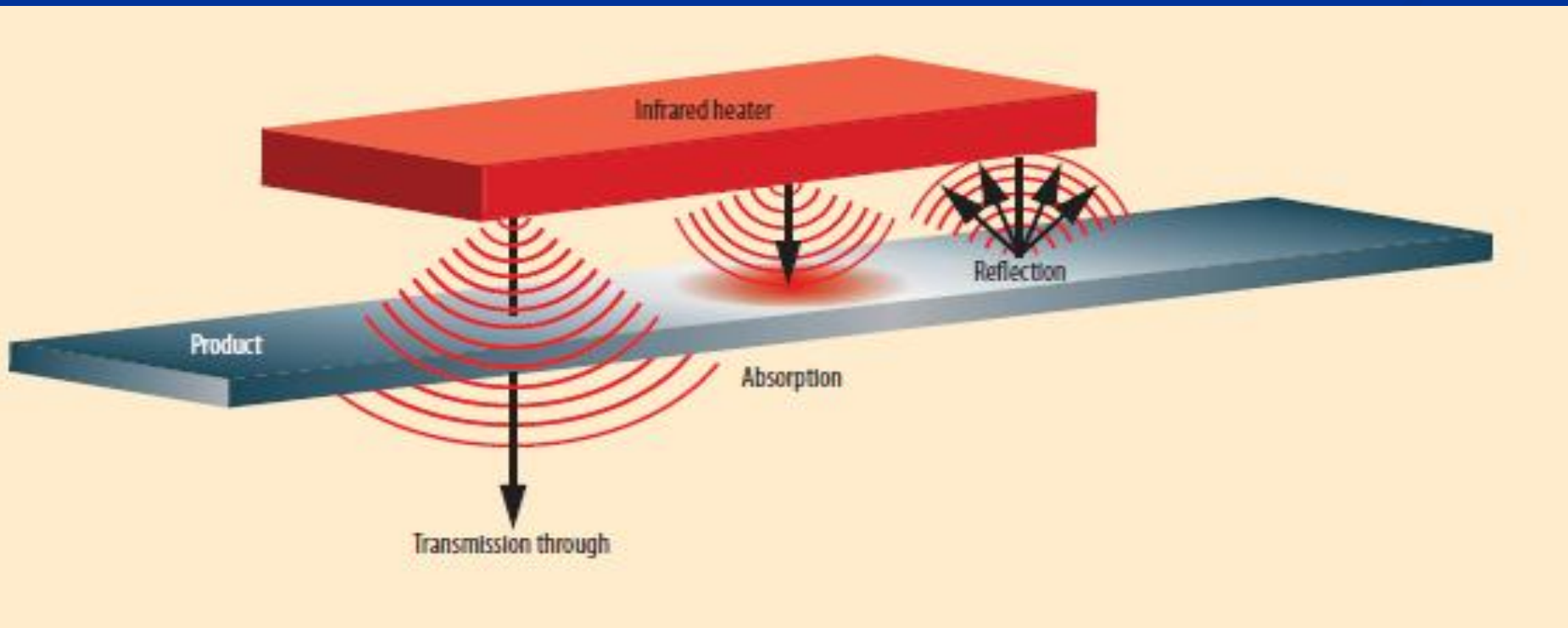
- **Convection** – Heated Air
- **Conduction** – Contact Heat
- **Radiant** – Electromagnetic Infrared

# How Does Infrared Work?

## Infrared Absorption

Infrared radiation travels out from the emitter until it strikes an object. At this time, the infrared will be:

- Reflected from the surface of the object
- Travel straight through the object with little or no effect.
- Absorbed by the object, its energy converted to heat.

