HYPHENATED SOLUTIONS TO BIODIESEL ANALYSIS AND STABILITY PROFILING

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First generation biodiesel, predominantly fatty acid methyl esters (FAMEs), is now ubiquitous at varying levels in petrodiesel. The presence of FAMEs can lead to specific problems within a diesel engine or wider reaching issues related to shared pipelines. Determination of these species in different matrices and study of their stability demands a multi-instrument approach.

One particular issue is related to the long term stability of the FAMEs, specifically oxidative processes. It has been suggested that incidents of 'gelling' of lubricant in diesel engines are initiated by oxidation of the FAMEs. Age profiling of biodiesel both through forced oxidation and long-term storage has been readily mapped using API-MS and the new species identified by deuterium exchange experiments (HDX), high mass resolution accurate mass measurements, HPLC-MS and MS/MS experiments. GC-MS analysis of the FAMEs readily reveals changes in the FAMEs profile related to ageing over a long time period >6 months but this is not readily evident in the early stages of FAMEs oxidation.

FIA and HDX experiments reveal the presence of poly-epoxidation and poly-hydroxylation of the FAMEs, the data complementary with the FAMEs depletion observed in the GC-MS total ion current chromatograms.

This presentation will discuss the merits of the different hyphenated approaches used, *e.g.* GC-MS, HPLC-MS, SFC-MS, HR-MS, FIA-MS and HDX-MS to meet the challenge of detecting first generation biodiesel and its degradation products in the different environments.