

# Gerloff Company Inc

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For Continuing Education!

# Deodorization – Methods & Materials



**Gerloff Company Inc**  
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# The Chemistry of Smoke



- ◆ What is soot?
  - The result of incomplete combustion
  - Can contain PAH's (polycyclic aromatic hydrocarbons) which are classified as a carcinogen
  - Type of soot is based on materials that burned

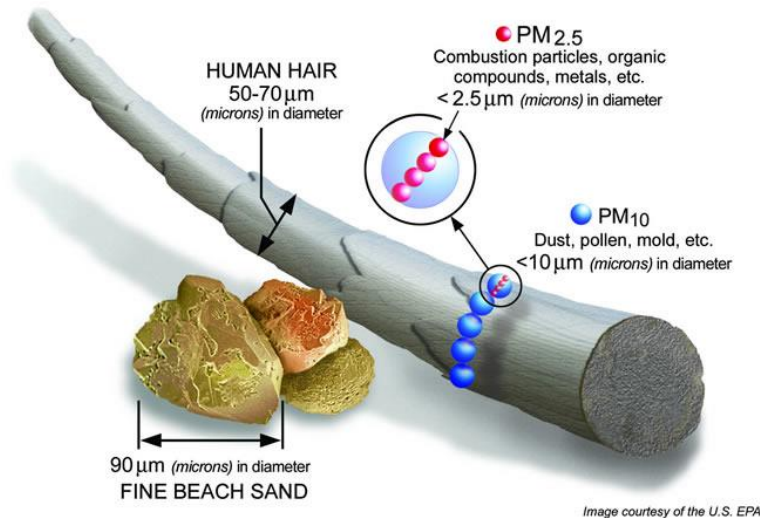
# The Chemistry of Smoke



- ◆ Types of soot are dependent on materials burned
  - Oily/Greasy Soot caused by petroleum and protein fires
    - Much more difficult to clean
  - Dry Soot is caused by burning of organic materials
    - Easier to clean

# The Chemistry of Smoke

- ◆ Soot particles can range in size from 0.1 to 4 Microns



- Grain of Beach Sand:
  - Approx. 90 microns
- Human Hair:
  - 50 – 70 microns in diameter
- Dust/Pollen
  - 1 – 10 Microns



# The Chemistry of Smoke



- ◆ HEPA Filters
  - HEPA Filter
    - Filters are at least 99.97% efficient in removing particles as small as .3 microns
  - Very effective in removing soot particles in the air
  - Very expensive

# Protein Fires



- ◆ Grease Fire
  - Most Common
- ◆ Generally associated with burning of Beef, Chicken or Fish
- ◆ Greasy & Sticky Residue
  - Difficult to clean
- ◆ Odor is compared to decomposing meat

# Natural Substance Fire



- ◆ Caused by burning of organic matter
  - Wood, Paper, Cotton, Wool, etc.
- ◆ Residue is typically a dry and powdery
- ◆ Odor is compared to that of a campfire



# Petroleum/Synthetic Fire



- ◆ Caused by burning of petroleum based products
  - Plastics, rubber, oil, etc.
- ◆ Residue is typically oily and sticky
  - Very difficult to clean
- ◆ Odor smells like burned plastic
- ◆ Creates “Soot Tags”
  - Typically misidentified as spider webs
- ◆ Soot is potentially carcinogenic

# Variables of Smoke Infiltration

The following affect the amount of smoke infiltration into materials:

- Heat
- Velocity
- Magnetism

# Variables of Smoke Infiltration



## ◆ Heat

- Temperature has a major effect on smoke penetration
  - The hotter the fire the more penetration
- Pores on materials open up with heat
- Amount of Oxygen has effect on heat of fire
  - Oxygen-rich = high heat
  - Oxygen-starved = lower heat, but heavy soot

# Variables of Smoke Infiltration



## ◆ Heat (continued)

### ■ “Heat Line”

- Relationship to “Heat Line” should be considered
- The lower the heat line, the higher the temperature