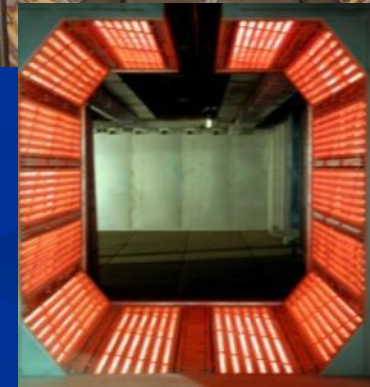




# Improving Process Heat Applications with IR

## Critical Factors to consider:

- Total output power (BTUs) of the source
- Wavelength (temperature) of the source
- Distance from the source to the product
- Reflective characteristics of the oven cavity
- Air movement and temperature in the oven
- Time product is exposed to the source
- Ratio of exposed surface area to mass of the product.
- Specific heat of the product
- Emissivity of the product
- Thermal conductivity of the product

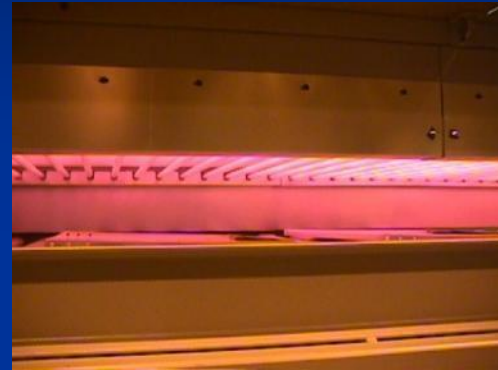




# Improving Process Heat Applications with IR

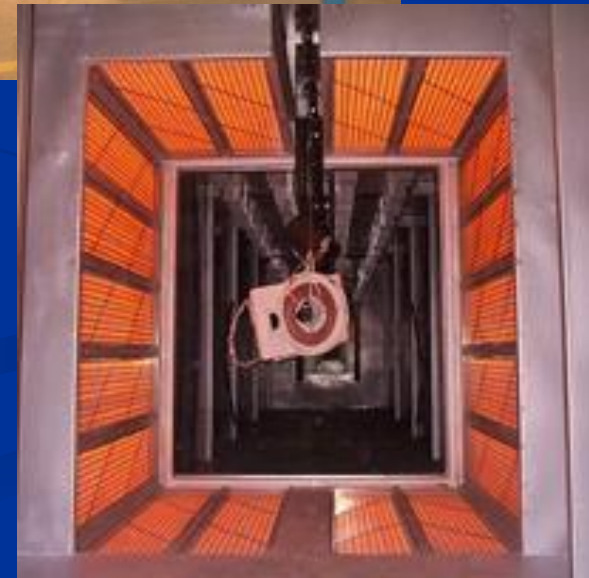
## Some Benefits of Using IR

- Increase Line Speed
- Reduce Energy Cost
- Increased Production Load
- Cut Overall Cure Times
- Operate Inside The Convection Oven
- Reduce Contamination



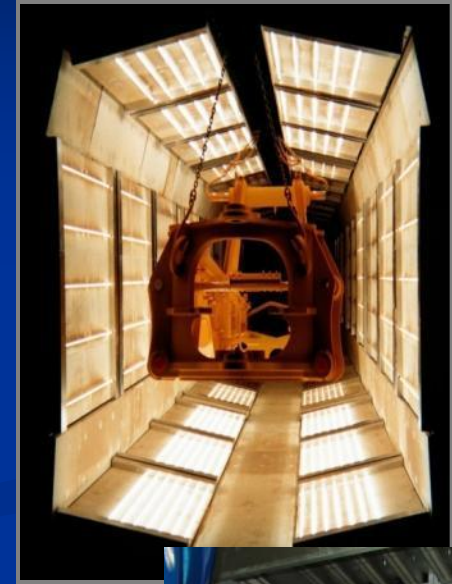
# Adding Infrared to an Existing Operation

- Infrared heats from the source to the target – it does not heat the air between. The heat energy is not transferred through an intermediate medium (e.g. air).
- Arrangement of heaters is critical to the success of the application
- Zones for different temperatures are possible within an arrangement of heaters (also referred to as bank of heaters, or heater array)



# Adding Infrared to an Existing Operation

- Modulation – Emitter output can be modulated to vary the output of radiation (Heat)
- Three-dimensional shapes can also be heated in an IR oven
- Parts can be rotated
- Ramp and soak zones conduct heat to hidden areas
- Combination IR & Convection heating helps to heat hidden areas.



