Midwest Research Institute
Applied Engineering Division

Control of Abrasive Blasting Emissions through Improved Materials

Gregory E. Muleski

Jason Downing

Overview

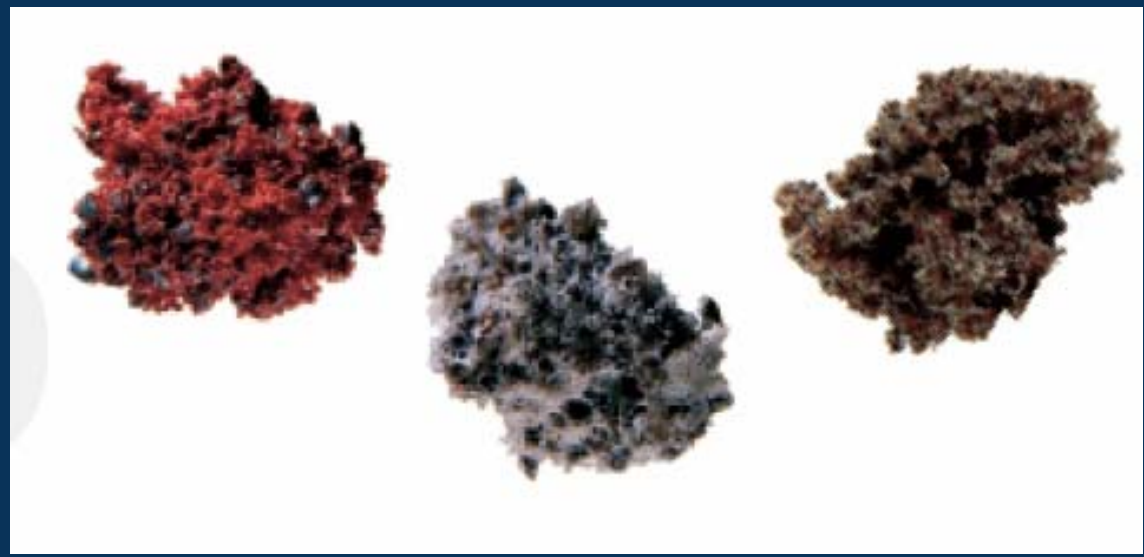
- Background
  - Emission studies
  - Newer materials
- Scoping Study
  - Methodology
  - Results
- Future Activities

Background

- AP-42 emission factors based on 1993 tests with silica sand
- Very limited data available for
  - Other traditional media (e.g., coal slag)
  - Improved materials

Foam-based abrasive media

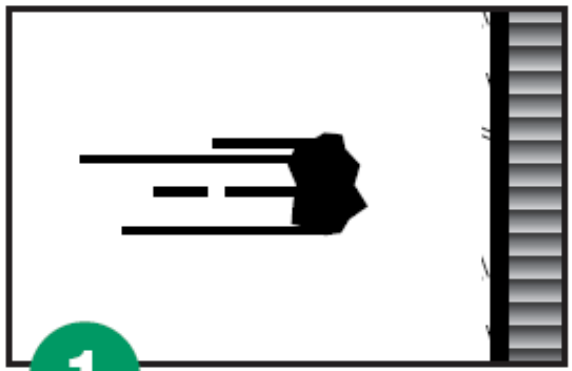
Polyurethane foam



Impregnated with abrasive material

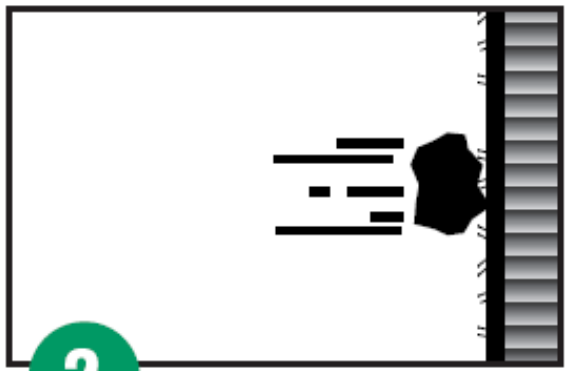
“Microcontainment”

Conventional Abrasive Blasting Media



1

Single-component, conventional abrasives are propelled to the surface using an air-driven system



