

# Rock Dusting on Longwalls

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# Agenda

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- Explosion Hazards
- Rock Dust Properties
- Assessment Methods
- Field Assessment



# Prevention of Coal Dust Explosions

- Inert or incombustible rock dust material must be applied
- Larger & more powerful equipment creates finer-sized coal dust particles
- Coal dust particle size significantly impacts propagation potential
- Finer coal dust requires more rock dust to inert



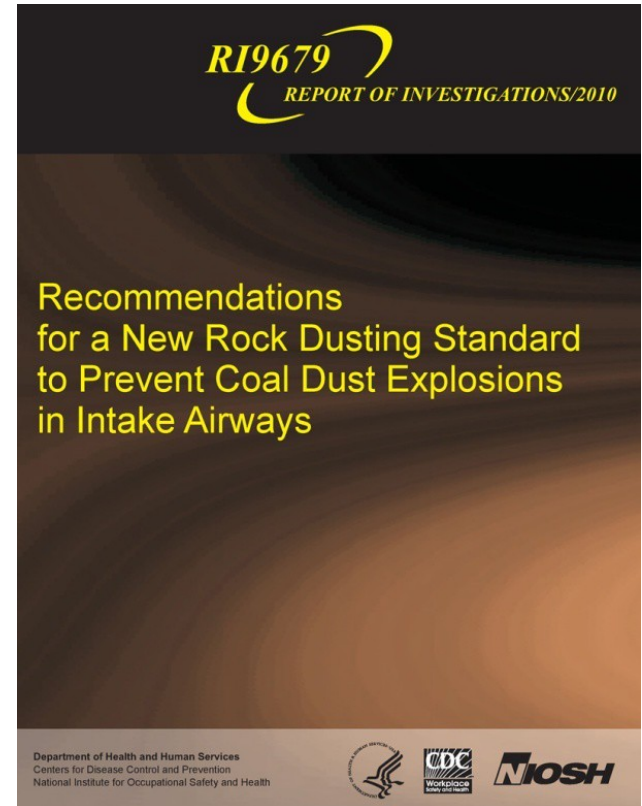
# Survey Results Continued

80% IC requirement based on results from:

- Recent coal dust particle size survey
- Full-scale experiments conducted in the Lake Lynn Experimental Mine
- Explosion temperature thermodynamic limit models

For details of results, go to

<http://www.cdc.gov/niosh/mining/works/coversheet1326.html>



# Possible Longwall Hazards

- Accumulations of coal dust in the tailgate entries
- Area not sampled or assessed
- Proximity to most likely source of methane ignition



More explosion information:

<http://www.cdc.gov/niosh/mining/features/minexpo2012.html>





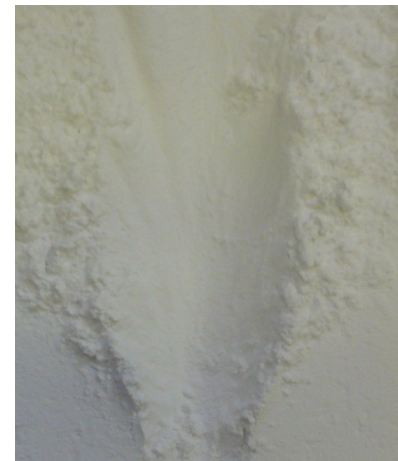
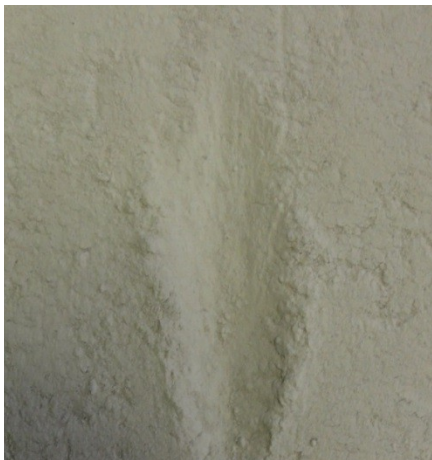
# Key Rock Dust Properties

- Must have sufficient percentage of fine particles <200 mesh to inert high volatile coal dust at the 80% level
- Rock dust must disperse effectively to prevent coal dust propagation (non-caking)
- Larger rock dust particles require more rock dust to inert an explosion



