
Issues and concerns

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Technology, and Policy Issues

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Ultrafine particles – issues and concerns

- Current engine fleet, especially worn high emitters
- Other sources
 - Off road
 - Aircraft
 - Other combustion
 - Indoor
- Post 2007 engines with catalyzed filtration systems
 - Nearly all of emissions will be volatile nuclei mode particles
 - These particles are extremely sensitive to dilution and sampling conditions – lab, ambient,....?
 - What should we measure?
 - Solid, volatile, soluble, insoluble, EC, OC, metals,..?
 - Mass, surface, number, size?
 - Suspended or collected
 - Fast response sizing instruments, mass spectrometers, or simpler N, S, EC
 - If number how small, on road and lab measurements often give 10 times or more higher count with 3 nm than 10 nm lower cutoff measurement
- Health impacts
 - Solid, volatile, semi volatile, soluble, insoluble
 - ACES may give us many answers
- Future engine concepts
 - Gaseous and alternative fuels
 - Low temperature combustion
 - Lube oil critical

Cumulative PM as fraction of emission standard, 2004 engine, BP50 fuel, AVL 8 mode test, measured with EEPS

- The upper plot shows the result for the engine without a PM trap.
 - Except for very light load nearly all of the particle mass is found in accumulation mode particles larger than 30 nm
 - All modes meet the standard
- The lower plot shows results with a wall flow PM filter as fraction of 2007 standard
 - Only the two high load modes 7 and 8 account for any significant mass, even they are less than 20% of the standard
 - A modal average would beat the standard by more than a factor of 20
 - Essentially all of the mass is in volatile nucleation mode nanoparticles smaller than 30 nm