# Energy Saving Ideas Using Infrared

- Use of infrared technology inside existing convection ovens can not only reduce required floor space but also assist the convection oven in maintaining temperature
- Heat recovery off infrared boost ovens to other ovens upstream in the process
- Infrared for dry-off applications can offset energy usage for high-speed blowers or compressed air systems

# Markets Served

- Liquid or Powder Coating Finishing
- Thermal Forming
- Textiles
- Paper
- Printing
- Food
- Laminating and Embossing
- Electronics



# Markets Served

## Coating and Finishing Markets

- Liquid or Powder Coatings
- UV Coatings
- Oil Filters
- Decorative Glass
- Decorative Cosmetics
- Wheels
- Cookware
- Lawn and Garden
- General Industrial
- Automotive OEM Paint Repair
- Automotive Tier 1 & 2 Suppliers
- Appliance
- Lighting
- Office Furniture
- Plastics
- Wood
- Flat Glass and Mirrors
- Brake Pads
- Truck and Bus Chassis

# Electric & Gas Infrared Applications



# IR Dry-Off and Cure Ovens

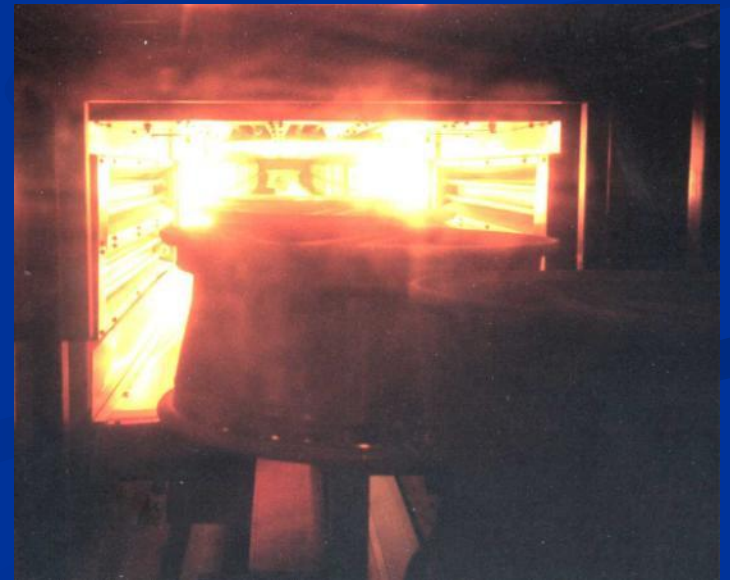
- Cure Powder Coating on ATV cargo racks
- Cured in only 4 minutes
- Complete process < 4 hrs
- Production up by 800%
- Included water dry off system.



Outdoor South in Laurel, MS.

# Cure Powder on Aluminum Wheel

- Cure base coat
- Cure clear coat
- Various wheel sizes
- 10 minute or less cure
- Multiple heat zones
- Pre – set cure profiles



# IR Booster Inside Convection Oven



- Convection set at 450 F
  - Powder not cured
- Slow conveyer
  - Lost Production
- Expand convection oven
  - Expensive
  - Floor space
- IR Booster Oven
  - Powder cured
  - No floor space taken
  - Save gas