2

Upon impact conventional abrasives…

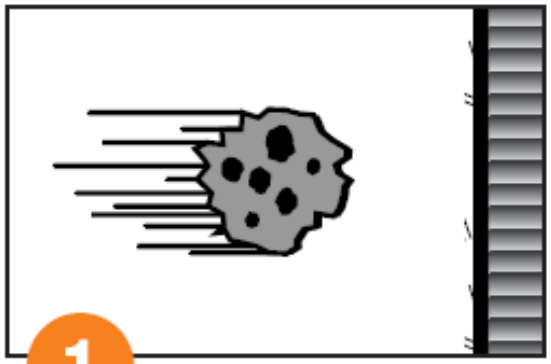
- Absorb the high-speed collision by fracturing and ricocheting into the air
- Transfer heat to the substrate
- Strip the complete coating system

3

Conventional abrasives release all fractured abrasives, contaminants, and coating layers as airborne dust

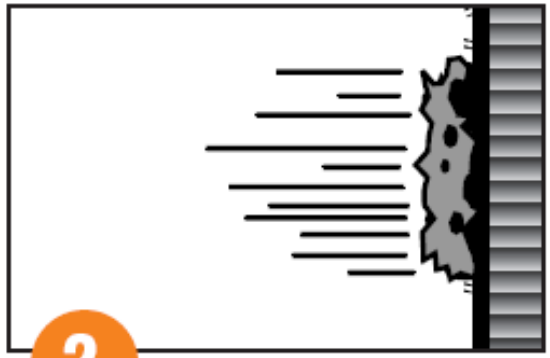
“Microcontainment”

Conventional Abrasive Bonded Into Sponge Media



1

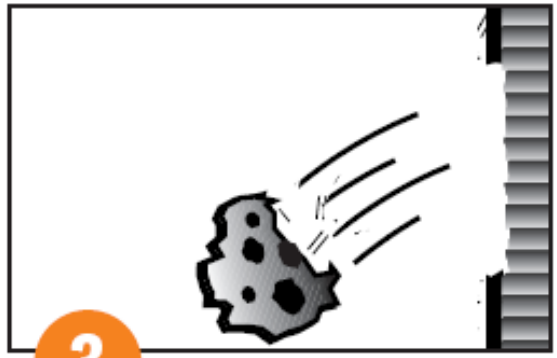
Dual-component, Sponge Media abrasives are propelled to the surface using an air-driven system



2

Upon impact Sponge Media abrasives…

- Absorb collision energy
- Flatten and suppress the release of loosened surface contaminants
- Expose its abrasives with little abrasive fracturing and remove contaminants
- Selectively or completely strip the coating system and profile the substrate



3

Sponge Media abrasives entrap most of what would normally have become airborne dust

Scoping Study

Objectives

- Develop comparative data between traditional and foam-based abrasives
- Develop guidelines for future testing

