


PM - An Overview




PM Issues – an Overview

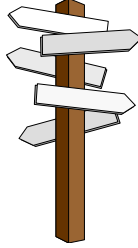
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Roadmap of presentation




- ▶ Historical developments
 - ▶ PM Position Papers
 - ▶ Legislation
 - ▶ Standardization
- ▶ Implementation problems
- ▶ Consequences and issues

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Historical developments




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1996: Directive 96/62/EC

- ▶ **Objectives:**
 - ▶ Avoid, prevent or reduce harmful effects on human health and environment as a whole
 - ▶ Assess air quality in MS on basis of common methods and criteria
 - ▶ Obtain adequate information on air quality and make it available to the public
 - ▶ Maintain air quality where good, and improve in other cases


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1996: Directive 96/62/EC

- ▶ **Common methods and criteria:**
 - ▶ Limit values and alert thresholds
 - ▶ Assessment of ambient air quality
 - ▶ Regimes and criteria
 - ▶ Sampling points: number, location, siting
 - ▶ Assessment methods
 - ▶ Data quality objectives
 - ▶ Reference measurement methodologies + equivalence provision
 - ▶ Quality requirements for laboratories

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1997: 1st PM Position Paper

- ▶ **Recommendations:**
 - ▶ Set limit values for PM₁₀
 - Based on WHO Air Quality Guidelines for Europe
 - ▶ 24-h Limit value of 50 µg.m⁻³ as 98-percentile
 - ▶ 1-year Limit Value of 20 µg.m⁻³
 - ▶ Develop standard for demonstration of equivalence of PM₁₀ measurement methods equivalent to nominated reference samplers or transfer reference samplers
 - ▶ Consider future measurement of PM_{2,5} and its standardization


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 **1999: Directive 1999/30/EC**


- ▶ **Limit values for PM_{10} :**
 - ▶ 24-h Limit value of $50 \mu\text{g}\cdot\text{m}^{-3}$ to be exceeded \leq 35 times per year + MoT
 - ▶ 1-year Limit Value of $40 \mu\text{g}\cdot\text{m}^{-3}$ + MoT
 - ▶ PMPP1 recommendations taken as indicative values ("Stage 2")
 - ▶ Possibility to discount contributions from *natural events* + winter sanding/salting
- ▶ **Reference method for PM_{10} :**
 - ▶ Manual method cf. EN 12341 + equivalent manual methods

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 **1999: Directive 1999/30/EC**


- ▶ **Measurement of $PM_{2,5}$:**
 - ▶ Obligation to measure and report values
 - ▶ Sites should be representative, but no numbers given
- ▶ **Information of the public :**
 - ▶ Obligation to inform public about air quality on – at least – a daily basis


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 **1998: Standard EN 12341**

- ▶ **Standard method for measuring PM_{10} :**
 - ▶ 24-h sampling on filter on a daily basis
 - ▶ 3 sampler types specified
 - ▶ 1 filter type specified
 - ▶ Filter weighing conditions specified
- ▶ **Procedure for demonstration of equivalence of other samplers**
- **Focus on sampler inlet characteristics**


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Consequences

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 **Implementation problems**

- ▶ **Public information obligation:**
 - ▶ Reference methodology not practicable
 - ▶ Use of continuous, automated measurement systems (CAMS) inevitable !
 - ▶ *Procedure needed for demonstration of equivalence of CAMS*
- ▶ **Natural events:**
 - ▶ Causal relationship between exceedences and events
 - ▶ Quantification of contributions
- ▶ **Comparability of measurement results**

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 **2001: PM_{10} Guidance Report**

- ▶ **"Interim" solutions to actual problems**
- ▶ **Use of continuous automated systems**
 - ▶ Structured approach to comparison of ACMS with reference method
 - ▶ Use of correction factors
 - ▶ Proposed default interim factor of 1,3 for TEOM and β -gauges when no information available
- ▶ **Impact of natural events**
 - ▶ Strategies proposed for long-range transport, local events and volcanic/seismic/wild-fire events


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 **Meanwhile in Brussels ...**




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 **2001: CAFÉ Programme**


- ▶ **Clean Air for Europe**
- ▶ **Development of Thematic Strategy for abatement of air pollution**
 - ▶ Aim: protection of human health and ecosystems
 - ▶ Based on precautionary principle and up-to-date science
 - ▶ Priority pollutants: particulate matter, ozone, nitrogen dioxide

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 **CAFÉ Programme**


- ▶ **Three strands:**
 - ▶ Implementation
 - ▶ Revision of existing Air Quality directives and National Emissions Ceiling (NEC) Directive:
 - ▶ streamlining, clarification
 - ▶ based on WHO reassessment of health effects of exposure
 - ▶ Integration of all political instruments to improve air quality into thematic strategy
- ▶ **Aim: 2015-2020**

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 **2003: 2nd PM Position Paper**


- ▶ **Update of PMPP1:**
 - ▶ In 2001, limit values of PM₁₀ for 2005 were exceeded at 34% of 718 monitoring stations
 - ▶ Levels decrease gradually due to reduction of secondary PM precursor gases
 - ▶ Annual limit value (stage 1) probably attained by most MS in 2005
 - ▶ 24-hour limit values to be exceeded at many locations
 - ▶ **Problem: high regional backgrounds due to long-range transport**

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 **2003: 2nd PM Position Paper**

- ▶ **Recommendations:**
 - ▶ **Use PM_{2.5} as metric** for assessing exposure:
 - ▶ 24-hour limit value around 35 µg.m⁻³, not to be exceeded 10% of the days of the year
 - ▶ no annual limit value yet: use values in range 12-20 µg.m⁻³ to identify appropriate value
 - ▶ Use Stage 2 PM₁₀ values as target for reduction of coarse PM fraction
 - ▶ Intensify PM_{2.5} monitoring as soon as possible
 - ▶ Reduce PM₁₀ to ≈20% of the PM_{2.5} sites
 - ▶ Monitor PM₁ and UFP at representative sites