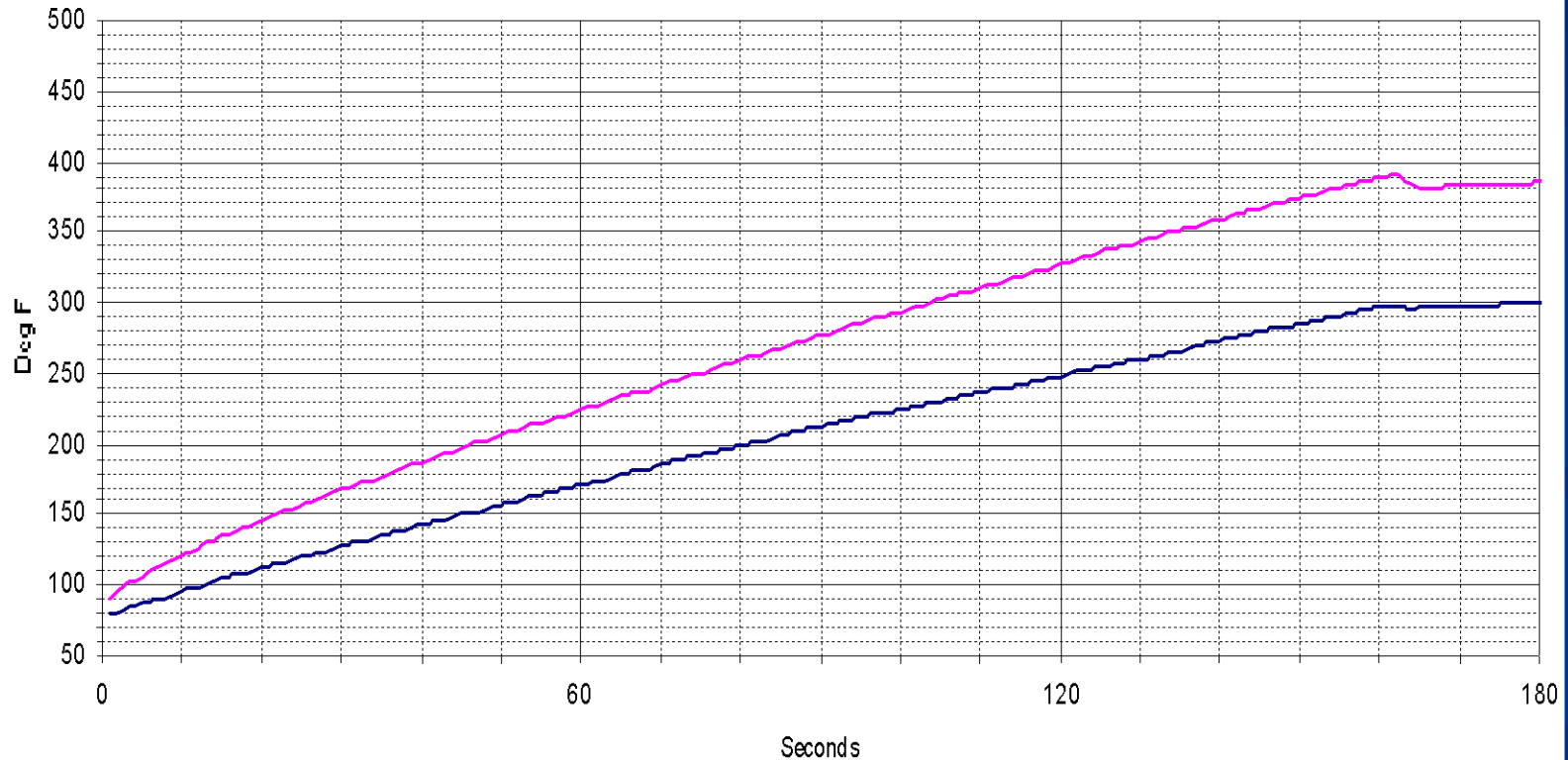
# IR Booster Temperature Curve

Application: Boost epoxy powder on steel springs

Oven: Ceramic Board Quartz Tubes on 2" centers. VOB. Sep: 30" R/R (Heated area: 38"x22")

