

California Air Resources Board

Biodiesel and Renewable Diesel Emissions Study and Biodiesel Multimedia Evaluation

Real-Time Particulate Matter Emissions


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California Air Resources Board
Mobile Source Control Division/
Heavy Duty In-Use Strategies Branch

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INSTRUMENTS AND PARAMETERS MEASURED

- Differential Mobility Spectrometer (DMS 500, Cambustion Ltd)**
 - Size distribution and number concentration for C15 Caterpillar and MBE 4000 vehicles
 - Classifies particles (4.5 nm-1000nm) according to their electrical mobility
- Engine Exhaust Particle Sizer (EEPS 3090, TSI Inc)**
 - Size distribution and number concentration for 2006 Cummins ISM
 - Electrical mobility analyzer (6.04 nm-523nm)
- Electrical Aerosol Detector (EAD 3070A, TSI Inc)**
 - Particle length/diameter concentration (the total length of all the particles if placed in a line) for 2006 Cummins ISM and MBE 4000 vehicles
 - Diffusion Charger (10- ~1000nm)
- Photoelectric Aerosol Sensor (PAS 2000, Eco Chem)**
 - Particle bound polycyclic aromatic hydrocarbons (pPAH) for 2006 Cummins ISM and MBE 4000 vehicles
 - Photoionization of particle-bound PAH



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Table 1 Number of driving runs used for data analysis

Fuel	2000 C15 Caterpillar		2006 Cummins ISM						2007 MBE 4000					
	Particle Number/ Size Dist.		Particle Number/ Size Dist.		Particle Length (PL, EAD)		pPAH (PAS)		Particle Number/ Size Dist.		Particle Length (PL, EAD)		pPAH (PAS)	
	Cruise	UDDS	Cruise	UDDS	Cruise	UDDS	Cruise	UDDS	Cruise	UDDS	Cruise	UDDS	Cruise	UDDS
CARB	2	2	6	6	6	6	6	6	6	12	6	12	6	12
Soy B20	NA	NA	3	3	3	3	3	3	3	8	3	8	3	8
Soy B50	1	1	3	3	3	3	3	3	3	9	3	9	3	9
Soy B100	1	1	3	3	3	3	3	3	3	7	3	9	3	9
AnB20	1	2	3	3	3	3	2	3	5	4(2)	4	4(2)	4	3(2)
AnB50	1	NA	3	3	3	3	3	3	4	3	3	3	4	4(1)
AnB100	1	1	3	3	3	3	3	3	4	4(1)	4(1)	4(1)	4	4(1)
R20	1	1	Renewable fuel was not tested for International and MBE 4000 trucks											
R50	1	NA												
R100	1	1												

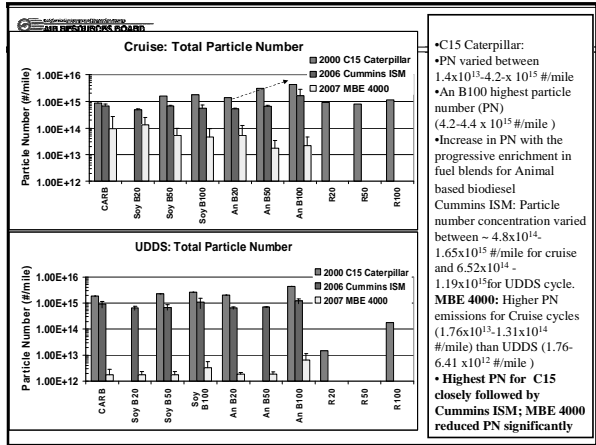
*A few single UDDS were run for MBE 4000 while testing Animal based biodiesel. These are denoted by the numbers in brackets ({}). Rest of the UDDSs are composites of two single UDDS

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PARTICLE EMISSIONS IN TERMS OF NUMBER

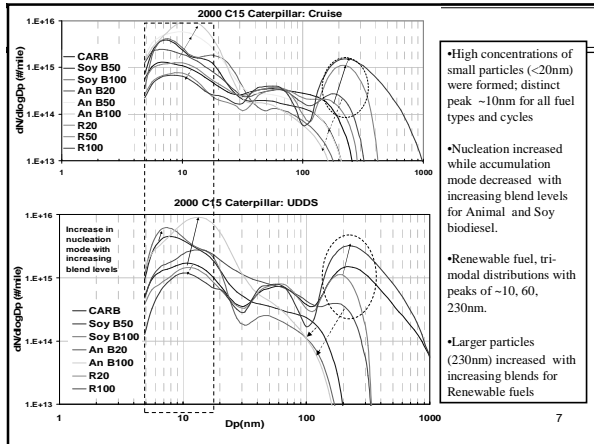
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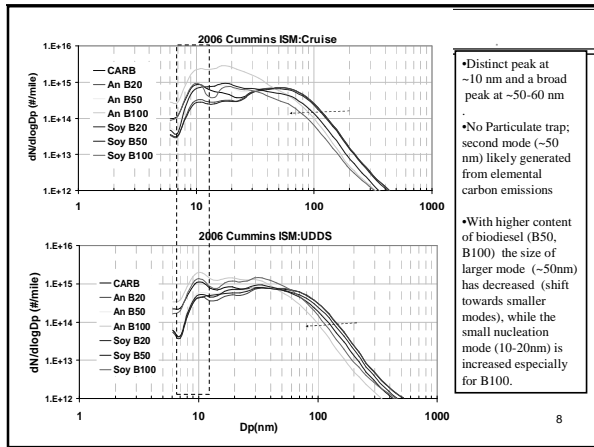


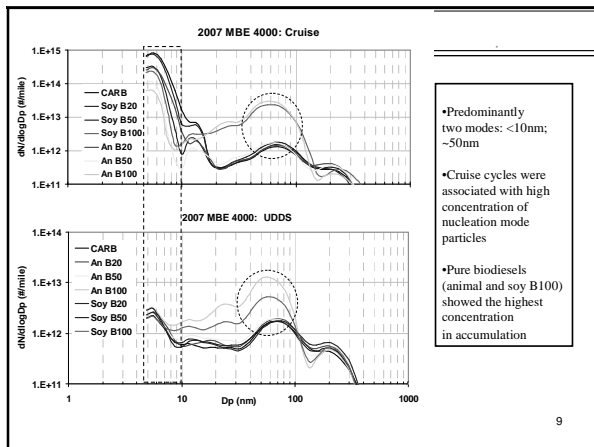
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PARTICLE SIZE DISTRIBUTION

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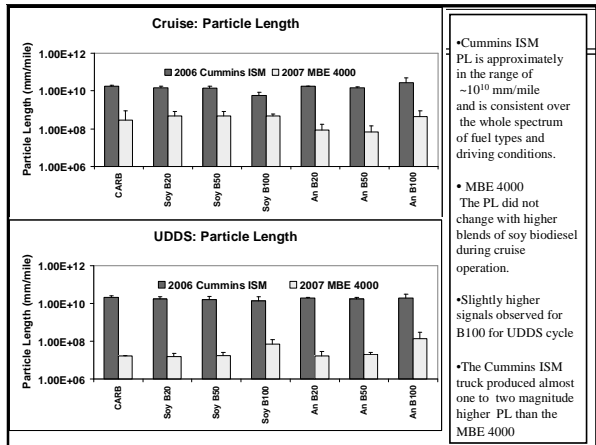




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**PARTICLE LENGTH (PL) / DIAMETER
CONCENTRATION**

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PARTICLE SURFACE BOUND PAH

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