Detection of Sulfur-Containing Chemicals Using Battelle's AirAlert

Greif has recently identified seven different sulfur-containing chemicals of concern with respect to repackaging operations at their Deer Park and Baytown facilities. The ACGIH threshold limit value (TLV), where established, which is an 8-hr time-weighted average (TWA), and other information regarding these chemicals are shown in the table below.

Chemical	Abbrev.	BP, ◦C	MW	TLV, ppm	TLV, ppb
Dimethyl sulfide (C_2H_6S)	DMS	37	62.1	10	10,000
Dimethyl disulfide ($C_2H_6S_2$)	DMDS	110	94.2	0.5	500
2-Mercaptoethanol (C_2H_6OS)	2ME	157	78.1		
n-Octyl mercaptan ($C_8H_{18}S$)	NOM	195	146.3	0.5*	500*
t-Dodecyl mercaptan ($C_{12}H_{26}S$)	TDM	212	202.4		
Butyl mercaptoethanol ($C_6H_{14}OS$)	BME	219	134.2		
n-Dodecyl mercaptan ($C_{12}H_{26}S$)	NDM	233	202.4	0.1	100

*OSHA Permissable Exposure Limit (PEL)

A method for the detection of two of these chemicals was previously described in two application notes, *Detection of n-Dodecyl Mercaptan Using Battelle's AirAlert, October 2014,* and *Update on Detection of n-Dodecyl Mercaptan and n-Octyl Mercaptan Using Battelle's AirAlert* , October 2014. Since the publication of these application notes, Battelle has developed a method for the simultaneous detection of six of the seven chemicals listed in the table using an AirAlert configured with a flame photometric detector (FPD) and a sample tube containing a dual-adsorbent bed (Tenax TA followed by HayeSep D). The highly volatile chemical, dimethyl sulfide, could not be detected quantitatively using the same method.

The detection of six sulfur-containing chemicals is illustrated in Figures 1 (from an Excel spreadsheet) and 2 (as displayed by the AirAlert Data Acquisition System). The masses of the chemicals injected into the AirAlert correspond to the concentrations given in Figure 1. Note that the method is not fully optimized, as illustrated by the relatively low responses obtained for DMDS and NDM. However, it may be seen that the AirAlert is capable of detecting each chemical at concentrations far below the applicable TLV. Further optimization of the method will involve primarily using a sample tube containing a dual-adsorbent bed with particles of a finer mesh than used in generating the data shown in the figures below. Note that the broad peak shown for TDM in Figure 2 is due to the fact that the analytical standard solution used actually contained a mixture of various isomers of TDM, each with different retention times.

