DEVELOPPEMENT OF ON-LINE AND FIELD DUAL TD GC - MS

FOR AUTOMATIC VOC MONITORING ON PETROCHEMICAL SITES

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Significance and objectives of the Research : Ambient air is polluted by many VOCs coming from Petrochemical Industry. PAMS, Oxygenated or Halogenated VOCs can be found in many ranges of concentration from background levels to high concentrations near site fence line. These compounds are precursors of ozone and Industrial bodies need to identify them to be in compliance with the authorized limits and to improve their process. The challenge is to analyse precisely ambient air composition in different locations, to perform continuous analysis with automatic validation of results, to analyse more and more compounds in compliance with regulations. This study is the development of an on-line system capable of measuring a large number of VOCs from ppt to ppm in field conditions. The device is reqired to identify automatically potential coeluted compounds by MS technology adapted to industrial context.

Method / Solution adopted: The coupling of two different FID GCs to a Quadrupole MS allowed by an elaborated multiplexer system is the originality of the project: one TDGC for light compounds and one TDGC for heavy compounds with specific trapping conditions and variable sampling volumes. The combination of two highly sensitive detectors using different technologies permits to identify and quantify very precisely. The integrated automatic calibrations system, using permeation tubes, allows automatics data validations. The design is adapted to measurement campains in field conditions: stability and autonomy of the device, robustness and easy transport associated with a very rapid starting.

Results: At Laboratory level, a simulation of a petrochemical site has been done and analysed to confirm the performances of the sytem. Simulation of detection and quantification of coelutions have been assessed and alarm when coelution tested. Then field trails have been performed at episode zero to determine the background before starting the mill and to compare with the simulation done before at lab level. Then another measurement campaign shows the concentration of around 100 compounds at different steps of the commissionning. Variations during specific hours are detected. Potential coeluted compounds as terpenes or organochlorinated are identified and monitored at ppt level.

Conclusion of the project: The ability of coupling in continuous two different GCs to a unique MS and the automatic identification is a new advance in the technology of industrial GC-MS. One of the big advantage is the possibility to play with two different trapping and thermodesorption techniques linked to one MS. The other Advantage is the ability to detect automatically coelutions and then to have the possibility to quantify each compound. This fully automatic system allows non-specialist operators to access to expertise level results.