

Local Air quality

Measuring emissions - nitrogen dioxide

Nitrogen dioxide can be measured in a number of ways, but the two most often used are by continuous 'chemi-luminescent' monitor and diffusion tubes.

Chemi-luminescent monitors: these are accurate monitors used to measure a number of gasses, including NO_2 , on a continuous basis. Their major drawbacks are that they are relatively bulky and expensive, and require a power supply. They make use of the quirk that when NO reacts with ozone to produce NO_2 , it also emits a small quantity of light. This is measured in a photomultiplier tube, or solid state device and is proportional to the concentration of NO in the gas sample.

This technique may be used to measure total NO_x concentrations by first using a catalyst to reduce all the NO_x to NO . The difference between the concentration of NO_x and NO , then gives the concentration of NO_2 .

Diffusion tubes: a much cheaper and more feasible solution to monitoring NO_2 concentrations, at a number of locations. They consist of a small tube (test-tube size), one end containing a pad of NO_2 absorbing material, the other end is opened for a set exposure time. The amount of NO_2 absorbed is determined by adding a reagent to form a coloured 'azo' dye, the optical density of which is measured in a laboratory using a spectrophotometer, to determine the average NO_2 concentration.

The laboratory used to carry out the analysis can significantly affect the results from NO_2 diffusion tubes. For this reason, best practise is to use three tubes at each monitoring point, and to co-locate one set with an existing continuous chemi-luminescent monitor. This way any bias can be corrected by referring the results back to the continuous monitor, and the three tubes will identify any anomaly.

Measuring emissions - hydrocarbons

"BTEX" diffusion tubes are used to measure concentrations of the organic compounds: benzene, toluene, ethyl-benzene and xylenes. In attempting to identify the source of the NO_2 emissions, monitoring the concentration of the hydrocarbon, benzene, can sometimes be used as an indicator, as petrol used in automobile engines contains benzene but diesel and the kerosene used in aircraft engines do not. By analysing the ratio of benzene to NO_2 , it may be possible to indicate the relative NO_2 source.

In the British Airways monitoring studies, one set of NO₂ tubes was co-located with the existing continuous chemi-luminescent monitor (LHR 2 monitor) just within the airport boundary, to identify any bias with the diffusion tubes. In addition, at most sites north of the airport the NO₂ diffusion tubes were supplemented with BTEX tubes for that study. The results from these, in conjunction with those from the NO₂ tubes, has been used to indicate where petrol fuelled road traffic has had an effect on the local NO₂ concentrations.