# Prevention of Caking with Additives

- Performance criteria
  - Must prevent caking - equally dispersible after wetting and dried
  - Does not reduce inerting effectiveness (>80%)
  - Does not add an additional health hazard
  - Can be used with most existing rock dusting equipment
- Additives such as stearic acid, tall oil, etc.
- Partnering with IMA-NA, NLA, and NSSGA



# Assessment Methods

## Low Temperature Ashing

- Measures the % incombustible content (IC)
- Burns the combustible material off
- Requires 1 g of sample





# Assessment Methods

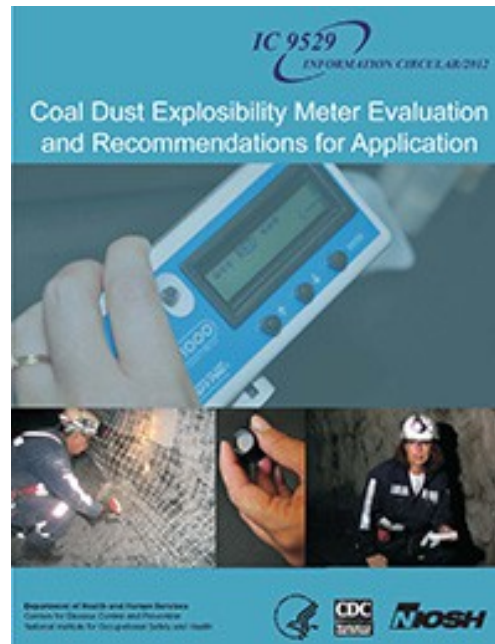
## Coal Dust Explosibility Meter (CDEM)

- Allows for immediate identification and mitigation of an area deficient in rock dust
- Based on:
  - optical reflectance
    - light rock dust
    - dark coal dust
  - Determines the ratio of rock dust to coal dust surface area (% RD)
  - Full-scale experiments on flame propagation
  - Use of well mixed and dry dust mixture
- Requires 4 g or less of dust



# Assessment Methods

- For more information on the CDEM: <http://www.cdc.gov/niosh/mining/Works/coversheet1843.html>
- CDEM calibration and usage videos: <http://www.cdc.gov/niosh/mining/Works/coversheet1856.html>

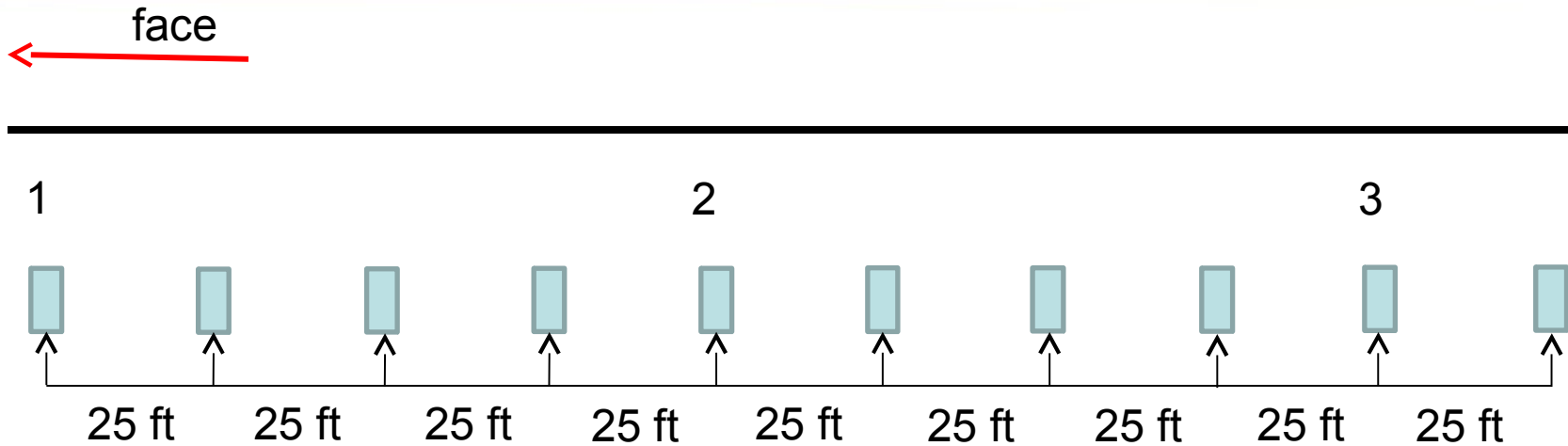


# Rock Dust Practice Assessment

- Dust collection trays set in tailgate entry
- Collect dust from floor, roof, and ribs
- Collect dust from cribs and/or cans
- Determine additional rock dust quantities, if needed



