

MDEC 2002

NO₂ Generation by Ceramic Traps

MSHA, Technical Support

Robert Setren

MSHA DPM RULE IMPLEMENTATION ACTIVITIES

- Evaluation of NO₂ generation by cat traps
- Filter options for use on perm machines
- Evaluate problems with implementation
- Lab and field tests new technologies
- Keep the mining industry informed
 - Web page - simplify and expand

Team Effort

- Diesel Partnership - coal
 - BCOA
 - Mine Operators
 - UMWA
 - NIOSH
- Mine Repair Shops
- Engine & Machine Manufacturers
- MSHA

MSHA Involved

- Technical Support
- Coal Mine Safety and Health
 - Health Specialist
 - Inspectors

NO₂ and Pt-Based Catalyzed Ceramic Traps

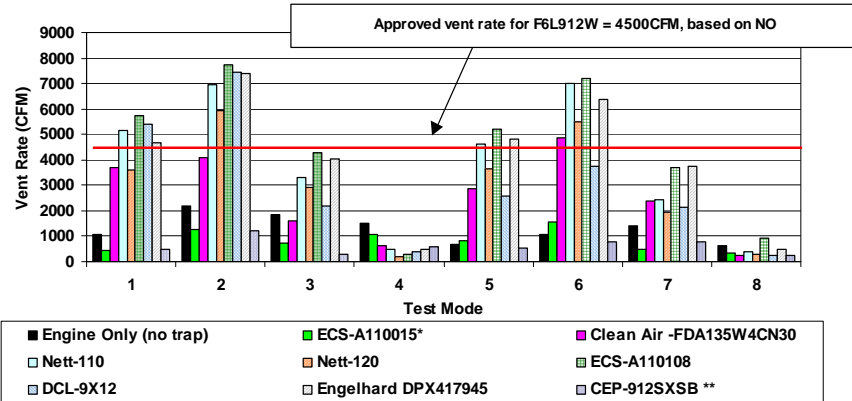
- What are they?
 - Trap particulate in pores of a porous structure
 - Coated with a Pt-based catalyst
 - Passive
- Catalyst
 - CO to CO₂
 - NO to NO₂
 - Allows soot to regenerate (burn off) at lower temperature

Pt Cat Ceramic Particulate Traps Events for DPM rule implementation

- Preamble recognized manufacturers' literature claims of slight increase in NO₂
- Diesel Partnership meeting in January 02, NO₂ increase reported to be very high
- MSHA receives trap from Utah - testing confirmed excess generation of NO₂
- MSHA requests traps from manufacturers

Lab Results on Pt Traps

Comparison of NO₂ vent rate requirements for Deutz F6L912W engine with Various DPM Traps (Note: vent rates crossing the 4500CFM requirement would not keep ambient levels of NO₂ within MSHA exposure TLVs)



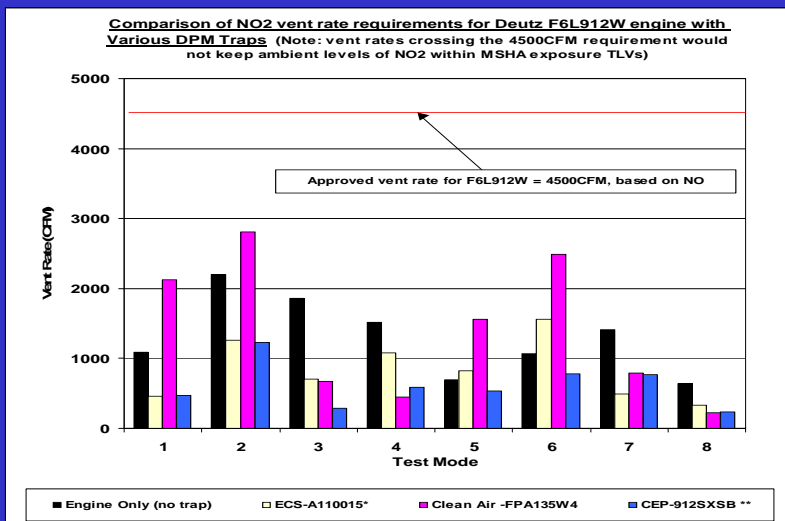
Field Test of Pt Trap

- Test at Deer Creek Mine
- Machine was shield hauler
- Tested loaded machine in isolated zone
- 15 minutes of testing ambient exceeded TLV
- 25 minutes - 10 ppm

PIBs Issued

- PIB 02-07 - warning
- PIB 02-04 - tests and actions

Other Passive Filter Products



Field Tests

- Evaluated numerous Pt Cat trap installations
- Many of the filters were plugged
- Not setup for off-board regeneration
- Cleaning methods questionable
- Test method - torque stall - questioned

MSHA plans

- New PIB being developed
- Our present thoughts are
 - If the Pt filter doesn't cause emissions > MSHA engine name plate quantity - OK, but
 - Trap is not getting hot enough to generate NO₂ and not getting hot enough to regenerate
 - A safe and healthful means must be developed to regenerate the filter

Con't

- If trap is getting hot enough to regenerate then NO_2 is probably going to be a problem
- MSHA will evaluate Pt-based catalyzed trap installations to ensure NO_2 will not be a problem

Passive filters on the MSHA list Proposed

- Filters listed by MSHA on web site will not cause an NO_2 problem, but
 - Get an accurate temperature trace of the machine operating at your normal duty cycle to ensure regeneration.
 - If the filters plug, a safe and healthful regeneration method will need to be developed

Active Regeneration - Traps

- Numerous manufacturers of off-board regeneration
- Numerous manufacturers of on-board electrical regenerators
- MSHA and NIOSH are evaluating safety and health considerations of regeneration
- On-going field tests

Summary

- Reducing exposure of miners to diesel particulate matter is important
- MSHA is evaluating technologies to ensure the health and safety of miners
- MSHA will post new information on web site.
- MSHA Technical Support 304 547 0400 ask for the Mechanical Safety Division

QUESTIONS ?