Product: 18.5" x 6.5" OD spring

Mat: 0.80" rod. Wt: 19.2 Lbs

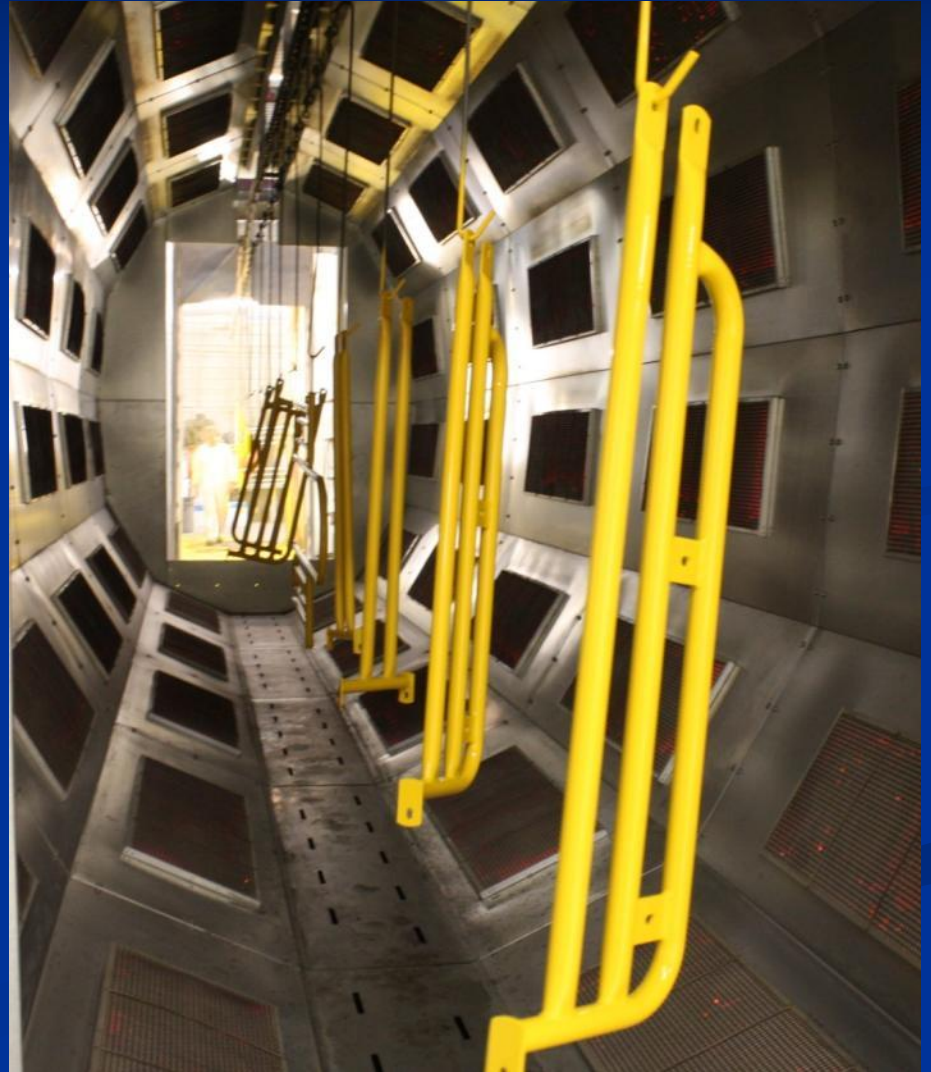


Page 2

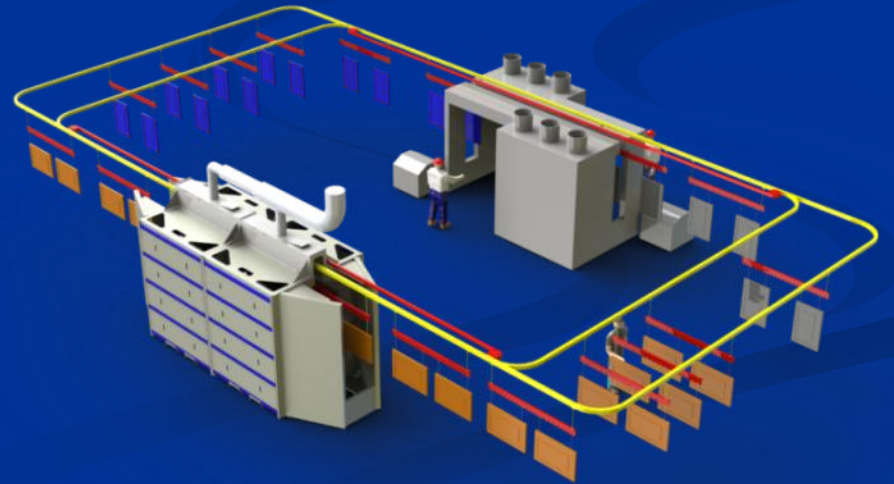
- 9 FPM Line Speed
- 22 ft. O.A.L.
- 2 min. 23 sec. Exposure
- Approx. 40 WSI (360 kW)
- 480 Volt 3 - Phase



