

MDEC 2007 ROUNDTABLE FORUM REVIEW PANEL

Diesel Particulates

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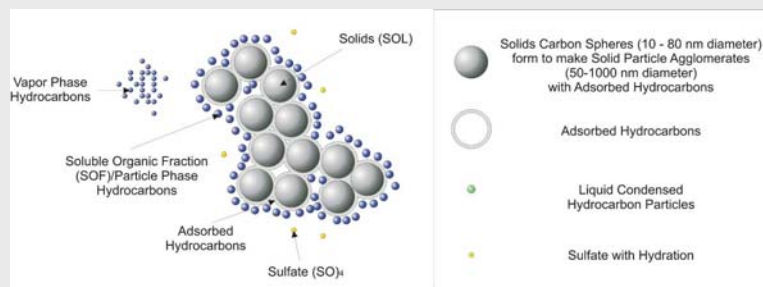
Diesel Aerosols vs. Diesel Particulate Matter (DPM)

- ✱ Pragmatic vs. theoretical definitions of DPM:
 - ✱ Any material collected on a specified filter medium after diluting exhaust with a clean, filtered air at a temperature of less than or equal to 125 °F (52 °C), as measured at a point immediately upstream of the primary filter.
 - ✱ Ever-changing complex mixture of solid and liquid nano and ultrafine aerosols contributed to environment by diesel engines.



DPM Properties

- ✱ Physical properties:
 - ✱ size;
 - ✱ morphology;
 - ✱ phase.
- ✱ Chemical composition:
 - ✱ Elemental carbon
 - ✱ Condensed hydrocarbons
 - ✱ Sulfates
 - ✱ Ash
 - ✱ Water



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Carbon Fraction of DPM

- ✱ Solid vs. Organic Carbon Fraction
 - ✱ EC vs. OC
 - ✱ OC: Particle bound vs. gaseous phase;
- ✱ Sampling and analysis issues:
 - ✱ sampling media artifacts:
 - adsorption;
 - desorption;
 - ✱ sampling flow rate and sampling time;
 - ✱ laboratory vs. underground environment;
 - ✱ fresh vs. aged aerosols;
 - ✱ limitations and peculiarities of the analysis methodology.
- ✱ DPM surrogates:
 - ✱ Gravimetric;
 - ✱ Total carbon;
 - ✱ Elemental carbon...

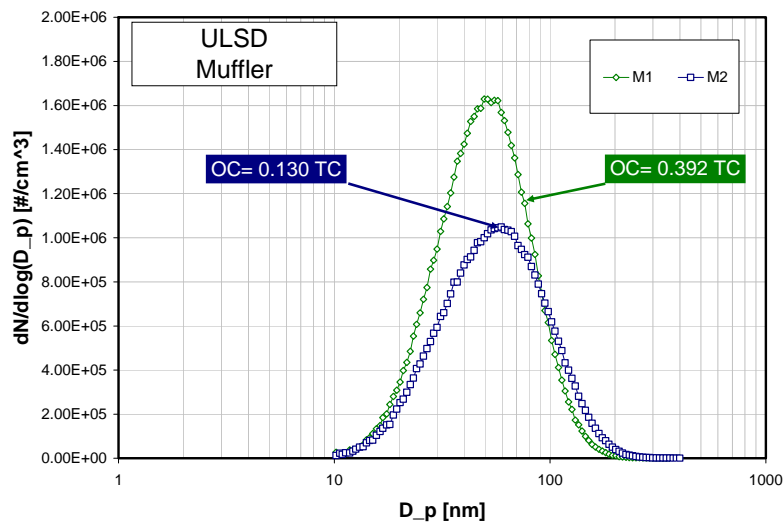
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Effects of Controls on Physical, Chemical, and Toxicological Properties of DPM

