



AIR QUALITY ANALYSIS - HEATHROW AIRPORT

It has become increasingly important to understand the effects of a rise in pollutants in the air, thus there is significant importance to efficiently and accurately measuring the concentrations of these.

Benzene, toluene and xylene (BTEX) and nitrogen oxides (NOx) are ubiquitous pollutants formed from the combustion of fossil fuels. Exposure to these has various health effects on the human body, including cancer, neurological, reproductive and respiratory issues. Plant and animal life can also be adversely affected. Hence there is significant importance in the identification and accurate measurement of these.

There has always been a difficulty in accurately quantifying benzene in air. This can be due to sampling issues where benzene is required to be adsorbed onto activated charcoal and then desorbed for GC/FID or other analysis; this is time consuming and can lead to a loss of sample. It is also not possible in real-time. Additionally, benzene concentrations can be reported as greater than they actually are, as a result of interferences from toluene and xylene, resulting in false positives and inaccurate data.

The DV3000 gas analyser from Duvas Technologies is able to qualify and quantify up to 13 gases, including BTEX and NOx, simultaneously to low ppb levels without cross-interference between species. Bespoke calibrations can be designed depending on customers' requirements.

The DV3000 is able to identify and measure concentrations of different gases using a sophisticated UV DOAS analytical technique. This technique uses differentials between a reference profile and a sample profile. Every species has its own unique absorption spectrum, like a fingerprint, making it possible to identify each individual species present at its concentration and the DV3000 uses a complex algorithm to de-convolute these spectra.

A multiple pass system allows for a longer path length in a relatively compact device, resulting in increased sensitivity. The algorithm allows for instant de-convolution of differential spectra, taking care to avoid cross-interferences. The spectral profiles generated every 20 milliseconds are averaged, giving one reading per second. This is done simultaneously for all gases being analysed.

The DV3000 is available for use in a fixed or portable mode. The portable mode is Bluetooth and GPS enabled, allowing for results to be viewed in real time on an Android tablet and for

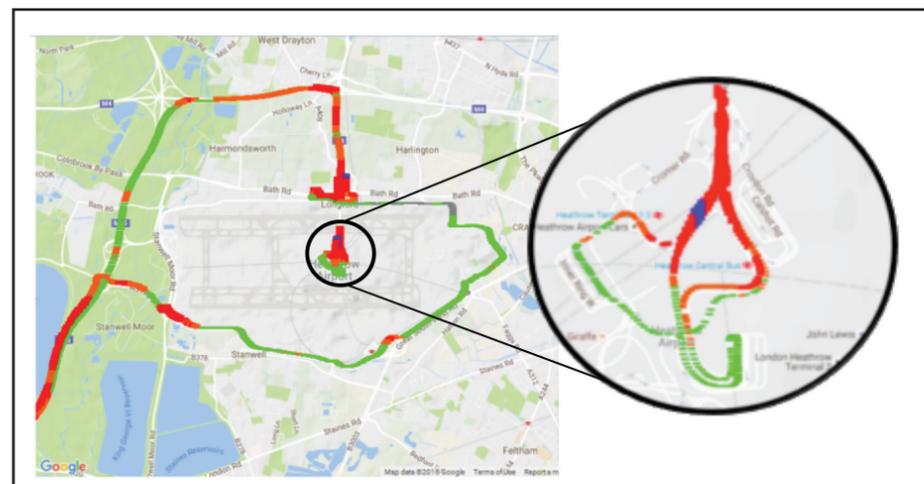


Figure 2: Total NOx levels from Duvas gas test at Heathrow airport, Aug 2016

data to be pinpointed to an exact location during the analysis of an area. An additional feature allows for the use of 2 battery packs, which supply power for 3 hours each. Power sources can be hot-swapped between the standard AC power supply and a battery pack, or between battery packs, for uninterrupted operation and prolonged field deployment. The unit with two battery packs weighs a mere 25kg, enabling it easy to perform analysis on-the-go. The android tablet is able to display the GPS location and multiple gas readings simultaneously.

As an example of the practical utility of the instrument, a DV3000 unit was mounted in an automobile and driven around public roads around Heathrow airport. Figure 1 and figure 2 show the levels of benzene and total nitrogen oxides (NOx) respectively. As one would expect since the area is persistently congested with ground traffic, benzene and NOx levels are high in the tunnel leading to terminals 1, 2 and 3 as there is nowhere for the exhaust emissions from fuel combustion to disperse to.

The data, which can be displayed in real time on an android app, is also saved in the instrument and can then be used for reporting purposes. Please note that the NO and NO2 concentrations can be separately reported or combined as shown to give total NOx.

The DV3000 is already being widely used by environmental protection agencies in various countries to monitor the levels of pollutant gases in industrial plant sites. The advantages of real-time rapid sampling and portability are combined with an ability to measure up to 13 species simultaneously. Thus a survey of a large area can be undertaken rapidly. This is especially useful where a report of pollution or leakage has been made to get immediate data to assess what response is required. Local authorities can use the instrument to assess where the effects are greatest and the unit can be sited temporarily at a fixed location to provide monitoring of a remediation exercise. This can be done at a fraction of the cost of a full mobile analytical laboratory. The survey shown above was carried out in the time it takes to drive the route and could easily be done by non-technical staff. Color-coded mapping levels can be user-selective to enable easy identification of areas requiring action or further investigation. In this particular case, surveys could be used to make decisions about traffic management when designing access for the new Heathrow runway and terminal constructions.

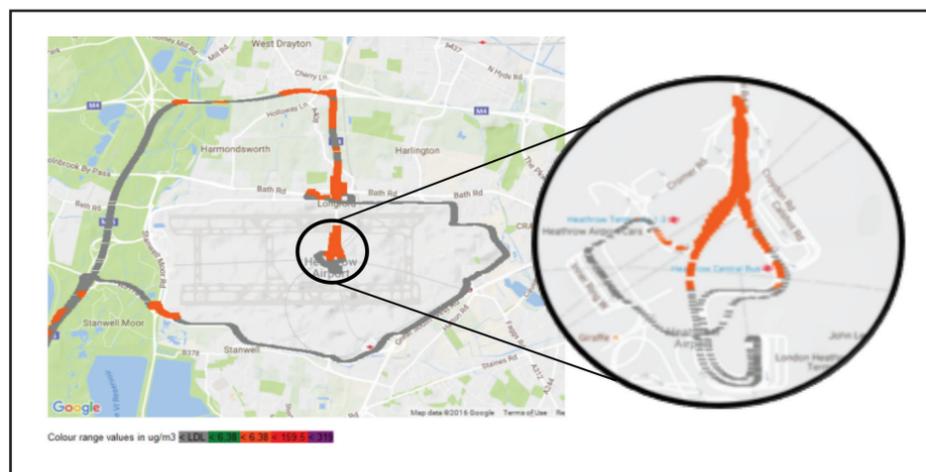


Figure 1: Benzene levels from Duvas gas test at Heathrow airport, Aug 2016

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