# Curing Powder Coating on Playground Equipment.



# Step Ladder Powder Cure





# Leather Drying Applications

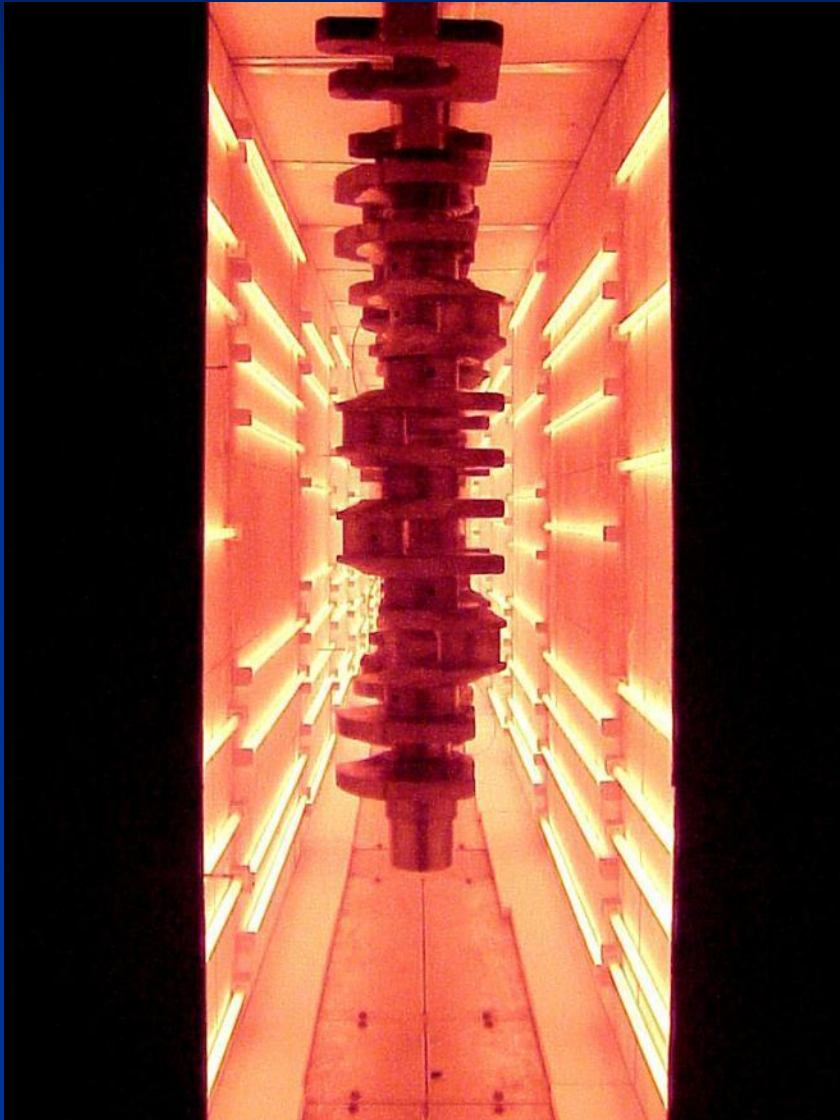




# Drying / Curing Water Based Coatings on Leather



# Heat Crank Shaft to Normalize Metal after Machining



- Norton Mfg Fostoria, OH
- Medium Wavelength BT Series Quartz Tubes
- Zoned in Length and Height for Uniformity and Heat Stratification
- 550 deg. F

# Cure Powder on Fire Extinguishers



- Fostoria 900 Series
- Medium Wave & Short Wave
- I.R. Multi-Zone  
3 Zones in High  
Both Hold & Build
- Full Cure
- 375 deg. F