# Example - tailgate entry A



- Laid trays on Day 1
- Recovered trays and dust on Day 3
- Range of TIC: 83% - 88%
- Range of mass: 7.2 g – 24.9 g

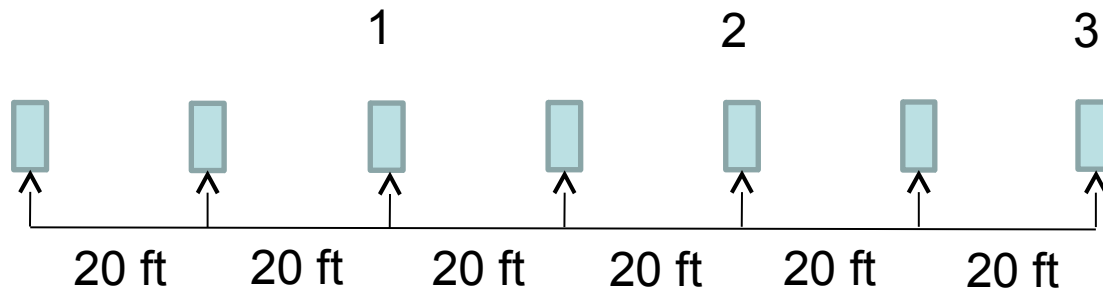
Location	Sample	%TIC
1	rib	98
	crib	81.8
	can	91.4
2	roof	88.9
	rib	96
	crib	85.6
	can	97.7
3	roof	86.4
	rib	90.9
	crib	89.7
	can	84.3





# Example - tailgate entry B

← face



- Laid trays on Day 1
- Recovered trays and dust on Day 3
- Range of TIC: 75% - 78%
- Range of mass: 8.6 g – 41.6 g

Location	Sample	%TIC
1	roof	72
	rib	88
	crib	82
	floor pipes	82
2	roof	55.5
	rib	71
	crib	82.6
	floor pipes	82.9
3	roof	48.4
	crib	81.5
	floor pipes	78.9



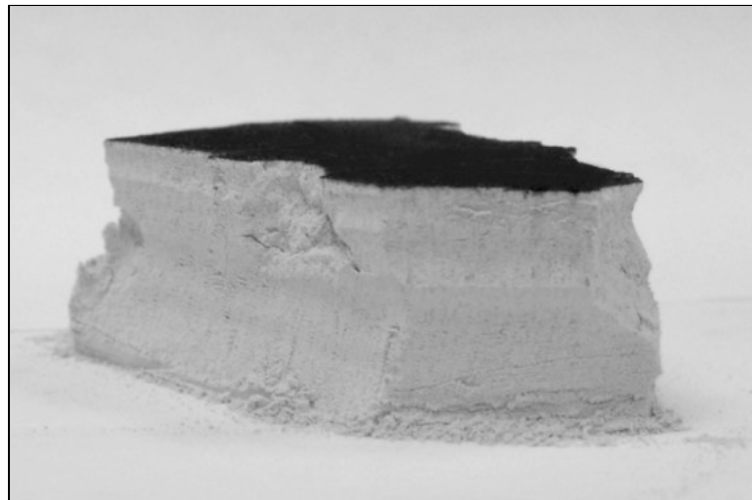
# Additionally...