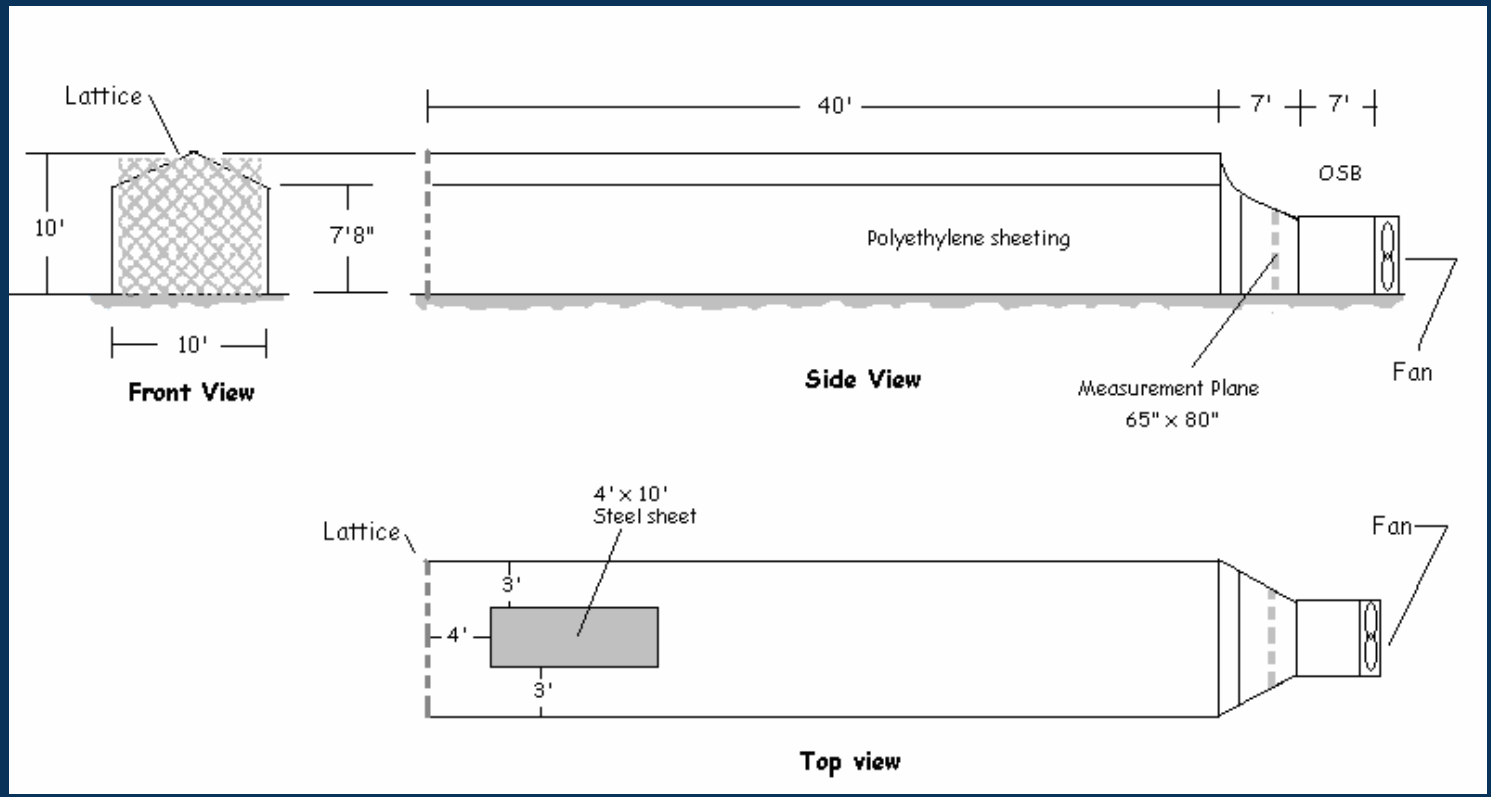
Scoping Study
(continued)

Methodology

Mimic essential features of 1993 EPA tests

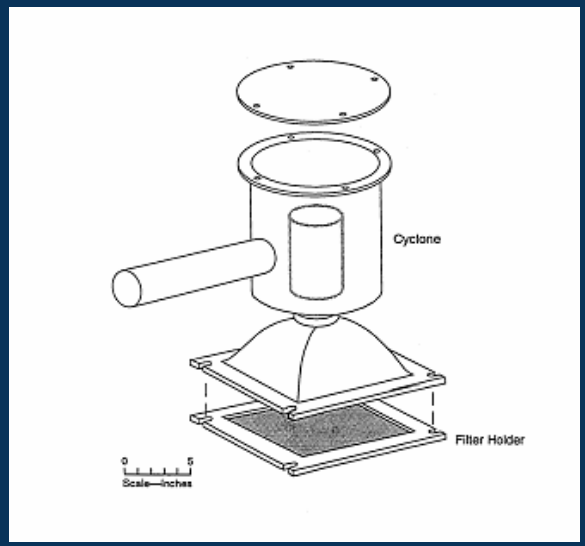
- Low-speed wind tunnel
- Same test substrate (auto hoods)
- Same grade of silica sand for comparison

Scoping Study
(continued)