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 **2003: 2nd PM Position Paper**

- ▶ **Recommendations:**
 - ▶ Review Reference Method for PM₁₀ taking into account forthcoming Reference Method for PM_{2.5}
 - ▶ MS should demonstrate **equivalence of non-reference methods** (if necessary after applying correction)
 - ▶ MS are encouraged to **intensify QA/QC** on national and international level


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 **2007 (?): New AAQ Directive**


- ▶ **Switch to $PM_{2.5}$ as principal metric for particulate matter**
 - ▶ Introduction of **National Exposure Reduction Target (NERT)**, **Average Exposure Indicator (AEI)**, Limit Value + MoT and Target Value
 - ▶ Limit value of $25 \mu\text{g}/\text{m}^3$ (annual average), to be met by 01/01/2015
 - ▶ NERT based on AEI to be met by 2020
 - ▶ Possibility to discount contributions from **natural sources** + winter sanding/salting

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 **2007 (?): New AAQ Directive**

- ▶ **Measurement requirements**
 - ▶ Measurement of PM_{10} and $PM_{2.5}$ at same stations
 - ▶ Ratio between PM_{10} and $PM_{2.5}$ sampling points between 1:2 and 2:1
 - ▶ Requirement to measure and **speciate $PM_{2.5}$** at background locations
 - ▶ Reference method cf. EN 14907 + equivalent manual methods
 - ▶ **More rigorous quality requirements** for monitoring institutions/networks


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 **2005: Standard EN 14907**

- ▶ **Standard method for measuring $PM_{2.5}$** :
 - ▶ 24-h sampling on filter on a daily basis
 - ▶ 2 sampler types specified
 - ▶ 4 filter types specified
 - ▶ Filter weighing conditions specified
- ▶ **Procedure for demonstration of equivalence of other samplers**
 - ▶ Based on Guidance Report for Demonstration of Equivalence


→ **Focus on collection on filter**



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 **2005: Equivalence Guidance Report**

- ▶ **General approach for demonstration of equivalence of non-reference methods**
- ▶ **Specific test and evaluation programme for ACMS for PM_{10} and $PM_{2.5}$**
 - ▶ Field comparisons with manual methods cf. EN 12341 or EN 14907
 - ▶ Evaluation based on uncertainty assessment
 - ▶ Use of correction factor/term permitted


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Consequences


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 **Implementation problems**

- ▶ **Meeting PM_{10} limit values**
 - ▶ No more MoT since 1/1/2005
 - ▶ Limit value is "absolute"
 - **Serious economic consequences (at least in the Netherlands)**
- ▶ **Measurements (uncertainties) have become critical**
 - Critical examination of methods
 - Discovery of (new) sources of error
 - Strong incentive to reduce uncertainties


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 **Implementation problems**


- ▶ **Meeting data quality objectives when using ACMS**
 - ▶ Data capture
 - ▶ Uncertainty requirements, i.e., equivalence with standard methods
 - Trade-off between data capture and QC ?
 - ▶ Comparability of different ACMS

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 **Implementation problems**


- ▶ **Harmonization of EN 12341 and 14907**
 - ▶ EN 14907 reflects more recent views
- ▶ **Use of standards EN 12341 and 14907**
 - ▶ Too many degrees of freedom
 - ▶ Filter conditioning
 - Effect on weighing uncertainties ?
- **Presentation by Paul Quincey**

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 **Implementation problems**


- ▶ **Practice of equivalence demonstration of ACMS**
 - ▶ Definition of "candidate" equivalent methods
 - ▶ Evaluation procedures (datasets; statistics)
 - ▶ Application of corrections
 - ▶ No ACMS for PM₁₀ is a panacea (yet), so what about PM_{2.5} ?
 - ▶ Much effort required for networks
 - Subject of 2007 Workshop
- **Follow-up ?**

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 **Implementation problems**


- ▶ **Part of exceedences caused by high background levels of PM**
 - ▶ Long-range transport
 - ▶ Natural sources
- **Strong focus on source apportionment**
 - ▶ No valid, accepted methods for quantification of contributions yet
 - ▶ Subject of 2006 workshop
 - ▶ Commission (JRC) to publish guidance
- **Presentation by Thomas Kuhlbusch**

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 **Implementation problems**

- ▶ **Comparability of measurement results**
 - ▶ Inter-network comparisons operational
 - ▶ On a national level
 - ▶ Bilateral between neighbouring networks, e.g., between Netherlands and Lower-Saxony, Nordrhein-Westfalia and Flanders
 - Improvement of comparability, e.g., through examination of differences in data treatment
 - ▶ Between Member States
 - ▶ Activities of Aquila network
 - ▶ Activities of JRC-IES
- **Presentation by Luisa Marelli**


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 **Conclusions**

- ▶ **Interest in PM has revived in 1990s**
- **Promulgation of PM legislation**
 - **Standardization**
 - **Guidance to member States on**
 - ▶ Natural contributions
 - ▶ Equivalence
- ▶ **Gradual shift in focus to lower size fractions**


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 **Conclusions**

- ▶ *PM issues have not changed much in 10 years time, but*
- ▶ *Implementation of PM legislation has*
 - ◊ Led to increased focus on issues
 - ◊ Led to better understanding of problems
 - ◊ Revealed more problems in correctly establishing PM levels
 - ◊ Which are critical in view of compliance problems and their consequences
 - ◊ Initiated development of solutions

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“And yet, to me, what is this quintessence of dust ?”

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