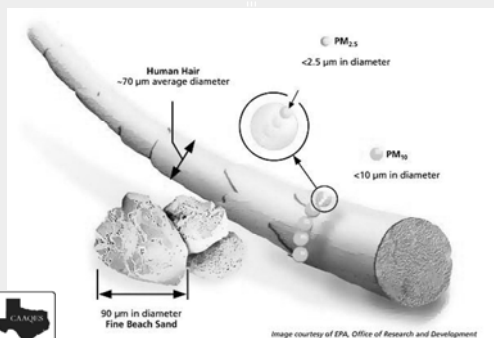


Particulate Matter (PM) Emissions

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PM Characterization



PM Quantification

- Urban PM
 - Combustion sources
 - Higher concentrations of PM_{2.5}
 - Average PM diameter: < 10 microns
- Rural PM
 - Mechanically generated
 - Lower concentrations of PM_{2.5}
 - Average PM diameter: ~ 20 microns



Coarse and Crustal PM

- Coarse PM
 - PM coarse = PM₁₀ - PM_{2.5}
 - Measurement challenges
 - NAAQS
 - National Ambient Air Quality Standards
- Crustal PM
 - Composition
 - Sources



Control of PM Emissions

Ronaldo Maghirang, KSU



Background: Fugitive Dust Sources

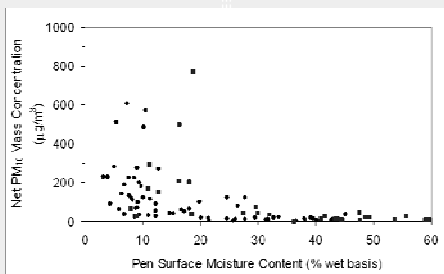


Background:

Fugitive Dust Control Strategies

- Source control techniques
 - Moisture management
 - Pen surface sprinkling
 - Surface amendment
 - Stocking density manipulation
 - Manure harvesting
- Edge-of-feedyard or downwind control techniques
 - “Water curtain”
 - Shelterbelts

Moisture Management Target Moisture Content?



Net PM₁₀ Concentrations vs. Pen Surface Moisture Content.

Pen Surface Sprinkling

- Application of water to pen surfaces (solid-set, tanker-mount, “reel rain”)
- **Efficacy**
 - Reduced net PM₁₀ concentration by 30 to 55%
- **Readiness for adoption**
 - Ready for producer implementation
 - Need to refine design and management procedures



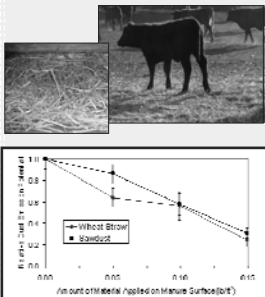
Manure Harvesting

- Frequent scraping of the pens to remove the dry, loose manure layer
- **Efficacy**
 - Dust emission potential of manure layer decreases with decreasing manure depth.
 - Manure harvesting can reduce the amount of water needed for dust control.
 - Yields highest fuel value
- **Readiness for adoption**
 - Ready for producer implementation
 - Need to refine management procedures



Surface Amendment

- Surface application of crop residue or other materials
- **Efficacy**
 - Application of wheat straw or sawdust reduced the dust emission potential of a manure surface.
- **Readiness for adoption**
 - Promising but needs to be validated at the field level

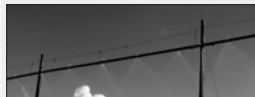


Stocking Density Manipulation

- Cross-fencing (solid or electric)
- Preserving 100% of bunk spacing
- **Efficacy**
 - Doubling the effective stocking density reduced net PM₁₀ **concentrations** at the corral fence line by 20%
 - No conclusive proof of reduced emission **rate**
 - Anecdotal evidence from producers

“Water Curtain”

- Spraying fine water droplets to capture dust particles.
- **Efficacy**
 - Prototype reduced near-field PM₁₀ concentration 20-40%
 - Used much water as a solid-set sprinkler system (1 gpm/ft)
- **Readiness for adoption**
 - May not be commercially feasible at this time



Shelterbelts

- Vegetation system downwind of a facility
- **Efficacy**
 - Effective in mitigating odor and dust generated from swine facilities and roads
- **Readiness for adoption**
 - Promising but needs field evaluation



Summary

- A surface moisture content of 20% may be a critical threshold for dust control.
- Strategies ready for producer implementation but need refinement
 - Pen surface sprinkling
 - Frequent manure removal
- Promising strategies that need further development or evaluation
 - Pen surface treatments
 - Shelterbelts
 - Increased stocking density with pen surface sprinkling