Low-Speed Wind Tunnel

Cyclone Preseparator



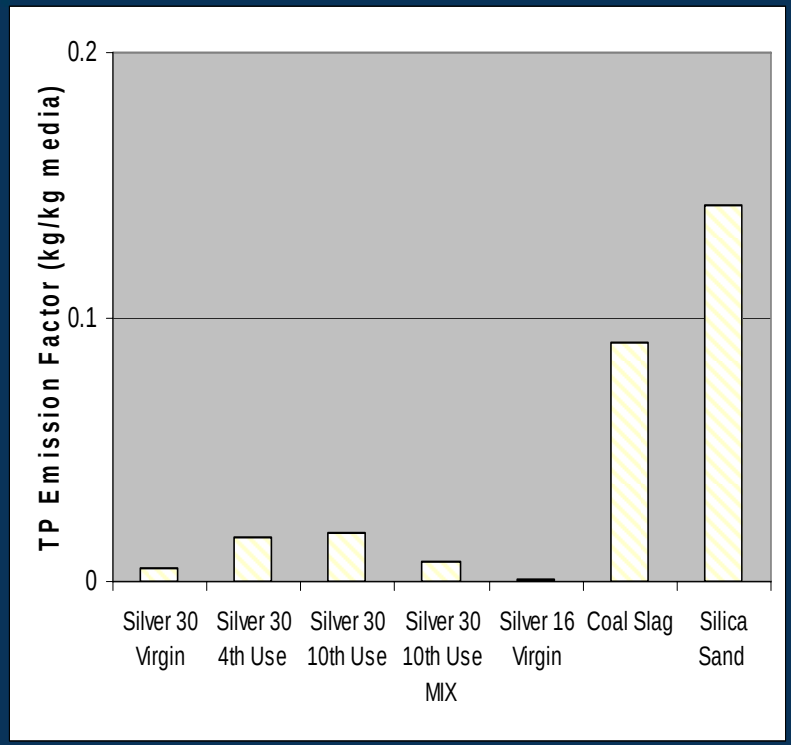
Collects both PM-10 and total particulate samples

