

Limitations of ASTM Method for Contaminated Bunkers

ASTM D7845-17, also known as the Standard Test Method for Determination of Chemical Species in Marine Fuel Oil by Multidimensional Gas Chromatography/Mass Spectrometry (GCMS), has been developed to quantify chemical species at low levels in marine fuels oils and cutter stocks. However, it seems there are certain limitations of this test method.

*Dr Malcolm Cooper, the Group Managing Director of VPS explains the limitation of using **ASTM D7845-17** as a test method for detecting 4-cumyl phenol found in contaminated marine fuel:*

The test method **ASTM D7845** lists 29 specific chemicals that may be detected and measured within the test method and is certainly a good method when looking for these named compounds. However, this is not an exhaustive list and does not cover how to handle any “**unknowns**” which may be present in the fuel sample.

Since there are literally thousands of possible organic contaminants that may be present in the fuel, the specific 29 chemicals named in the test method, is a major limitation. Also, since 4-cumyl phenol is not amongst the 29 named chemicals and this being the major compound VPS detected in the Houston fuel issue, this indicates another of the limitations of using this method. These limitations are the reason why VPS do not use this method.

ASTM D7845-17 uses direct injection onto a GCMS via a **Deans valve-switching arrangement**, whereby a sample is injected onto a pre-column prior to an analytical column, with the pre-column being back-flushed to remove heavy fuel oil components (this step is the only sample preparation prior to analysis). This valve-switching pre-column arrangement eliminates the higher boiling hydrocarbons in the fuel oil and can prevent high boiling chemicals from reaching the analytical column.

The D7845 method detects 4-isopropyl phenol (Boiling Point 212C), but not 4-cumyl phenol (Boiling Point 335C). The method lists 29 specific compounds that can be detected, which are quantified using **Single Ion Monitoring (SIM)**. In order to apply SIM, the organic compound must be known prior to analysis (in order to identify the SIM mass number) and when dealing with problem fuel samples where the organic contaminant is not known, shows a limitation of the method.

It should be noted that the **VPS Acid-Extraction GCMS method**, transfers all acidic compounds from the fuel oil through extraction as a sample clean-up and extraction treatment prior to the sample being directly injected into the GCMS.

This sample pre-treatment method eliminates all hydrocarbon compounds in the fuel oil since they are not acidic and therefore do not enter the aqueous phase during extraction. The method is semi-quantitative and highly selective for acidic compounds such as carboxylic acid acids, phenols, etc. Also, the total acidic content in the fuel oil is quantitatively measured.

For further clarification, kindly email us at info@v-p-s.com or contact your Account manager.

More contact details can be found at www.v-p-s.com.