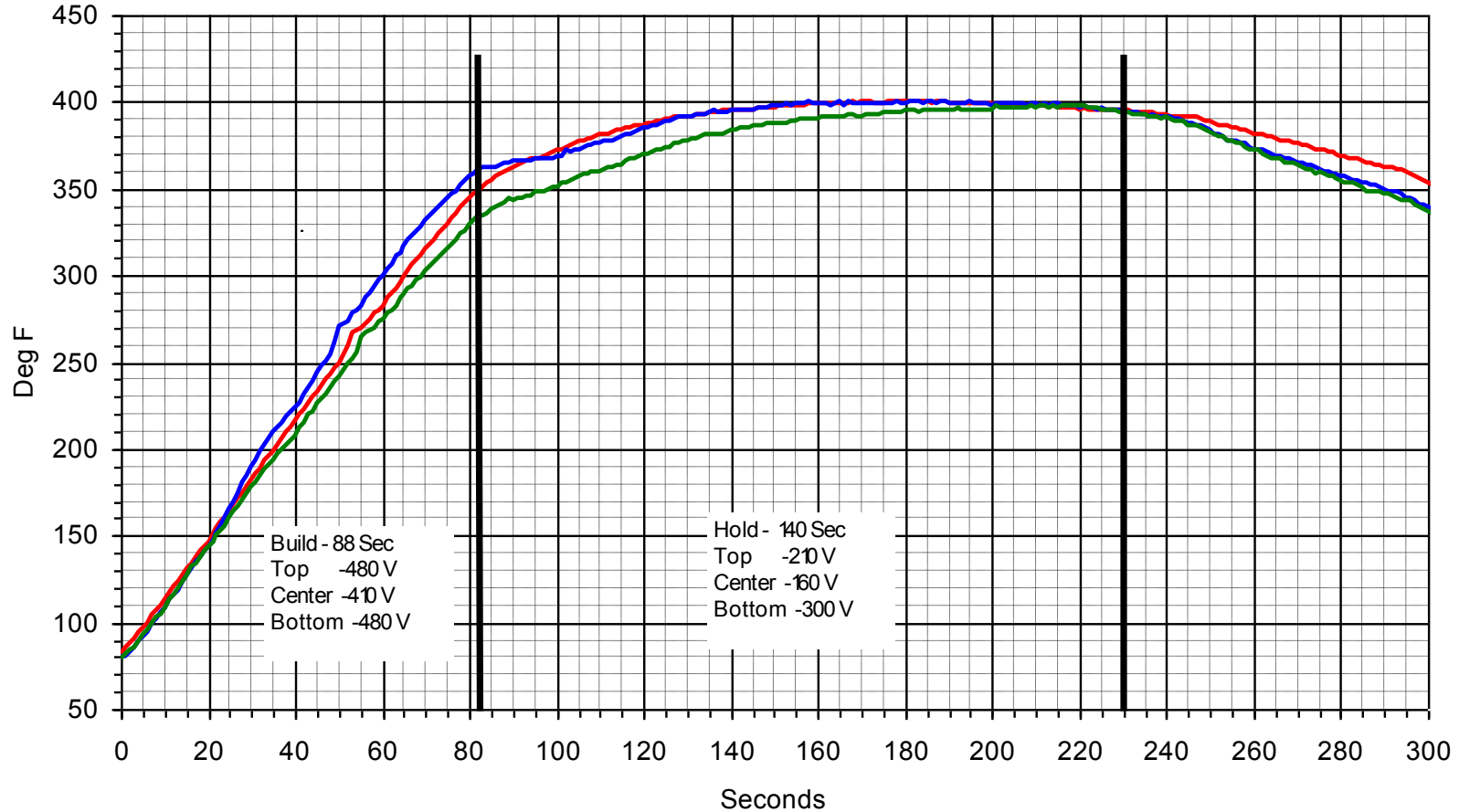
# Cure Powder on Fire Extinguishers

04-27-2006

## Lab Test

Application: Powder Coat (Red)  
Oven: VOB. 16 - 1600WQtubes. 4 - 2500WQLamps  
Separation: 16 1/2" refl/refl, Voltage 480

