Instrumental Monitoring

An electronic nose is a piece of scientific equipment designed to do the same job as a human nose. It is able to detect and identify specific odours by analysing the chemicals present and comparing them to a pre-programmed list of odour 'fingerprints'. The benefit of using an electronic nose compared to a human one is that it can monitor odours continuously at the source or area of odour impact.

What is it?

An electronic nose, or E-nose, is a piece of scientific equipment designed to mimic the mammalian olfaction in the detection and characterization of simple or complex odours. These devices allow the identification of mixtures of organic samples as a whole, providing their olfactory fingerprint (identifiable to sources that released the mixture), without recognizing the individual odor-generating compounds, exactly as the human nose doesn't need to identify each single odorant molecule to distinguish the odour of an apple from rotten eggs. To do this, the instrument must be trained: it must be provided with a database of olfactory fingerprints relating to the odors to which it may be exposed to during the analysis. That database is put together by analyzing air samples with known olfactory qualities at different odour concentration and thus defining the olfactory classes (odour types) to be recognized.

The e-nose is made up of three different components: a series of chemical sensors which react to a wide range of odours (volatile

organic compounds responsible for odours interact with the sensor surface and cause a change in certain chemical and physical properties);

- a sensor signal processing system which organises the information from the sensors;
- an odour recognition system which compares this information received to a catalogue of pre-stored datasets (i.e. the training set) to identify the odours detected.
- Each odour has a unique ‘fingerprint’ related to its chemical composition, allowing the E-nose to compare and identify each odour detected, in the same way a human nose would first detect an odour and then process the stimuli and use memory to identify the odour type.

What can it be used for?

Electronic noses have the enormous advantage that they can be used for continuous determination of odour concentration at emissions. In the case of emissions, they can also be used in order to monitor the efficiency of odour abatement systems continuously. When applied to emission monitoring, e-nose data can be used as input data for dispersion modelling.

What can it NOT be used for?

E-noses can not measure the intensity and the pleasantness of the odour (hedonic tone). When used for the estimation of odour concentration at emissions, electronic noses shall be trained with samples that are analysed by dynamic olfactometry. For this reason, they cannot substitute dynamic olfactometry.