



Monitoring Compliance With The EU PM_{2.5} Average Exposure Indicator In The UK

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Air Quality – The Major Challenges, AAMG, 9/10 December 2009

Topics

Requirements of the Directive

UK implementation and network

Data ratification and QA/QC processes

Datasets and observations

Directive 2008/50/EC – PM_{2.5} (1)

Limit Value – Calendar year average 25µg/m³ by 2015

Limit Value – Calendar year average 20µg/m³ by 2020

Fixed Measurement DQO ±25% at Limit Value

Directive 2008/50/EC – PM_{2.5} (2)

Average Exposure Indicator: 3-year average concentration now, compared to 3-year average in 2020

Percentage reduction target set, depending on current levels, with a view to reduce AEI to below 18µg/m³ everywhere

Exposure Concentration Obligation – Calendar year average 20µg/m³ by 2015

Target Value – Calendar year average 25µg/m³ by 2010

Directive 2008/50/EC – PM_{2.5} (3)

Average Exposure Indicator:

UK average concentration January – November 2009:

12.0 µg/m³

(43 sites with data capture >75%, provisional data from July 09 on)

Currently 10% reduction required by 2020

UK network

UK monitoring network is a de-centralised entity...

- UK Government (Defra)
- QA/QC contractor (AEA)
- Management units (BV, ERG)
- Local Site Operators
- Equipment Support Units

All working together with a single common aim



UK network (2)

Directive assessed to determine monitoring station requirements for the UK

Divided into:

15 Zones

28 Agglomerations

Number of sites, $PM_{10}:PM_{2.5}$ ratio, Traffic:Background ratio, 1 site per million people, urban areas >100,000... all make the final picture complicated!



UK Network

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58 PM_{10} sites



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Pollutant	Minimum required by Directive (Traffic)	Current number in network (Traffic)	Final number to be deployed in network (Traffic)
PM_{10}	115 (min 47 $PM_{2.5}$)	58 (16)	65 (24)
$PM_{2.5}$	min 39 PM_{10} , min 39 traffic)	60 (13)	77 (22)

UK Network – Instrument Choices

Following extensive research...

TEOM FDMS automatic analyser – with modified “CB” drier

Met One BAM automatic analyser (2)

Partisol 2025 sampler (13)

KFG SEQ/47 reference method (2)



Determination of compliance – co-location

A staged approach:

PM₁₀ and PM_{2.5} with SEQ/47,
Partisol and FDMS at two sites

PM₁₀ and PM_{2.5} with Partisol and
FDMS at 4 sites

PM_{2.5} with Partisol and FDMS at 1
site

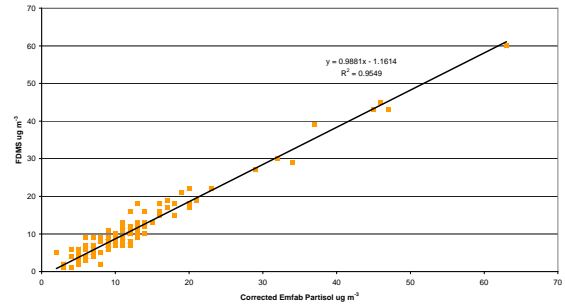
PM₁₀ and PM_{2.5} with Partisol and
FDMS required at 2 additional sites

Will evaluate relationships between
techniques regularly



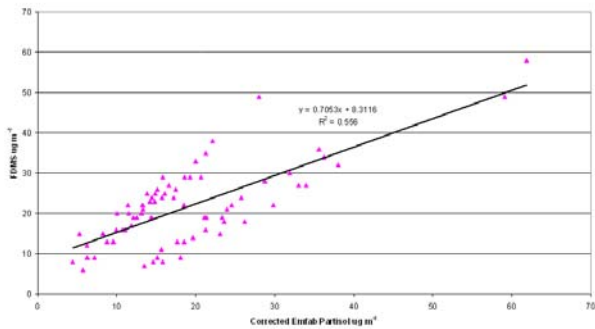
Co-location... the good

Port Talbot Margam: FDMS v Partisol PM2.5 (22nd Jan - 30th Jun)



Co-location... the bad AND the ugly!

