Photo Ionization Detector

Chemical Analysis
Non-Specific

This method measures the amount of a specific group of chemical compounds (hydrocarbons) present in an air sample. It does not differentiate the types of hydrocarbon present but simply measures the concentration. This is often used for refineries and as a preliminary screening but it does not provide any information on the odour concentration.

What is it?

In those cases in which the odour problem is specifically related to hydrocarbon molecules (this can be typically the case for refineries), a non-specific gas analysis can be applied as a preliminary screening tool to assess the total amount of hydrocarbon compounds. This kind of technique is conducted with easy transportable and quite cheap tools, like FID (Flame Ionization Detector) or PID (Photo Ionization Detector).

The principle on which these tools are based is the pyrolysis of the organic compounds that are present in the analyzed gas. This pyrolysis (which is conceptually similar to a combustion) is made possible by the presence of an energy source, which produces ions detectable by an electric sensor.

The main differences between these two kinds of sensor are is that the FID needs a hydrogen bottle to maintain a hydrogen flame as an energy source, while the PID uses a UV lamp. Because of this different ionization mechanism, a FID is able to detect also **methane**, which is odourless, while a PID, which has a weaker energy source, is useful to detect **NMHC** (Non-Methanic HydroCarbons).

The main drawback of this method is that the total hydrocarbon concentration that is measured **can not be related directly to the odour concentration.** The output of these type of instruments is a **total VOC concentration** expressed in terms of a concentration equivalent to a calibration gas concentration. Indeed, there are several scientific papers proving that the correlation between total VOC concentration and odour concentration of gas samples is generally non-existent. Moreover, these instruments do not take into consideration the different odour threshold of different compounds, the response factors of the electric sensor, and the mixing effects.

What can it be used for?

This type of analysis can be extremely useful for the detection of **gas leaks**, which are potentially associated with diffuse odour emissions.
One typical example is the case of refineries, where fugitive emissions from equipment and piping can be detected by means of the measurement of the total VOC concentration. Where a concentration of total VOC above a certain value (e.g. 10000 ppm) is measured, a leak is present. The same approach is used in **landfills** in order to identify the presence of leaks in the landfill cover, through which landfill is emitted into the atmosphere.

What can it NOT be used for?

This technique doesn't give any information about the odour properties of the analysed gas.