

Integration of Local Meteorological Data WITH ROADSIDE AND BOUNDARY AIR MONITORING APPLICATIONS



**Weather
Monitoring**

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About the Author

Gary is a graduate of Exeter University and has worked at Casella for 14 years, being product Manager for the last 4 years. He has Certificates of competency in Noise & Vibration Monitoring & Sampling for toxic substances (BIOH).

As a result of current legislation and the declaration of Air Quality Management Areas, most Local Authorities are now focusing on the quality of air in their boroughs. In particular, for regions that exceed Government guidelines, Local Authorities have embarked upon detailed monitoring studies by installing a range of instruments to monitor, measure and ultimately help tackle air pollution.

In general, a high percentage of the most serious pollution within most Local Authority boundaries is generated by road traffic. The identification of road generated pollution as a major contributing factor to poor urban air quality has led to the need for more specific measurement systems to be designed. Many roadside monitors contain analysers which provide continuous measurement of two important urban pollutants: NO_x (nitrogen oxides) and PM10 (particulate matter in particles less than 10 microns in aerodynamic diameter), other parameters include NO₂ (nitrogen dioxide) CO (carbon monoxide), O₃ (ozone), benzene, while also simultaneously measuring noise, temperature and relative humidity.

If levels are found to be high, the Local Authorities can take preventative actions to reduce levels. This additional measurement activity, allied to the fact that it is an undisputed fact that so much urban pollution is road-traffic generated, has led authorities to develop more integrated air pollution management schemes whereby air quality data is integrated into an urban traffic management and control scheme (UTMC). This enables real time data to be used alongside information on roads usage to produce dynamic public information schemes demonstrating the levels of pollution in particular locations. Such information can often lead to modification of traffic flows that will, as a matter of fact, reduce pollution levels.

Software packages collect, analyse and export air quality data to custom designed websites and/or public display screens. This type of service can be used to provide the general public with the latest air quality data and other information or air quality or health related issues from surrounding boroughs.

Meteorological measurements such as wind speed and direction provide critical information in helping air quality professionals understand the behaviour of all of the above air pollutants together with noise.

Atmospheric conditions including stability, precipitation, and temperature all play an important role in determining ground level air pollution concentrations. Measurement of key meteorological parameters such as vertical & horizontal wind speed, wind direction, rainfall, temperature and solar radiation therefore enable a better understanding of the behaviour of air pollution to be ascertained.

At a basic level, simple polar diagrams or windroses that plot the relationship between a pollution level and wind direction can assist in identifying from which direction a particular pollutant is coming (source apportionment). Other techniques such as multiple linear regression analysis and ultimately sophisticated atmospheric dispersions models all require meteorological data to be able to assess and predict the behaviour of pollutants within the atmosphere.

Many systems also offer "real time" data via telemetry such as radio or GSM, allowing individuals to view data instantly if required. This is increasingly being used by emergency response and Hazmat (hazardous material) teams where they have a requirement to monitor levels of pollutants which may be released in traffic incidents involving hazardous cargoes or from chemical incidents at process works. Here they have to be able to plot data instantly as it happens in order to make decisions regarding action plans and or evacuations.

All these applications are also very dependent upon the local prevailing weather conditions. Many processes and authorities

have access to historical data from various Met agencies, but this is rarely accurate enough for very local pollution control or mapping, due to vast differences in local terrain and geography.

By definition, most of the roadside systems are in urban environments, and buildings can have a dramatic effect on the local distribution of pollutants. Many chemicals react with sunlight to form secondary pollutants such as ozone. The monitoring of meteorological parameter alongside the actual pollutants gases and PM10 particulates will help understand their formation and distribution.



Typical roadside pollution monitoring unit

No article on air pollution would be complete without reference to industrial emissions which, although not as universal as that emanating from road traffic, remain a significant problem for Environmental Health professionals.

Industry has not escaped Government attention as the Integrated Pollution Prevention Control (IPPC) regulations demonstrate. Different sectors of industry have been brought within the remit of the regulations over the past couple of years leaving plant managers and operators with a responsibility to measure pollution levels around their boundaries. This will cover all aspects of industry with one of the largest growing sectors being waste disposal industries. Additionally Section 106 of the planning regulations has placed an onus on developers of commercial and residential projects to prove that their projects will have no significant environmental impact during construction and subsequent use. The BRE (Building Research Establishment Ltd) recently published a guidance document for all construction industries to advise them all to adopt best practice in controlling levels of dust and noise emanating from their activities. Meteorological parameter monitoring will also help in this process as the pollutants path of travel will be dictated by the prevailing weather conditions.

Tyne & Wear Air Quality Processing and Posting

Members of the public living in Tyne and Wear have access to one of the country's most comprehensive internet web sites that gives up to date information about the quality of air in their locality.

Under an initiative organised by the Tyne and Wear Pollution Group, information collected by a network of monitoring stations across the region is fed into a central server at the University of Sunderland where it is automatically processed and posted onto the dedicated web site: <http://enviweb.sunderland.ac.uk/>

A total of 14 air quality monitoring stations measuring all, or combinations of, wind speed and direction, NO, NO_x, NO₂, SO₂, O₃, CO, PM10 particulates, pressure and temperature feed back data at pre-determined intervals to enable local authorities in Newcastle, Gateshead, Sunderland, South Tyneside and North Tyneside to collect and compare their data to the various government Air Quality Directives. The Tyne and Wear Pollution Group has also adopted a visionary approach and used the technology to offer the information to the general public via the Internet, working in conjunction with Bedford-based Casella ETi who designed, supplied and installed most of the air quality monitoring stations and built the web site based on its Enview 2000 software.

Members of the public are being encouraged to visit the web site to get the full regional picture for themselves. They can read, at a glance, data from stations on the kerbside, roadside, and in urban background and urban industrial sites. They can also use links to relevant Government web sites such as DEFRA and the departments of Health, Transport and Trade & Industry.

Casella ETi's Cameron Stathers says: "We have presented the information to the public in the most user-friendly way while at the same time customising the design to meet the requirements of the individual local authorities. We have also made it possible for the new European BobiAAA standard to be incorporated into the site to provide easier accessibility for those with impaired vision."

Marion Dixon, Environmental Health Manager in the Community and Cultural Services operation at Sunderland Council is delighted with the project. She says: "It really was a logical step for us to take. We need to obtain the information from the various monitoring stations to meet Government requirements, so we decided to pass on that information to members of the general public and anybody else with an interest in environmental matters."

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