- Other observations:
  - Layering present?
  - Homogenous mixture?
- Plan
  - Effort to match rock dust loading with coal production or face advance
  - Effort to maintain the tank in headgate

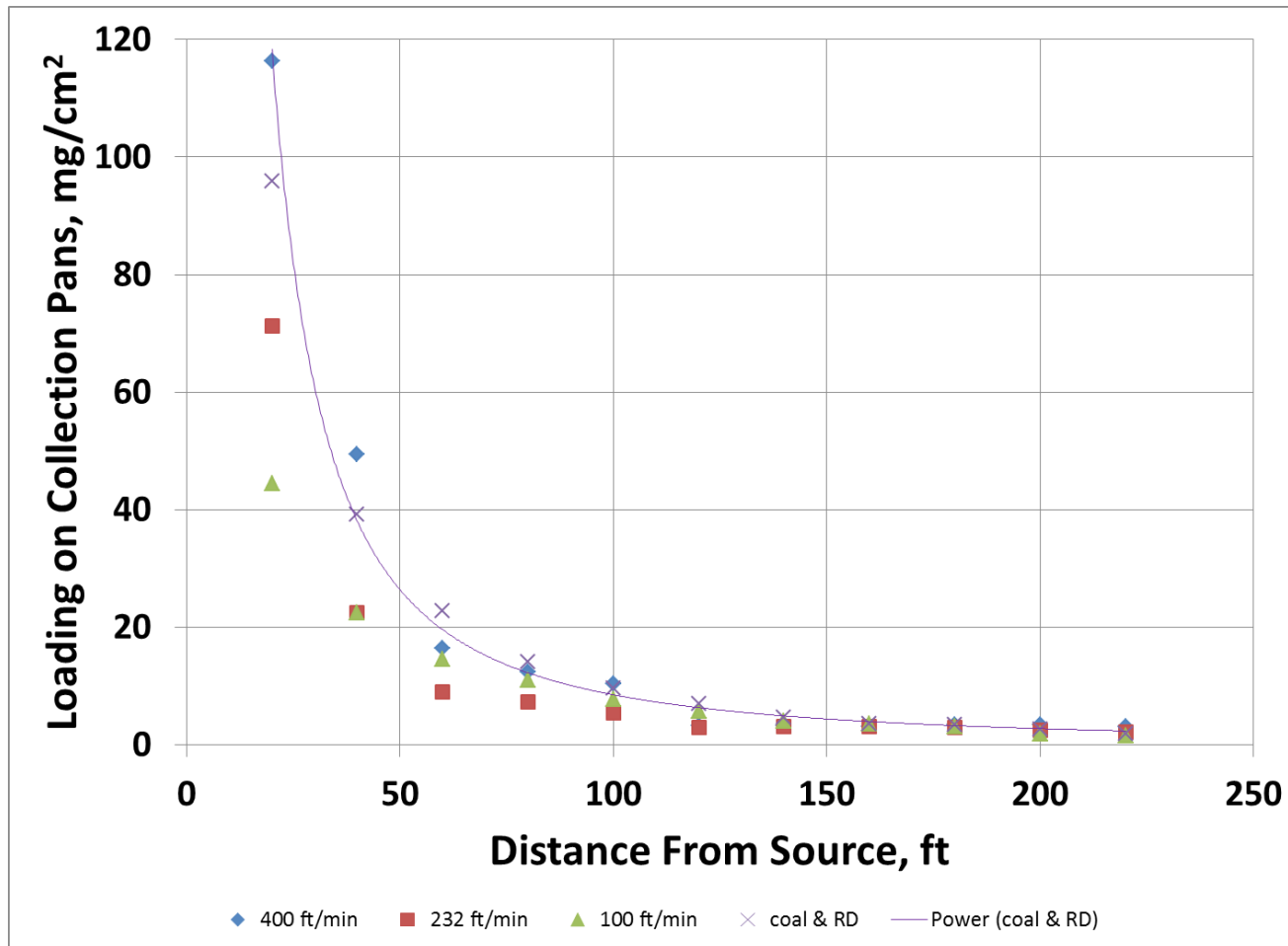


# Float Coal Dust Hazard

- 75  $\mu\text{m}$  or smaller (minus 200 mesh)
- An explosive layer of coal and rock dust can be deposited on top of pure rock dust.
- The top layer could be diluted and misrepresent the true explosion hazard.