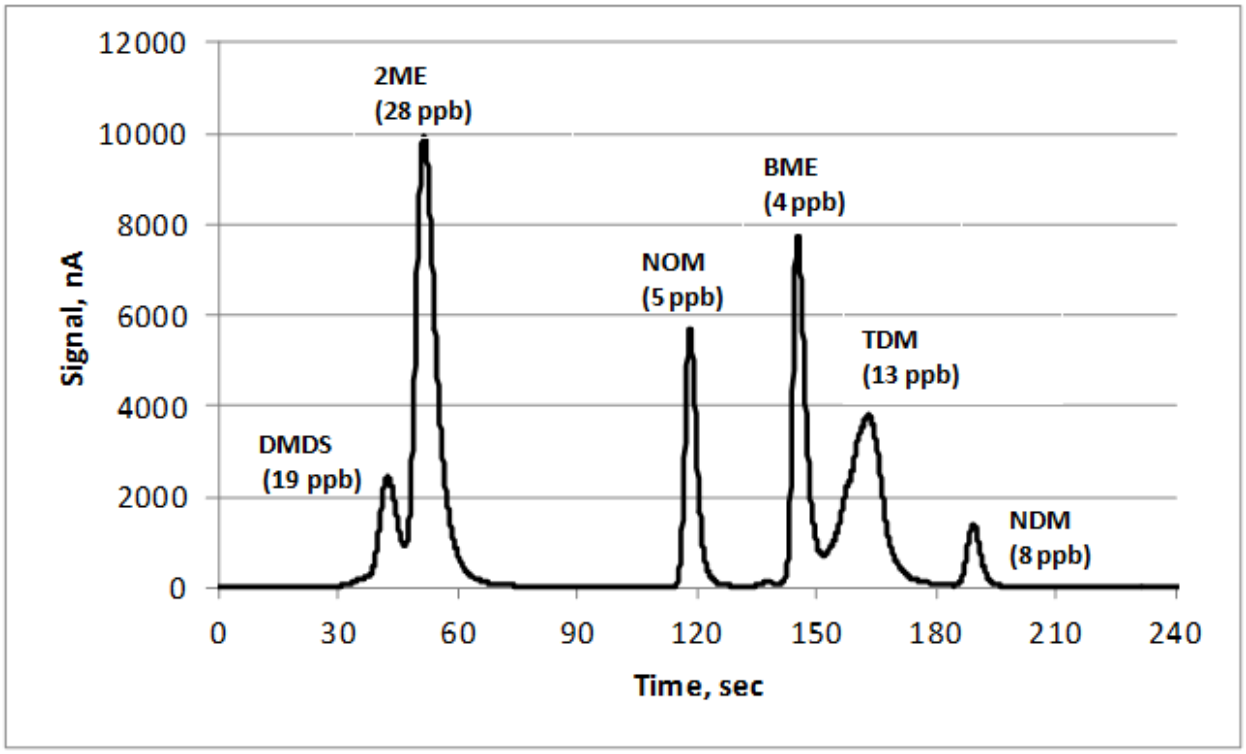

Figure 1. Chromatogram illustrating the simultaneous detection of six "Greif chemicals."

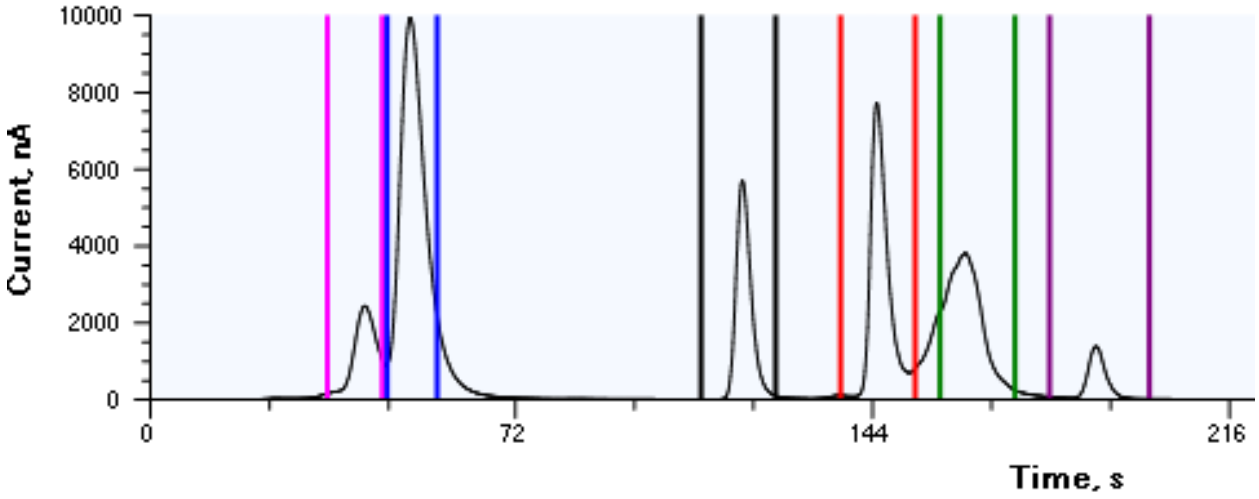

Figure 2. Chromatogram as displayed on the AirAlert Data Acquisition System.