# Variables of Smoke Infiltration



## ◆ Velocity

- As air is heated it expands rapidly
  - With the expansion of air, smoke is forced into pores of materials
- Velocity is increased with increased oxygen
  - “Backdrafts”

# Variables of Smoke Infiltration



## ◆ Magnetism

- Soot particles hold a negative charge making them attracted to metal objects
- Example:
  - Nail Heads in sheetrock

# What is Odor?



- ◆ By Definition
  - Odors are gases or vapors, which emanate from a source into the air where the individual then perceives them.
- ◆ With this in mind, to eliminate an odor, the source must be eliminated

# What is Odor?



## ◆ Types of Odor

### ■ Real Odor

- True Sensation of smell transmitted by the Olfactory Nerve
- This is the easier type of odor to deodorize
- Removal of odor source is a must!



# What is Odor?

## ♦ Types of Odor

### ■ Heightened Awareness Odor

- “Psychological Odor”
- Smell based on experience, assumption and suggestion
- Most difficult to address



Example: Febreze Commercial

# What is Odor?



## ◆ Factors affecting Odor

- Humidity
- Temperature
  - Odor might reoccur during the summer if not deodorized thoroughly
    - ◆ i.e. attics and dead air spaces

# Restoration Options

- ◆ Only (3) Options in Deodorization
  - Clean
    - Typically the least expensive option, if applicable
    - Always “Test Clean” questionable substrates
  - Resurface
    - Can be achieved by painting, refinishing, or media blasting
  - Replace
    - Typically for charred or heavily soiled materials

# Steps to Successful Restoration

## ◆ Demolition



- All materials deemed nonrestorable are to be removed first
  - Any charred materials
  - Porous materials
    - ◆ Insulation
    - ◆ Acoustical Ceiling Tile
    - ◆ Carpet
- Materials that are to be removed to allow access are removed at this stage



# Steps to Successful Restoration

## ◆ Cleaning



- Dry wipe and/or wet wipe
  - All surfaces within the affected area to be cleaned
- HEPA filtered air scrubbers used during this stage
- Pre-Deodorization could be necessary at this stage

# Steps to Successful Restoration

## ◆ Deodorization

- Method of deodorization dependent on job
  - Thermal Fog
  - Wet Fog
  - Solvent Deodorizer
  - Ozone
- Smoke odor should be absent upon completion
  - If odor is still present, something was missed



# Steps to Successful Restoration



## ◆ Reconstruction

- Encapsulant to be applied to all surfaces to be sealed at this point
- Final reconstruction to be completed.

# Structural Cleaning Methods

- ◆ Variables to Consider
  - Type of fire
    - Protein, Natural, Petroleum
  - Severity of fire
    - Heat, Soot, Charring
  - Type of materials to be cleaned
    - Drywall, Masonry, Carpet, Wood, etc.



# Structural Cleaning Methods



- ◆ Dry Wipe/Clean
  - Effective to clean natural substance fire
  - Chem Sponges
    - Made of Natural Rubber
      - ◆ Despite name there are no chemicals
    - Soot has a magnetic like attraction to rubber
    - Works well on Smooth and Semi-Smooth Surfaces
    - Use sponge alone
      - ◆ NO LIQUIDS!

# Structural Cleaning Methods



- ◆ Dry Wipe/Clean
  - HEPA Vacuuming
    - Very useful in cleaning loose particulate
    - Typically performed in conjunction with Chem Sponges
    - Make sure to check filters
    - Useful in cleaning electrical components

# Structural Cleaning Methods



## ♦ Wet Wipe

- Effective to clean Protein and Petroleum based fires
- Utilizes Surfactants to clean
  - Fired Up Degreaser
  - MC-1
- Cuts through grease and oil associated with Protein and Petroleum based fires

