

Landfill gas analyzers

Landfill gas analyzers fall into two specific categories:

1. Gas analyzers used to check whether the gas is still being produced to decide when the land can be reclaimed.
2. Landfill gas analyzers that check the quality of the gas being produced prior to use in some industrial process.

Both of these applications will involve regular checking with a landfill gas analyzer, with a check of flow rate in the first case as well. This will only apply to small landfill sites, since large sites will have a flare system in place to burn off (waste!) the landfill gas produced.

The landfill gas analyzer will have to measure carbon dioxide and methane in the most basic form, since these are the main components of landfill gas. This page will now concentrate solely on the landfill gas analyzer used to measure gas destined for industrial use. The analyzer used to check whether gas is still being produced is not much different in design, and it will hopefully become less common in future. Landfill gas is a valuable resource and should be used, not flared off!

Landfill gas should consist of around 60 – 80 % methane, with the rest being mainly carbon dioxide, with some hydrogen sulfide and other unwanted components. 80 % methane is perfectly acceptable for many purposes, such as industrial heating or running a gas motor to produce electricity, but 60 % methane will require some gas preparation before it can be used.

The alternative is to mix it with a supply of natural gas and hence increase the proportions. This is where the landfill gas analyzer is needed. Knowledge of the composition of the landfill gas is essential for further use. The composition will also vary with time so the landfill gas analyzer must be used regularly or permanently to monitor changes and react to them accordingly. Gas will be produced for roughly fifty years after closing of the landfill site, depending on the material deposited and the temperatures etc. The landfill gas can be effectively used for around the first fifteen of these years, after which the quantity and quality will both deteriorate.

Construction of a landfill gas analyzer:

Measurement of carbon dioxide and methane is best carried out using infrared technology, and this would be the basic minimum for a landfill gas analyzer. A measurement of oxygen is also useful for a number of reasons. It can be a simple safety precaution to avoid an explosive condition in the landfill site itself, or a measure of the integrity of the pipe work system. An increase in the oxygen level measured by the landfill gas analyzer would suggest a leak in the system somewhere, allowing air in. Measurement of hydrogen sulfide is also common, since this is one of the major contaminants likely in landfill gases. This measurement can be accomplished easily in the landfill gas analyzer using an electrochemical sensor. The landfill gas will, however, in all cases be used for some form of combustion, and it is usual to measure the products of combustion to ensure that the process is both clean and efficient.

There is therefore some logic in combining the functions of the landfill gas analyzer and the flue gas analyzer for this use. Since there are already sensors for carbon dioxide, methane and oxygen in the instrument, it is only necessary to add sensors for carbon monoxide and nitric oxide, together with temperature measurement channels. All the other peripherals are already in the landfill gas analyzer, such as pump etc.

The landfill gas will generally be damp, but at a lower temperature, so the real humidity will not be high. If measurements are carried out in summer, then there will be no problem with condensation in the instrument, but this could occur in winter where the ambient temperature is lower than the underground temperature. The only solution is to fit the landfill gas analyzer with a sample conditioner of some type in order to remove the excessive moisture from the gas flow. There are various types of sample conditioner available, and this is not the place for a description of them, but it must be borne in mind that a landfill gas analyzer will often be used away from any source of electrical power.

The landfill gas analyzer is a useful and essential tool for any commercial use of the gas from a landfill site. The combination with a flue gas analyzer is a sensible saving. Many combined instruments are very much less worth than single instruments with the same functions, but this is an exception since the two instruments have very similar construction and complement each other in many ways. The most reliable technology at the moment is infrared measurement of the landfill gas. Flow measurement is only necessary on small sites that do not have to be flared. Large sites can simply include a gas flow meter in the pipe work. The quality of the landfill gas is important when it is used undiluted for gas motors, whilst simple combustion applications will usually be able to use the gas under most circumstances. Nevertheless, a rough idea of the composition will be needed to avoid unnecessary emissions.