DEVELOPMENT OF A COMPLETE, FULLY AUTONOMOUS ON-LINE CABINET SOLUTION FOR CONTINUOUS MONITORING OF ODOROUS COMPOUNDS

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The presence of odorous compounds presents issues for both ambient air pollution and specific industrial processes. Monitoring these odorous compounds is important because some of them have adverse effects on human health, on the environment and process efficiency even at very low concentrations. Some of these molecules have an extremely low odor detection threshold which requires the use of sensitive systems capable of analyzing a wide range of concentrations from ppt to ppm levels. In industrial areas, many odorous compounds, such as Volatile Organic Compounds (VOCs), can be emitted and specific identification and quantification of all molecules is difficult due to the large number of potential interferences. Therefore, low-cost sensors are not suited for such application. Usually, laboratory gas chromatographs are used to perform identification and quantification of molecules in complex mixtures. Nevertheless, these devices require trained operators and do not allow for continuous monitoring (off-line sampling). To improve the accessibility of results and to avoid the risk of losing sample information during transport, there is a need for easy-to-use continuous on-site monitoring systems. Moreover, it is often crucial for industrial processes to have results in a timely manner to control the process.

The goal of this study is to present a complete, gas chromatography on-line solution for continuous monitoring of odorous compounds for process optimization. In total, five systems were used, each for specific compounds analysis. Three systems consist of gas chromatograph (GC) equipped with a Flame Ionization Detector (FID) for the respective identification and quantification of VOCs (including some aldehydes and ketones), amines (such as methyl, dimethyl-, trimethylamine and ethyl and diethyl amine) and Total Hydrocarbons. All these compounds were detected at ppm levels. Another system is a GC equipped with an electrolytic cell specific for sulfur compounds detection at ppb and ppm levels. Compounds such as H_2S, SO_2, methyl and ethyl mercaptan and others were identified and quantified. Finally, ammonia was measured using FT-UV spectrometry. Three gas generators (air, nitrogen and hydrogen generators) were used to supply the GCs, allowing for continuous monitoring without using cylinders. All systems and gas generators were integrated in two airtight and waterproof cabinets regulated in temperature. This complete and fully autonomous solution is ideal for industrial processes where environmental conditions can be harsh and where results need to be obtained quickly and in continuous mode.