# Structural Cleaning Methods



## ♦ Combination

- Utilizes both dry and wet cleaning methods
- HEPA vacuum and/or Chem Sponge first
  - The goal is to get the large particulate cleaned
- Wet wipe all surfaces after dry wipe is done

# Structural Cleaning Methods



- ◆ Acoustical Tile Cleaning
  - Utilizes bleach or peroxide based spray on cleaners
  - Must be light soiling to be cost effective
  - Acoustical Tile is very porous, so it may still hold odor
    - Usually better to replace



# Structural Cleaning Methods



- ◆ Media Blasting
  - Most aggressive form of cleaning
    - Takes off a layer of the surface being cleaned
  - Many different Medias
    - Sand
    - Soda
    - Pecan Shells
    - Dry Ice
  - General Uses
    - Masonry
    - Structural Framing
    - Decking
  - Not always cost effective

# Structural Cleaning Methods



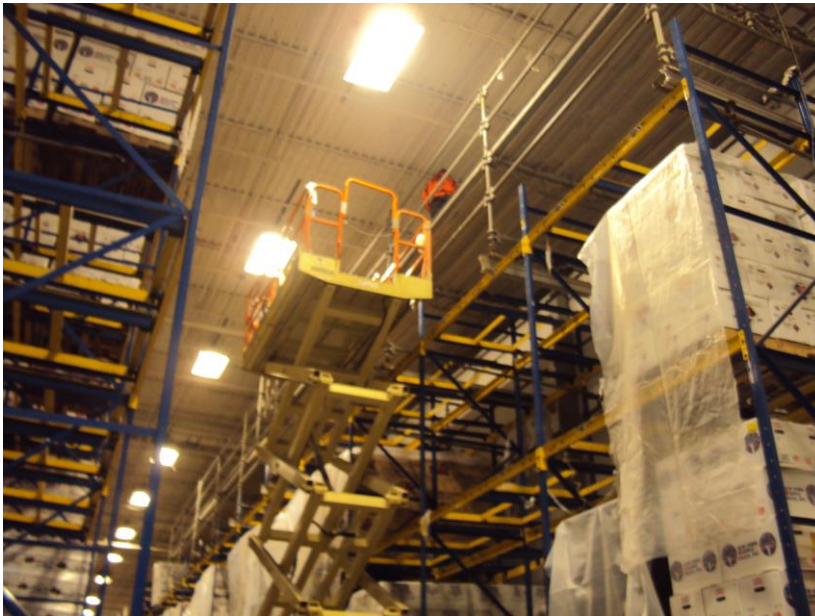
# Structural Cleaning Methods



## ◆ Safety

- Proper Personal Protection Equipment (PPE)
  - Tyvek Overalls
  - Eye Protection
  - Gloves
  - Respirators
  - Hard hats
- Type of PPE required dependent on job

# Structural Cleaning Methods



## ◆ Elevated Work Safety

- Scaffolds
  - Ensure all guardrails are in place
  - May have to construct job specific scaffolding
- Aerial Lifts
  - Scissor Lifts
  - Boom Lifts
- Must be qualified to operate



# Methods of Deodorization

## ◆ Natural Deodorization



- If left alone, nature eventually deodorizes nearly everything
- Could take years though



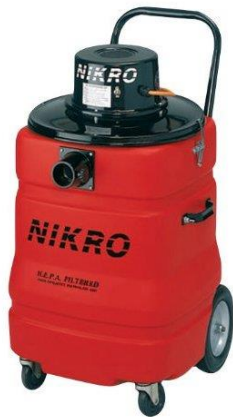
# Methods of Deodorization



## ◆ Source Removal

- Most important aspect of deodorization
- Any charred building materials must be removed
- Affected structure must be cleaned in it's entirety

# Methods of Deodorization



## ◆ Source Removal

- Remaining Soot/Fallout should be cleaned
  - HEPA Vacuum
  - Chem Sponge
  - Wet Wipe
- HEPA filtered air scrubbers used to remove particulate from air

