**MSHA's DPM STANDARD:
SAMPLING AND COMPLIANCE
STRATEGIES FOR
METAL AND NONMETAL MINES**

MDEC 2002

United States Department of Labor
MSHA
Mine Safety and Health Administration

Background

- Rule published in FR on January 19, 2001
- Legal challenge filed January 29, 2001
- All parties agreed to attempt to negotiate mutually acceptable settlement
- 2 partial settlement agreements thus far
- Provisions on:
  - Fuel, maintenance, engines, training, and recordkeeping in effect July 5, 2001
  - DPM interim limit, compliance determination, environmental monitoring for DPM in effect July 20, 2002

Background

- Other terms of July 15, 2002 partial settlement agreement:
  - Compliance assistance (DPM baseline sampling and information on DPM controls) until July 19, 2003
  - Feasible engr or admin controls required if exposure exceeds limit; PPE required if exposure exceeds limit despite feasible engr and admin controls
  - Job rotation not allowed for compliance

Background

- Personal sampling for compliance determinations
- Two step process for determining compliance with interim limit
- Mine operators must develop and implement written compliance strategy

Background

- New rulemaking initiated; addresses:
  - § 57.5060(a) and (b) DPM limits
  - § 57.5060(c) Time extensions to reach limits
  - § 57.5060(d) Exceptions to limits
  - § 57.5060(e) Use of PPE
  - § 57.5060(f) Use of administrative controls
  - § 57.5061(b) Use of EC as DPM surrogate
  - § 57.5061(c) Sampling strategy
  - § 57.5062 DPM control plan
  - Technological and economic feasibility
  - Paperwork burden

§57.5060(a) Interim DPM Limit

- Mine operator must limit exposure to DPM by restricting average 8-hr equivalent full-shift airborne concentration of total carbon to:

400_{TC} µg/m^3

§57.5060(a) Interim DPM Limit

- Why limit total carbon ?
  - Can't sample/analyze DPM
  - DPM consistently 80%-85% total carbon
  - sampling/analysis for total carbon meets NIOSH accuracy criteria at low concentration

§57.5061 Compliance Determinations

- Per settlement agreement:
  - Compliance determination based on single, shift-weighted (8-hr), full shift, personal exposure sample
  - Sampling train includes 10-mm Dorr Oliver nylon cyclone and SKC DPM sample cassette with integral submicron impactor and tandem quartz fiber filters
  - Sample analyzed for elemental carbon (EC) and organic carbon (OC) per NIOSH Method 5040

§57.5061 Compliance Determinations

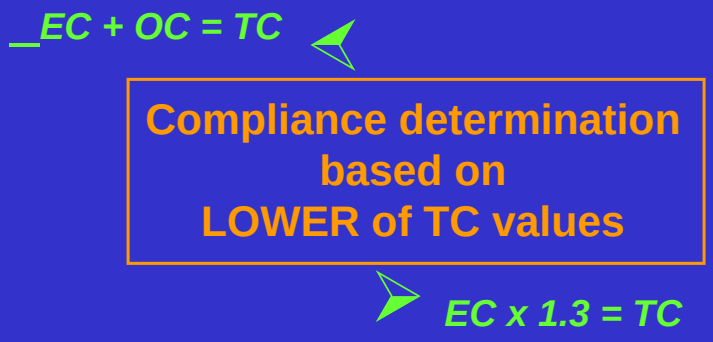
- Miners most likely to have the highest DPM exposure selected for sampling
- Sampling documentation
  - Date, mine information
  - Subject miner, occupation, location, activities
  - Filter number, pump, calibration, time on/off
  - Ventilation, temperature, humidity
  - DPM sources - equipment operated, other equipment, fuel, maintenance, emissions
  - DPM controls - DPM filters, enclosed cabs, work practice controls

§57.5061 Compliance Determinations

- Per settlement agreement:
  - DPM limit expressed as limit on airborne concentration of total carbon (TC)
  - EC + OC = TC
  - Due to possible interference from other OC sources in mine (tobacco smoke, drill oil mist), TC based on EC + OC may include non-DPM carbon
  - If EC + OC exceeds interim DPM limit, TC will also be determined by EC x 1.3 = TC
  - EC x 1.3 reasonable estimate of TC based on sampling at 31 MNM mines

§57.5061 Compliance Determinations

- Per settlement agreement:



§57.5061 Compliance Determinations

- Violations of the interim DPM limit will be cited only if measured DPM concentration exceeds the limit by a sufficient margin to insure, at 95% confidence level, that miner was actually overexposed
  - Compliance determination must take into account normal sampling and analytical errors, referred to as error factor
- Error factor for EC + OC = TC is 1.14
- Error factor for EC x 1.3 = TC is 1.12