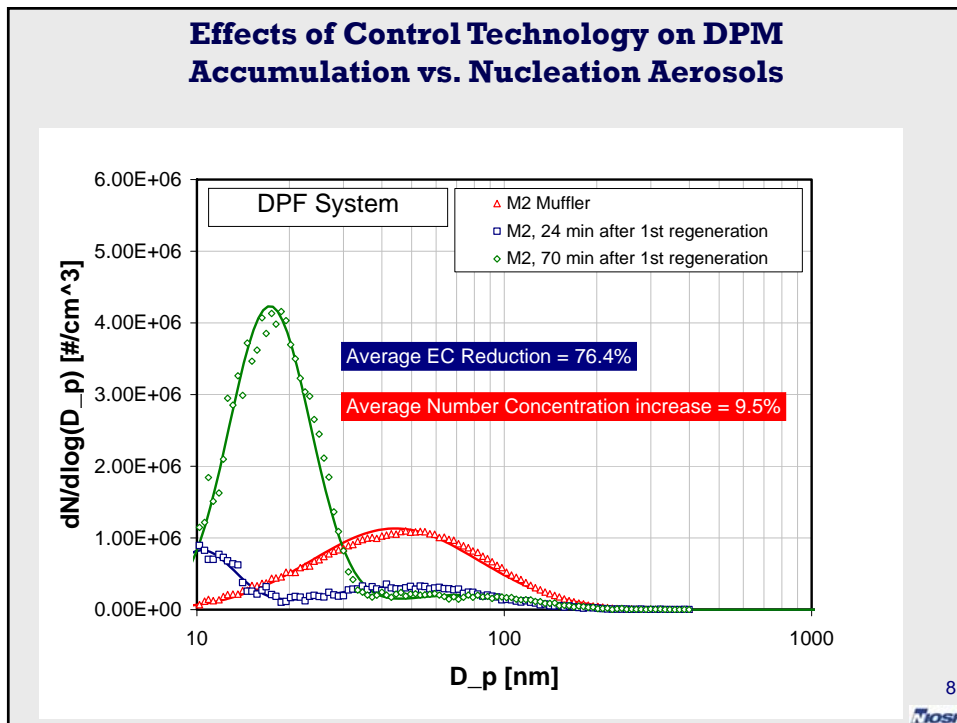
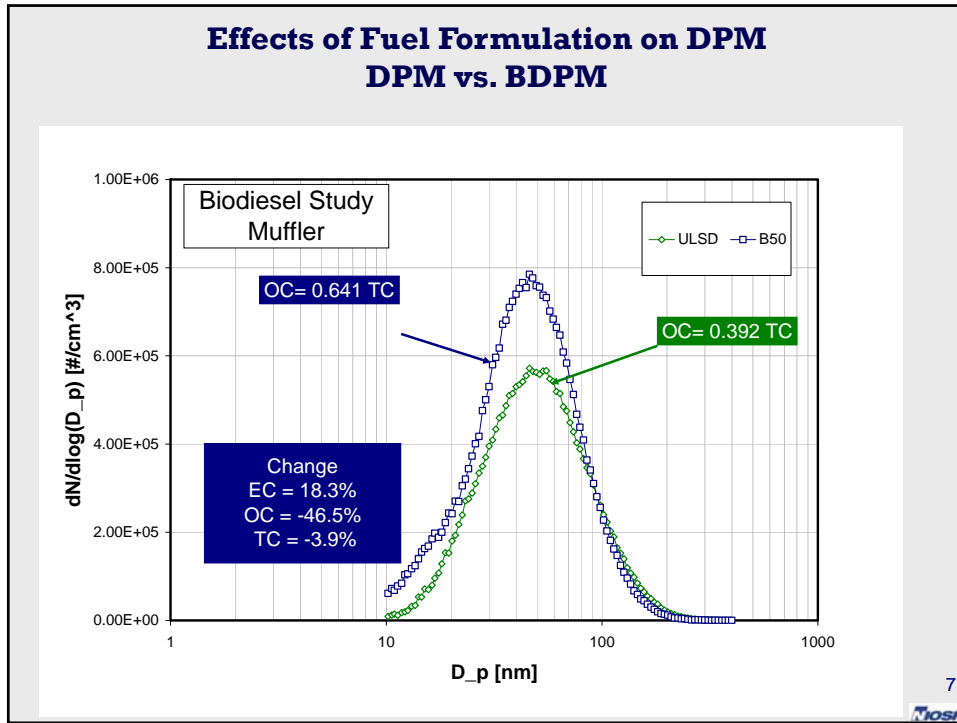
- Physical, chemical, and toxicological properties of DPM affected by:
 - Engine type and design;
 - Engine operating condition;
 - Fuel formulation;
 - Exhaust aftertreatment...

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Effects of Engine Operating Mode on DPM



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Risk Associated with Exposure to Diesel Aerosols

- ✱ How to reduce risk associated with exposure of underground miners and other workers to diesel aerosols:
 - ✱ How to adequately assess exposure?
 - ✱ How to estimate value of control technologies and strategies?
 - ✱ How to optimize controls for application?

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Adverse Health Effects

- ✱ Are the adverse health effects associated with exposure to diesel aerosols related to:
 - ✱ Solid particles;
 - ✱ Organic fractions:
 - ✱ Particle bound
 - ✱ Liquid phase aerosols
 - ✱ Synergy?

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Exposure Assessment Metric

- ✱ Mass;
- ✱ Number;
- ✱ Surface area;
- ✱ Chemical composition;
- ✱ Morphological properties...

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Control Strategy and Technologies

- ✱ How to devise DPM reduction strategy and select control technologies:
 - ✱ DPM vs. NO_2 ;
 - ✱ EC vs. OC vs. TC vs. DPM;
 - ✱ Particle vs. gas phase;
 - ✱ Mass vs. number.
- ✱ Integrated approach;
- ✱ Hierarchy of solutions;
- ✱ Role of education;
- ✱ Optimization;
- ✱ Implementation.

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Optimization of Control Strategies and Technologies for Applications

- ✱ Who to partner with?
 - ✱ vehicle manufacturers;
 - ✱ engine manufacturers;
 - ✱ exhaust aftertreatment manufacturers...

- ✱ OEM vs. retrofit:
 - ✱ Transition to future;
 - ✱ Optimization for specific applications.

- ✱ Small but demanding market.

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How to resolve DPM puzzle?

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