Test Substrates

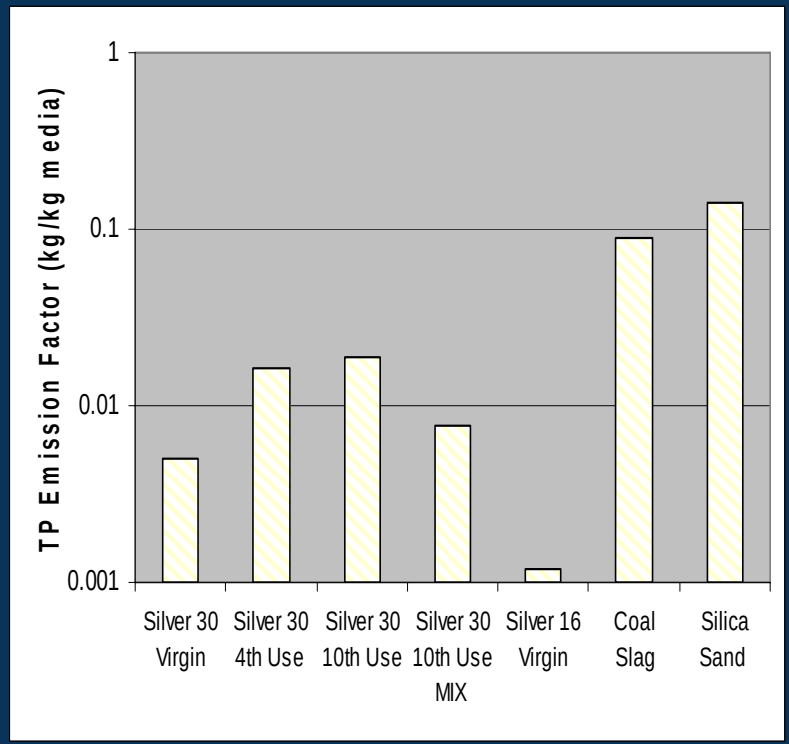
Before

After

Total Particulate Emission Factors

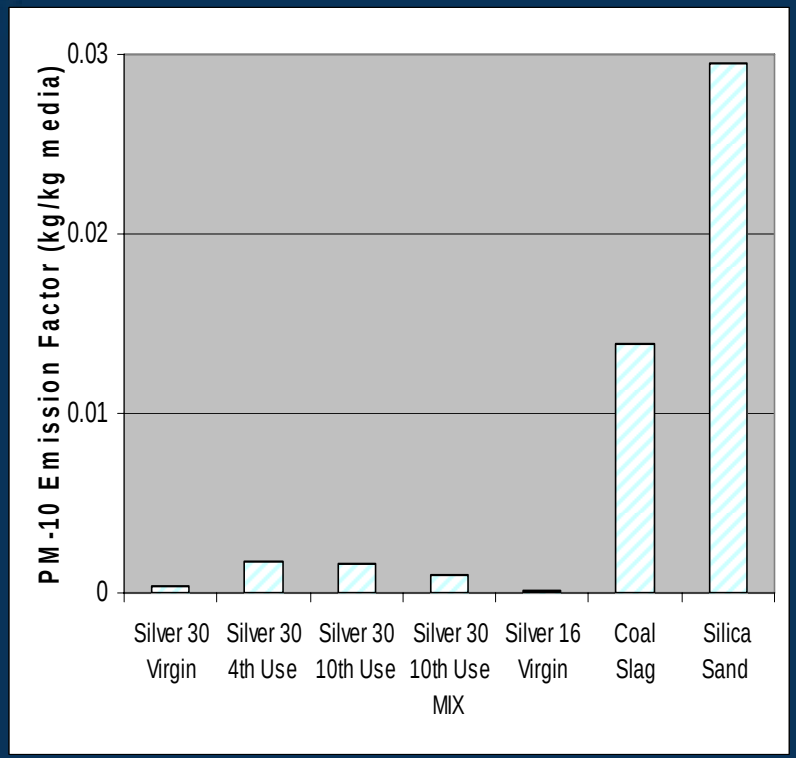


Arithmetic Scale

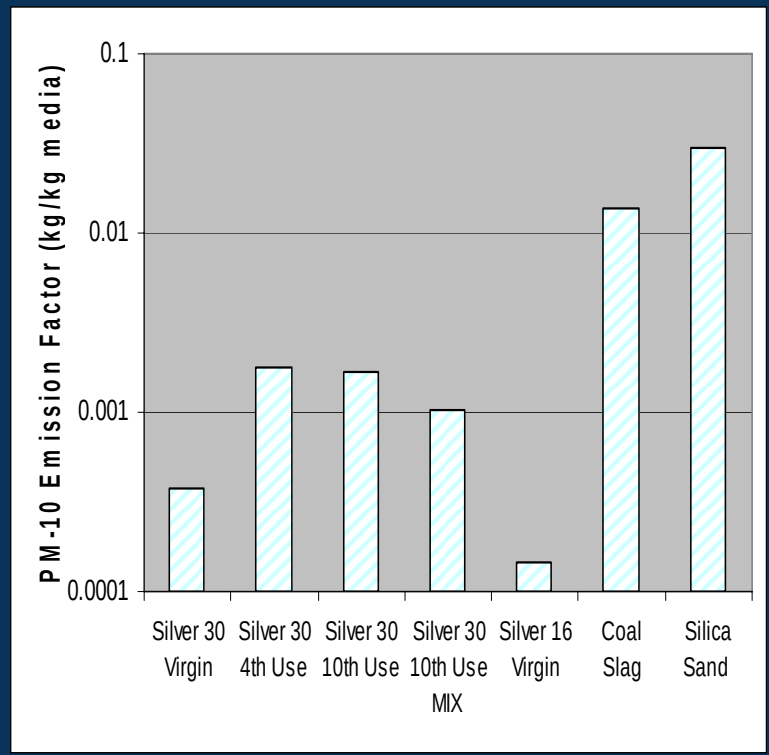


Logarithmic Scale

PM-10 Emission Factors



Arithmetic Scale



Logarithmic Scale

Comparison with 1993 Results (*Silica Sand*)

	TP Emission Factor (kg/kg media)	PM-10 Emission Factor (kg/kg media)
1993 EPA Tests (painted hood surface)		
Average of 5, 10 and 15 mph tests	0.063	0.022
Average of 5 and 10 mph tests	0.049	0.029
Present Study (7 mph)	0.14	0.030

Foam-Based Abrasive Compared to Traditional Materials

	Percent reduction in emissions			
	based on coal slag		*based on silica sand*	
Condition	TP	PM-10	TP	PM-10
Virgin	94	97	96	99
10th Use/Mix	91	93	94	96

Future Testing

Objectives – For a full-scale, field operation

- Develop size-specific particulate emission factors
- Characterize metal emissions due to
  - abrasive media itself
  - test substrate
- Develop supporting data for permit applications

Future Testing
(continued)

Meeting with USEPA in February 2006

- Presented results from scoping study
- Discussed “working group” approach for future tests
  - State regulators
  - Trade groups
  - End users

Conclusions

- Foam-based provides up to 2 orders of magnitude of control than traditional abrasives
- Future tests to better characterize particle size distribution and metal emissions
- Currently assembling working group to oversee future testing efforts