



Recommendations to Expert Groups

From Project UFIPOLNET to Expert Groups of Air Quality

INTRODUCTION

About two years ago the EU-Commission proposed a clean air strategy to protect human health and the environment (TSAP) (Reference: IP/05/1170 Date: 21/09/2005, IP/05/1170). Margot Wallström as Vice-President of the EC and Stavros Dimas (EC, Environment) participated in an experiment to measure the level of air pollution by particle matter to underline the importance of this strategy.

“American researchers recently investigated the potential health risks of ultrafine particles in rats. The results show that the nano-sized materials inhaled by rats follow a rapid and efficient pathway from the nasal cavity to several regions in the brain. Exposure also caused signs of inflammation and stress. The ultrafine particles used in the study are the same size as nano particles, which are controversial due to concern about their security to humans (DG ENV; Science for Environment Policy 14 September, 2006 Issue 34).”

A revision of the air quality directive is planned for 2013 by the European Commission, where they will discuss whether PM10 and PM2.5 limits will be changed to or complemented by other metrics, like PM1 or the number of ultrafine particles. In Germany, the VDI-Clean Air Standards Commission KRdL is completing a series of guidelines (VDI 3867 parts 1 to 6). These standards give guidance about instruments and methods to measure particle number concentration and size distribution in ambient aerosol.

In many European countries, including Germany, a broad discussion about particulate filters for cars is underway. In the EU regulation 715/2007 (20.6.2007) about Euro 5 and 6, particle number emission measurements are introduced: "In order to ensure that emissions of ultra fine particulate matter (PM 0.1 μm and below) are controlled, the Commission should adopt (...) a number based approach to emissions of PM (...)." Meanwhile, the Commission has proposed a limit of 5×10^{11} particles/km and the amendment of vehicle certification regulation 83 for light duty vehicles, which describes the detailed sampling and measurement procedures (e.g. conditioning at 300°C and measurement of particles larger than 23 nm) is progressing.

The proposal for Euro VI (heavy duty vehicle emissions) COM(2007) 851 final, in annex I also introduces emission limits for particle number (PN) per kWh, In the Swiss New Norm SNR 277205 from 2007, measurement and certification of Diesel Particle Filter Systems with respect to nano particles and secondary emissions is defined. In 2007, ISO TC24/SC4 started a new work item to standardise the calibration of particle number concentration measuring instruments.

The relevance of ultrafine particles has also reached the political stage. In answers to questions by members of the German parliament dealing with PM emissions from power plants and industry (Bundestag Drucksache 16/8128), the relevance of UFP was discussed.

ACHIEVEMENTS BY UFIPOLNET

The EU-project UFIPOLNET aims at making routine measurements of the number of particulates in ambient air easier, less expensive and more reliable. Long term measurement of ultrafine particle number concentrations and size distributions at different locations will demonstrate a way to prove the reduction of traffic related emissions in European cities due to new regulations.

The objective of the project also was to demonstrate that the new, affordable measuring device for ultrafine particles is applicable for routine monitoring all over Europe. The four prototypes have delivered reliable and comparable data for various kinds of analysis. To produce comparable data, the sampling system was standardised as well. It includes e.g. a PM10 inlet, a PM1 cyclone, a dryer unit and a critical orifice.



The commercial version of the prototype UFP 330 will soon be available for use in all European measuring networks. It will cost about the same as a common PM_{2.5} sampler. Other advantages of this reliable instrument are low cost of ownership (both maintenance and personnel) and simple setup and operation, especially when compared to other instruments measuring size distributions of particles. Neither working fluids like butanol nor a radioactive source are needed; which eliminates liquid waste, emissions of volatile organic compounds and the risk of handling radioactive materials. The instrument will measure particles between 20 and 500 nanometres in 6 size classes (>20 | >30 | >50 | >70 | >100 | >200 (up to 500) nm), respectively.

The feed back of practical experiences during 12 months of routine measurement in networks resulted in several improvements of the instrument. It also helped to create a user orientated manual.

RECOMMENDATIONS TO STAKEHOLDERS

The relevant organisations setting norms in the field of measuring air quality (e.g. ISO, CEN and DIN/VDI in Germany) should be encouraged to consider the recommendation of the device developed within the UFIPOLNET project as a future tool for routine monitoring of ultrafine particle number concentration and size distribution. Based on both the technical experience made within the project and the data collected over a period of one year at four different sites, recommendations for size classes and sampling intervals can also be derived to support regulators on both the national and the EU level.

RECOMMENDATIONS

Technical

- Encourage instrument manufacturer to produce instruments without radioactivity, without working fluids and with low maintenance costs
- A common data protocol for routine measuring networks across Europe would make implementation of new technology faster and less expensive for both instrument developer and user
- Data of UFP will be put in data bases of routine measuring networks
- Common definition of number concentration range classes and time resolution is needed for harmonized future reporting; e.g. 6 size classes from 20 nm to 500 nm as in the UFP 330 device or 8 classes from 10 to 1000 nm which contain the 6 classes measured by UFP 330
 - Quality assurance: Development and use of a mobile standard to compare and/or validate instruments measuring particle number concentration and size distribution

Organisational

- Support of CEN-standardisation (Prof. Bruckmann/D, NRW)
- Round robin tests like for particle number size distribution measurements in the city on national and international level
- Funding for applied research with UFP in ambient air of cities, quality assurance measures
- From now to 2013: Encourage and fund as many monitoring sites as possible to start routine measurements of UFP to establish the necessary data and knowledge base for upcoming decisions

Utilization

- Usage of future data for epidemiologic effect studies
- Control of emission regulations in air quality directives
- Controlling of the effect of measures like environmental zones

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CONTACT

Dr. Gunter Löschau; Tel.: +49-351-8928-131; Email: Gunter.Loeschau@smul.sachsen.de; <http://www.ufipolnet.eu>