Rapid, On-Site Vehicle Interior Air Quality (VIAQ) Testing, Using SIFT-MS

Key Benefits

Aldehydes and VOCs analyzed in one simple analysis

Simple turnkey operation with pass/fail reporting and configurable thresholds

Laboratory quality analytical results within seconds enables instant decision making

Direct air analysis without sample preparation

Robust and readily deployed to site

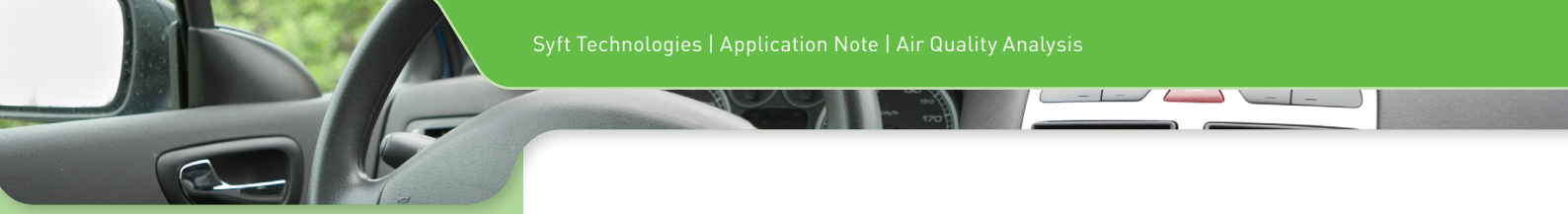
The ease of use, sensitivity, selectivity, and high-throughput analysis provided by Syft Technologies' Voice200ultra SIFT-MS solution provides simple, reliable, and economic analysis of vehicle interior air quality on the production line and in the parking lot

The high-speed, sensitive analysis provided by SIFT-MS makes it ideally suited to testing of chemically diverse VOCs in the VIAQ application. SIFT-MS eliminates expensive sampling consumables, sample preparation prior to analysis, and delays arising from laboratory-based analysis. Syft Technologies' instruments are also extremely easy to use and are designed for industrial applications. Combined, these benefits provide instant feedback on the acceptability of every vehicle coming off the production line.

Public concerns about the health impacts of the "new car smell" have led several countries to impose limits on permissible concentrations of certain volatile organic compounds (VOCs). For example, on 1 March 2012, the Chinese government issued a standard to regulate the vehicle interior air quality (VIAQ) of new vehicles. Details of the Chinese, Japanese, and Korean standards are shown in Table 1. Currently these standards are based around two traditional laboratory-based analytical methods (gas chromatography mass spectrometry (GC/MS) and high-performance liquid chromatography (HPLC)) that are expensive, have slow sample turnaround, require trained laboratory technicians, and are incompatible with rapid testing on the production line or in the parking lot.

Syft Technologies' Selected Ion Flow Tube Mass Spectrometry (SIFT-MS) solution provides a very attractive alternative to the GC/MS- and HPLC-based methods. In one simple, rapid analysis, all aldehydes and other VOCs required by the Chinese, Japanese, and Korean standards are detected and quantified.
The unique ability of SIFT-MS to simultaneously analyze the small, reactive aldehydes and general VOCs in real time arises from the use of ultra-soft ionization and the elimination of chromatographic separation. Example results for three new vehicles from the same manufacturer are shown in Figure 1.

Moreover, since SIFT-MS provides ease of use, simple reporting and is a robust, direct analysis technique that requires no sample preparation or preconcentration, it can be used to economically screen all cars coming off the production line. This ensures that any deviations from the standard production specification can be identified immediately, allowing corrective actions to be taken.



Experimental Method[1]

Sample	Ambient air
Accessories	10 meters of ¼" o.d. Teflon tubing[2]
	Diaphragm sampling pump

1. Air drawn past the instrument inlet at about 4 L min
2. Residence time in tube ~3 seconds

SIFT-MS Analysis

Instrument	Voice200ultra
Sample flow	25 sccm
Analysis type	Selected Ion Mode (SIM)
Reagent ions	H_3O^+, NO^+, O_2^+
Compounds	Aldehydes, aromatic and aliphatic hydrocarbons, dichlorobenzene and phthalates
Analysis time	<1 minute
Typical LOQ	see Table 1

Further Reading

Syft Whitepaper *SIFT-MS: A Significant New Tool for Real-Time Air Quality Monitoring*

Syft Brochure *LabSyft: Laboratory Software for SIFT-MS Applications*

Syft Brochure *Real Solutions*

Syft Brochure *Mobile Analysis of VOCs Made Simple*

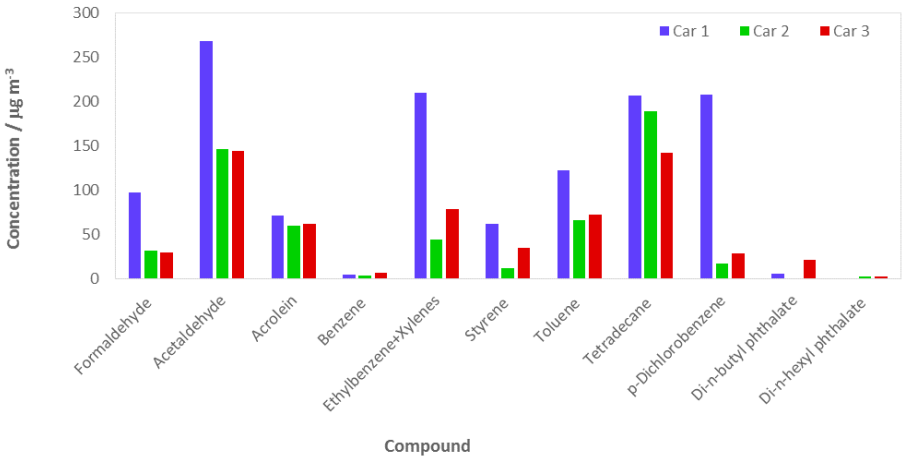
B.J. Prince, D.B. Milligan, M.J. McEwan (2010), *Application of [SIFT-MS] to real-time atmospheric monitoring*, Rapid Commun. Mass Spectrom. 24, 1763.

V.S. Langford, I. Graves, M.J. McEwan (2014), *Rapid monitoring of volatile organic compounds: a comparison between gas chromatography/mass spectrometry and selected ion flow tube mass spectrometry*, Rapid Commun. Mass Spectrom, 28, 10.

Table 1: Target compounds and maximum permissible concentrations for the Chinese, Japanese, and Korean VIAQ standards. Typical limit of detection (LOD) for a one-second measurement using a Syft Technologies Voice200ultra SIFT-MS instrument.

Compound	Maximum permissible concentrations / µg m^{-3}			LOD / µg m^{-3}
	China	Japan	Korea	
Formaldehyde	100	100	250	1.9
Acetaldehyde	50	48		4.7
Acrolein	50			2.0
Benzene	110		30	0.81
Ethylbenzene	1500	3800	1600	1.2
Xylene	1500	870	870	1.2
Styrene	260	220	300	1.1
Toluene	1100	260	1000	1.2
Tetradecane		330		5.6
p-Dichlorobenzene		240		2.3
Di-n-butylphthalate		220		0.84
Di-n-hexylphthalate		330		1.3

Figure 1: Aldehyde and VOC emissions from three newly imported cars (same manufacturer; three different models). Data are the mean of duplicate measurements and have had the background subtracted (ambient air).



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