§57.5061 Compliance Determinations

- Compliance determination incorporates "shift weighted" average concentration
- Sample time = full shift length, but compliance based on 480 minutes
  - TWA = analyte mass / (flow rate x shift length)
  - SWA = analyte mass / (flow rate x 480 minutes)
- For shifts longer than 8 hours, shift weighting causes an upward adjustment in DPM concentration

SWA = TWA x (shift length / 480)

SKC DPM filter cassette with submicron impactor and tandem quartz fiber filters

DPM Filter Cassette Mounted On Cyclone In Lapel Holder

Personal Sampling For DPM In Gypsum Mine

§ 57.5071 Environmental Monitoring

- Mine operators must monitor as often as necessary to effectively determine if any miners are overexposed to DPM
- If overexposure identified, mine operator must promptly post notice of, and promptly complete corrective action
- MSHA will not cite for DPM overexposure based on mine operator's monitoring
- Violation only if mine operator monitoring indicates an overexposure, and no corrective action taken

DPM Control Strategies

- Per settlement agreement, restricting exposures requires mine operators to use "hierarchy of controls"
  - Feasible engineering and administrative controls, including work practice controls, must be implemented first (job rotation not allowed as means of compliance);
  - If exposures continue to exceed established limit . . . ;
  - . . . use of personal protective equipment (respirators) is required

DPM Control Strategies

- As published in FR in January 2001:
  - Administrative controls prohibited (defined as job rotation)
  - Use of PPE (respirators) greatly restricted
- Per settlement agreement:
  - Administrative controls permitted (includes work practice controls in general, but not job rotation)
  - PPE (respirators) required if DPM exposures exceed interim limit despite feasible engr and administrative controls

DPM Control Strategies

- Standard is "Performance Oriented"
  - Mine operator chooses controls
- Engineering controls eliminate hazard through substitution, isolation, enclosure, and ventilation. Examples:
  - DPM exhaust filters
  - Low emission engines
  - Environmental cabs (filtered breathing air)
  - Ventilation upgrades (main or auxiliary)
  - Alternate fuels, fuel additives
  - Remotely controlled equipment

DPM Control Strategies

- Administrative, including work practice controls, change the way work tasks are performed to reduce or eliminate hazard
  - Job rotation (an administrative control) as a means of compliance expressly prohibited
  - Limits on unnecessary idling
  - Limits on lugging (low speed, high load)
  - Speed limits, one-way travel
  - Limits on equipment (or hp) in area or split
  - Areas designated “off limits” for personnel or for diesel equipment

DPM Control Strategies

- If exposure exceeds interim limit despite all feasible engr and administrative controls, PPE required as means of compliance
- PPE also required while engr and admin controls being established
- When PPE required, respiratory protection program per ANSI Z88.2 also required (written SOP’s, fit testing, storage/cleaning training, inspection, surveillance)

DPM Control Strategies

- Mandatory "Best Practices"
  - Low sulfur fuel (500 ppm)
  - EPA registered fuel additives
  - Engine maintenance, qualified mechanics
  - Emissions tagging
  - Newly introduced engines must be either MSHA Approved or meet specified EPA particulate emission limits
  - Training
  - Recordkeeping

SUMMARY

- All provisions in effect since July 5, 2001 continue to be effective without change
- Provisions on maintenance tagging and moving engines from one U/G to another added March 2002
- Interim DPM limit of 400 $\mu g/m^3$ in effect since July 20, 2002
- Compliance assistance until July 20, 2003
  - DPM limit will not be enforced until 07-20-02 at mines that cooperate in good faith with MSHA during compliance assistance

SUMMARY

- Compliance assistance will consist of
  - DPM baseline sampling - all UG mines
  - Information on feasible DPM controls
- Mine operators must develop and implement written compliance strategy

SUMMARY

- MSHA will Sample for Total Carbon (TC)
- Determining TC concentration requires 2-step process; each step has its own Error Factor
- Lower of TC values used for compliance determination
- For compliance with DPM limit, mine operators required to implement feasible engineering and administrative controls
- Job rotation not allowed for compliance

SUMMARY

- If DPM exposure exceeds limit despite all feasible engineering and administrative controls, respirators and respiratory protection program per ANSI Z88.2 are required
- After compliance assistance period, mine operators must conduct monitoring for DPM and control exposures accordingly
- Rulemaking initiated - - ANPRM issued 09-25-02; comments due by 11-25-2002