Establishing a UK primary standard for radioactive aerosols.

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Introduction

- Specific aims of project
- Background
- Measurement of radioactive aerosol
- Measurement problems
- Possible solutions
- Candidate aerosols
- Aerosol generation techniques
- Test facility
- Conclusion
Specific aims of project

A report on:

- What the industry requires – by consultation with manufacturers and users
- What the solution could be – suggestions
- How it can be produced – practical plans
- Expected costs – price of setting up options / business opportunities
Background

- Stack / area monitoring for regulatory compliance

- Accurate alpha determination in the presence of Radon

*Often in a challenging measurement environment*
Measurement of radioactive aerosol

Basic characterisation and toxicological testing
which may involve the
use of surrogate aerosols of well controlled and well characterised properties eg
particle size, concentration, morphology, chemical composition, solubility)

Technical basis

Process control
(routine sampling / monitoring for aerosol including size / concentration measurements)

Health protection
(monitoring using fixed area / portable personal samplers, ALARA principle, exit / surface monitoring for early contamination warning)

Environmental monitoring
(regulatory air quality compliance, effluent / stack monitoring)

Emergency response
(real time graded response to higher activity levels, may require portable / mobile instrumentation)

Regulatory compliance demonstration

Measurement of radioactive aerosol

Considerations

- Type and size of particulate collected
- Degree of dust loading
- Type of filter used
- Detection efficiency of filter / instrument
- Radon?
- Real time / integrated measurement
- Calibration
Measurement problems

- Degradation of spectra due to dust loading
- Radon compensation
- Link calibration source to filters measured
- Monitor positioning

Possible solutions

- Production of spiked aerosol
- Production of filters of known activity
- Instrument exposure facility
- Production of radon for compensation testing.
Candidate aerosols

Requirements

- Physical properties of aerosol (size, shape, chemically non toxic, insoluble, stable) – importance of particles of uniform size?

- Radionuclides of interest and activity levels required

Particulate

- Radioactivity associated with / carried on montmorillonite clay, methylmethacrylate (Perspex), polystyrene from chloride solution, chelation process – synthetic glass / sand
Aerosol generation techniques

- Spinning disk generator
- Compressed air nebulisers
- Ultrasonic nebulisers
- Fluidised bed
Test facility

Compressed Air

Mass Flow Control

Aerosol Generator

30 lpm

Pre filters

Hepa filters

Pressure sensor

4 x 5 lpm

Flow splitter

Instruments under test

Ref 1 2 3

330 lpm

4 x 5 lpm
Conclusions

More information required on

- effect of filter type
- effect of dust loading
- particle size distribution
- calibration of instruments

Before a facility could be developed to support UK user community

Possible PhD project??
Rolling Programme Formulation
Ideas for future NMS funded projects

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