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Questionnaire from 3. ETH Workshop 1999

Results of the 3. Nanoparticle Conference Questionnaire

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Structure

- Health Effects Of Vehicle Particulate Emissions
  - generic issues
- Research Testing Of Vehicle Particulate Emissions
  - technical issues
- Current Measurement Procedures
- Existing Practices
- Conclusions

Response

- 42 responses, approximately 30% of attendees.
- W. Europe (84%) E. Europe (8%), US (8%)
- Respondents were affiliated with :
  - university & commercial R&D organisations,
  - government
  - automotive, fuels and after-treatment industries.
- majority of respondents have operational experience in the Vehicle Particulate Measurement field
- 85% willing to join internal network of expertise

Health Effects

- 66% believed there was insufficient evidence to link PM10 / PM2.5 to health effects
- 70% believed there was insufficient evidence to link Vehicle Particle Emissions to health effects

- Ambient measurement ranking = Number, Composition, Size, Mass
- Emissions measurement ranking = Number, Size, Composition, Mass

General Issues - Existing knowledge and future priorities

	PM_{10}	VPEs	Priority
Link between ambient measurements and sources	2.5	2.3	4.3
Particle surface effects	2.1	2.3	4.1
Particle composition	2.2	2.5	4.1
Particle size	2.9	2.9	4.1
Human Studies	2.3	2.1	3.9
Epidemiology	2.6	2.1	3.7
Particle acidity	2.3	2.3	3.6
Particle solubility	2.7	2.7	3.4
Quantification of Health Costs	2.2	2.1	2.9
Animal Toxicology	3.0	2.2	2.8

Research Testing Of Vehicle Particulate Emissions

- Do we have a mature understanding of VPE measurement? **Y: 27%**

- Can we define tail-pipe emission contributions to ambient PM?
- Total **Yes : 27%**
- Particle mass **Yes : 41%**
- Particle number **Yes : 11%**
- Particle size **Yes : 18%**
- Particle composition **Yes : 22%**

Composition / Metrics

- What elements of particle composition should we measure routinely?

  Carbon 35% Sulphate 32%

  Metals 24% Organics 29%

- What particle characteristics should be measured and what is the priority of measurement

  Surface area > Size / mobility >
  Number > Mass =
  Composition

VPE Measurement Priorities

- Defined Sampling Procedures
- Calibration Materials
- Formation of nanoparticles on combustion
- Defined Measurement Procedures
- After-treatment Effects

Highest Priority :

- - address needs for common sampling measurement and calibration procedures plus formation mechanisms

VPE Measurement Priorities

- Dilution Effects (Ratio, Rate)
- Instrument Inter-comparison
- Modelling of particle formation in tailpipe
- Overall Measurement Uncertainty
- Humidity Effects

High Priority :

- - address specific measurement factors with greatest influence on reproducibility

VPE Measurement Priorities

- Additive Effects
- Sample Ageing
- Fate of volatile droplets / particles
- Correlation with Other Pollutants
- Temperature Effects

Medium Priority :

- - address specific measurement factors with greatest influence on transport to ambient environment

VPE Measurement Priorities

- Tunnel Losses
- Instrumentation Accuracy
- Instrumentation Reproducibility
- Flow Effects
- Correlation with regulated measurements

Low Priority :

- - better understood variables of CVS tunnel and instrument

VPE Measurement Priorities

- Sampling Materials
- Defined Data Handling Procedures
- Defined size ranges
- Reporting Conventions
- Pressure Effects

Lowest Priority :

- - common reporting

Current Measurement Procedures

- Are existing test cycles appropriate?

  Yes 45% No 31% Don't Know 24%

- Are Standard CVS sampling conditions appropriate **Yes 22% No 48% Don't Know 30%**

- Is there an appropriate size cut for particle number?

  Yes 30% No 30% Don't Know 40%

- Recommended Size Cut?
  - **Median = 250 nm, Range = 5 nm – 10 mm**

Existing Practices

- Particle sizing instrumentation
- **SMPS 48% DMPS 9% ELPI 15%**
- **Andersen 12% MOUDI 6%**
- **Light scatter 6% Time Of Flight 6%**
- **Nanomet / PAS 3% DMA 6%**

- Routine composition
- **Carbon 27% SOF 15%**
- **Metals 3% PAH 6%**
- **Sulphate 6% VOC 15%**

Existing Practices

- Do you use secondary dilution afterCVS? **Y: 35%**
- Standard in-house measurement procedure? **Y:61%**
- Standard in-house sampling procedure? **Y : 65%**
- Routine calibration procedures? **Y : 68%**

- Willing to publish procedures for establishing common measurement guidelines or an inter-comparison exercise? **Y : 54%**

Conclusions

- Good base level of understanding and skill applied to the measurement of vehicle particulate emissions.
- Specific measurement needs are split between basic and applied research issues.
- There remains a lack of knowledge as to the mechanics of nanoparticle formation and ageing
- There is a strong need for defined sampling and measurement procedures in this field, with appropriate calibration materials.
- These may be developed from existing procedures used by individual laboratories