London Marylebone: FDMS v Partisol PM2.5 (31st Mar - 23rd Jun 2009)



QA/QC and Data Ratification Processes

Many different processes:

- **Sampler techniques**
 - In accordance with EN12341/14907
- **Automatic analysers**
 - Documented methodologies
 - Broadly in line with GDE
 - Not so simple...



QA/QC

Quality Assurance:

- Network design
- Analyser choice
- Choice of site location
- Site installation and commissioning

Quality Control:

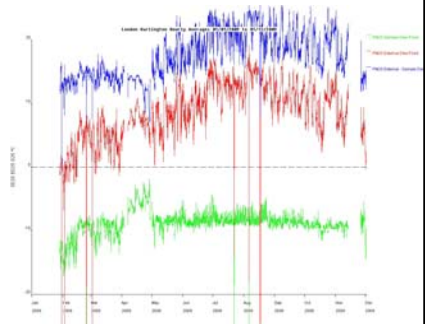
- Commissioning audit
- Daily data checking
- 6 month performance tests (leaks, flows, calibrations)
- Comparison of datasets during ratification

Ratification tools (1) – Dew Points

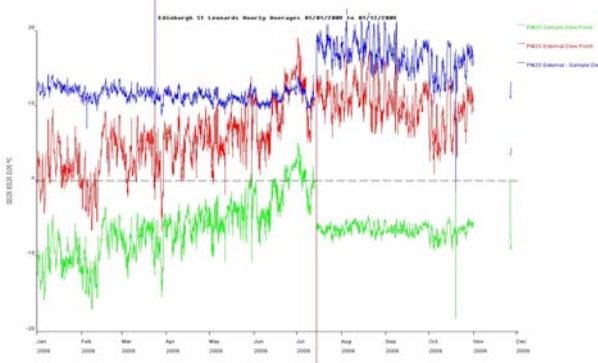
Sample and external dew points provide evidence of good drier performance:

Sample dew point must be less than 2°C (or more than 2° below cooler temp)

Difference between sample and external dew points (Δ dew) must be more than 10°C



More Dew Points



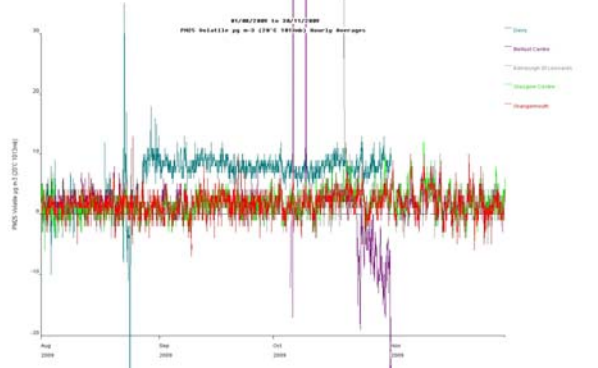
Ratification tools (2) - Reference Concs

Reference concentrations (10 and 2.5) likely to be similar from site-to-site over a fairly large range (up to 130km)

This information can be used to make visual assessments performance of individual sites against the regional collective.

Can also devise criteria to be used to automatically screen for outlier sites to take action quickly (eg Grubbs, student t, SD etc)

Reference Concentration Outliers



Data Capture

Problems?

- All background PM_{2.5} in 09 FDMS, other PM_{2.5} sites and PM₁₀ upgrading through year
- Definite increase in amount of effort required to process PM from FDMS both during validation and ratification
- Instrument noise
- Co-location performance checks
- Regional reference concentrations
- Drier performance tests

	2008	2009
PM10	85% (66 sites)	88% (58 sites)
PM2.5	84% (10 sites)	82% (60 sites)

Samplers not exempt from low data capture either.

In Summary

- Ratification of PM data is complex!
- UK network assesses AEI making use of automatic analysers and co-located samplers to demonstrate equivalence
- FDMS analysers provide extensive informative meta data, but requires additional work during the ratification process
- Provisional 2009 data suggests UK will need to reduce PM_{2.5} concentrations by 10% by 2020



One more thing...

- The world is flat
- "640k ought to be enough for anybody" (Bill Gates)
- "He will never amount to anything." (Albert Einstein's primary school)
- "Pasteur's theory of germs is ridiculous fiction." (Pierre Pachet)

20/20 hindsight is a wonderful thing:

What will we be saying about PM monitoring in 2020?

Are our current efforts a "fickle folly"?
(Brian Stacey, as misquoted by The Observer)