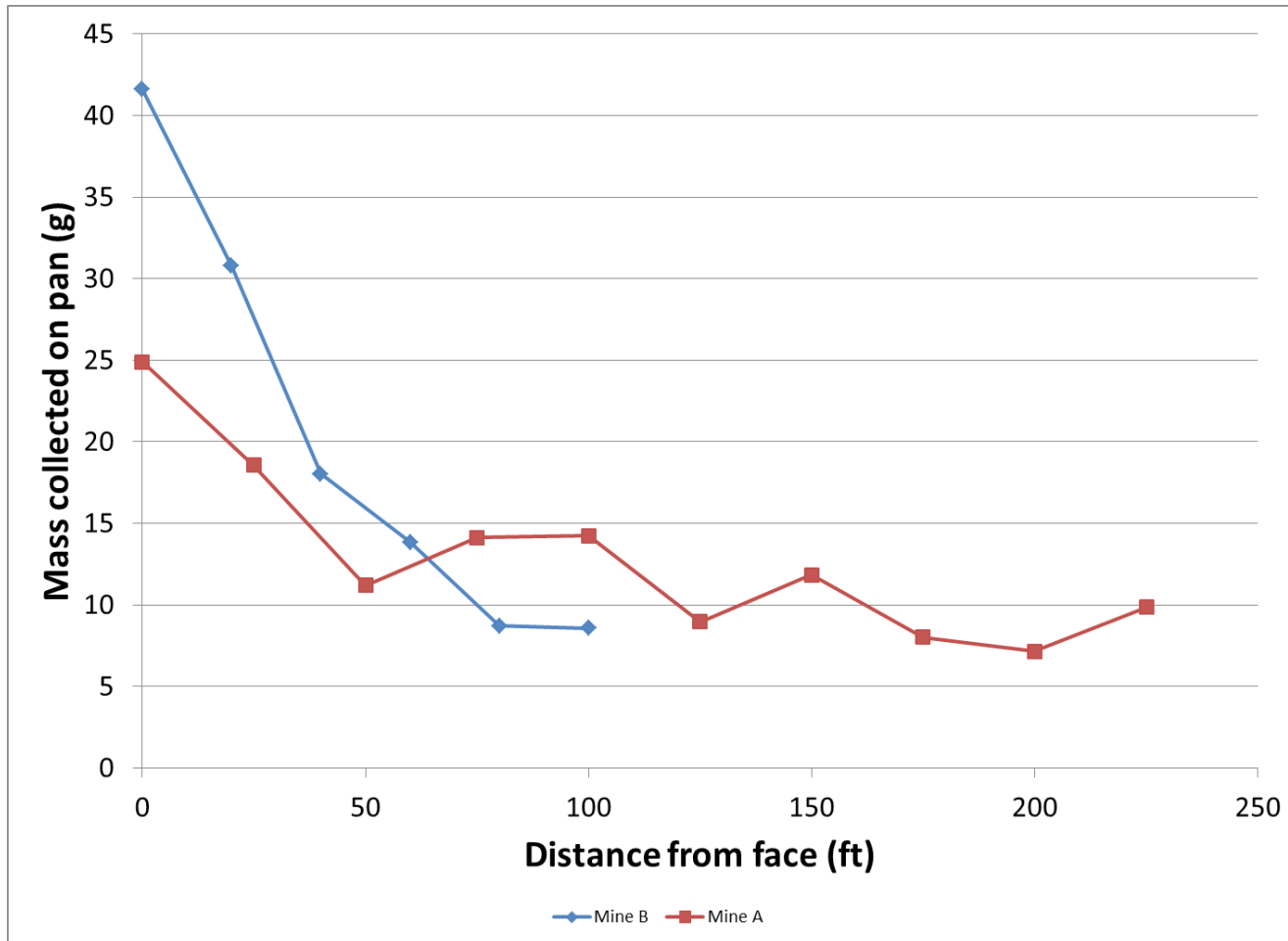


# Experimental Collection





# Field Collection



# Observed Practices

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- Need to dust tailgate during longwall operation
- Large rock dust tanks in headgate
- Pneumatic hose across panel to rock dust tailgate
- Tailgate trickle dusters supplied by manually transported bags not recommended



# Conclusions

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- Fine coal dust in proximity to most likely ignition source
- Assessment methods
  - Low temperature ashing
  - CDEM
- Monitor and assess your practices
- Presence of float coal dust
- Don't have a plan? Make one.



# Questions?

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