# Methods of Deodorization



- ◆ Wet (Cold) Fogging
  - Electric powered device used primarily for water based deodorants
  - Particle Size
    - 8-15 microns
  - General Uses
    - Airspace fogging
    - Duct fogging

# Methods of Deodorization



- ◆ Thermal (Hot) Fogging
  - Uses heat to combust deodorization product into a dry fog
  - Odor Modification Agent
    - Actually changes the molecular structure of the odor molecule
  - Ventilate building thoroughly prior to reentry

# Methods of Deodorization



## ◆ Thermal (Hot) Fogging

- Very small particle size
  - .5-2 Microns
  - Replicates the size of smoke particles
- Must be trained to use
- Always contact fire department prior to using
  - Will set off fire detectors



# Methods of Deodorization



## ◆ Encapsulates

- Used to seal porous building materials after cleaning
  - Clear or with color pigment
- Typically applied with airless sprayer
- General Uses
  - Masonry
  - Framing
  - Ducts
  - Dead Air Spaces

# Methods of Deodorization



- ◆ Solvent Deodorizers
  - To be used on delicate surfaces
    - Dry Cleaning
    - Wood Restoration
  - Uses minimal water & works by evaporation

# Methods of Deodorization



## ◆ Granular Odor Counteractants

- Utilized to erect an odor-absorbing barrier
  - Activated Carbon
  - Crystal Odor Counteractant (COC)
- Typically used in conjunction with deodorant gel blocks
- Most effective when put in air stream
  - HVAC Plenum
  - Air Scrubber

# Methods of Deodorization



## ◆ Ozone ( $O_3$ )

- Oxidizing Agent
  - Do not use in wet environment
- Changes the molecular structure of the air by adding a molecule of oxygen
  - Produces absence of odor
- Heavier than air
  - Use in conjunction with airmovers

# Methods of Deodorization



## ◆ Ozone (O<sub>3</sub>)

- Smells like air after lightning strike
- Very last resort for structural deodorization
  - Over exposure to Ozone is dangerous
  - Over exposure can deteriorate rubber and cause corrosion on metal
- Ventilate building thoroughly prior to reentry



# HVAC System Deodorization



## ◆ Ducts (NADCA)

- Cleaned with Rotobrush
  - Under negative pressure
- Flex Ducts
  - Can be cleaned, but condition must be assessed
- Duct Board
  - Must be sealed after cleaning
- Metal Duct
  - Cleans well, but insulation should be assessed

# HVAC System Dedorization



- ◆ Air Handler (NADCA)
  - Coils (Evaporator, Condenser & Heat)
    - Coils cleaned via HEPA vacuum followed by appropriate coil cleaner
  - Blower
    - Typically blower is removed and cleaned
  - Air Handler
    - Housing cleaned completely
    - Insulation should be cleaned and sealed
  - Start Up
    - A licensed technician needs to check unit prior to start up

# Case Study



- ◆ Pet Pharmaceutical Manufacturing Fire
  - Extensive Smoke and Structural Damage
  - Extensive amount of contents and equipment
  - Business Interruption
    - Need to get back up and running

# Case Study



## ◆ Initial Assessment

- Power shut down to building
  - Need temporary
- Find out what is most important to owner
  - Equipment and supplies
- Shoring and critical barrier requirements

# Case Study



## ◆ Contents

- Impeded Structural cleaning and reconstruction
- Moved off-site for assessment
  - Inventory
  - Total Loss Inventory
  - Cleaning/Deodorization
- Storage/Relocation



# Case Study



- ◆ Structural Cleaning
  - Lubricate and cover all equipment
  - Start from the top down
    - HEPA Vac
    - Wet Wipe
  - Clean HVAC System



# Case Study



## ◆ Deodorization

- Thermal Fog
- Encapsulation
  - Done in sections at night
- Reconstruction of rest of structure completed

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