Product: Fire Extinguisher  
Large tank



— TC on Base — TC on side — TC on Neck

# Cure Black Powder on Clutch Plates



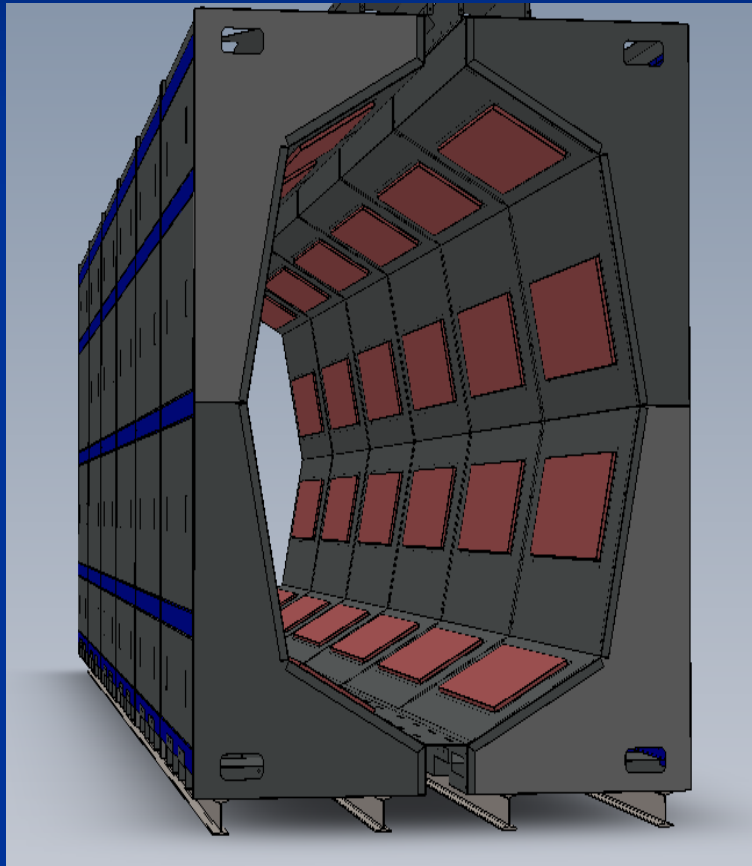
- Wellman Product
- Short Wavelength T-3 Quartz Lamps
- Total cure with I.R
- Less than 3 minute time cycle

# Powder Coating on Medium Density Fiberboard (MDF)





# Fire Extinguishers





# Switch Gear Components

## Problem

- Some parts did not cure
  - Tall oven opening created convective air flow
  - No additional capacity in the existing oven
  - Nat. Gas cost was rising
- 

## Goals

- Reduce energy costs
- Achieve complete cure
- Reduce hot air escaping from oven entrance
- No increase in labor cost or line length



# Switch Gear Components

## Solution

- Installed a 12' section of opposing IR heaters in the existing oven vestibule.
  - Parts were exposed to 1 min of IR.
  - A 3 position automatically adjustable heaters for varying products widths for added efficiency.
- 

## Benefits

- Convection oven set point was turned down from 425°F to 360°F.
- Reduced Gas usage by 781 Dekatherm/month
- Net total savings per month = \$7,043  
(Annual Savings = \$84,500)



# Thermoforming Video

- Insert Movie File Here

# IR Batch Oven Curing Trailers



# QUESTIONS?

---



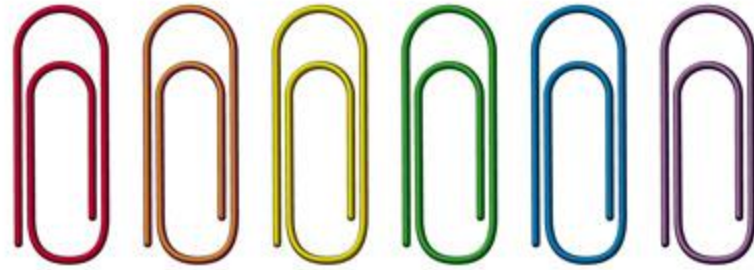
*Please Submit your questions by:*

A screenshot of a web form for submitting a question. The form has a white background with a blue border. Inside the form, the text reads "Typing your question in the box and hitting submit." Below the text is a dark grey button with the text "Submit a Question" in white. There are also small up and down arrow icons on the right side of the form.

***THANK YOU!***

---





***We apologize for this brief interruption but we are experiencing technical difficulties and will resume shortly.***

