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Shimadzu Europa GmbH
Albert-Hahn-Str. 6-10 · 47269 Duisburg
Phone: +49-203-7687-0
Telefax: +49-203-766625
Email: shimadzu@shimadzu.de
Internet: www.shimadzu.de

Editorial Team:
Uta Steeger · Phone: +49-203-7687-410
Ralf Weber, Angela Baehren

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Sensitive nose pro

Monitoring Chemical Hazards with

Figure 1: GC-2014

The use or generation of hazardous substances is often unavoidable in chemical manufacturing. Nowadays, although it is possible to work in a safe and controlled manner with highly toxic substances, there is always a risk of leaks at critical locations and the possibility that human beings will be exposed to these substances. To provide more safety in the workplace, reliable monitoring of chemical hazards is a must.

Solvias Chemical Hazards Monitors are an integral part of the safety concept used by numerous leading corporations. The monitors record exposures from the ppm to the ppt range and trigger alarms when limits are exceeded.

Solvias Chemical Hazards Monitors are used in refineries, the petrochemical industry, polymer chemicals and basic chemicals as well as fine chemicals, agricultural chemicals or in pharmaceutical production.

Solvias developed SAM GC-600, a Chemical Hazards Monitor on the basis of Shimadzu's GC-14A in 1988. It was developed specifically for continuous chemical hazards monitoring and is used where highly toxic or carcinogenic substances may be present in plant air or in the workplace. Based on its high level of selectivity and sensitivity, as well as its low detection and alarm limits, the SAM GC-600 is a reliable, robust monitor for hazardous substance exposures in the ppm to ppt range. It not only offers the needed reliability, but can also help you to continuously improve production processes.

After Shimadzu's launch of GC-2014 in 2005 this new analyzer technology was chosen as the basis to continue the success story of SAM GC-600 in Chemical Hazards Monitoring.

Operating principle

Figure 2 shows the operating principle:

The heart of the SAM GC-600 Chemical Hazards Monitor is a

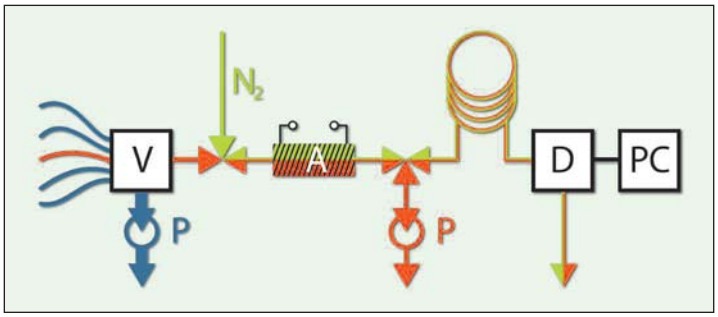

Figure 2: Operating principle

vides more Safety in the Workplace

GC

Advantages of Chemical Hazards Monitoring
• Early alarm triggering signalling exposure to hazardous substances – warning and display already well below existing limits thanks to adjustable alarm thresholds
• Highly selective and interference-free measurement – no false alarms and no consequent interruptions in operations
• Individual customized method development in the laboratory plus implementation and optimization on site – development of special solutions for reliable chemical hazards monitoring *
• Wide bandwidth – almost all substances with a boiling point < 250 °C or a vapor pressure > 0.000001 mbar can be analyzed
*To date, analysis methods have been developed for more than 50 substances (see extract of the substance list)

gas chromatograph equipped with an accumulation module (A). The air to be analyzed is drawn in continuously at up to 15 sampling points by means of two pumps (P) and – depending on the measuring path selected – passes through a multiposition valve (V) (see Figure 3) and the adsorbent-containing accumulation module. Here, all substances not normally found in air are first adsorbed, then thermally desorbed, separated from each other chromatographically and then detected (D).

Finally, the software (PC) calculates the substance concentrations from the chromatograms and manages all functions of the SAM GC-600. This controller is based on a PC, running under the Windows® operating system. The software, which was especially developed for this unit, allows all measurement results to be managed, archived, and evaluated statistically, and it also allows the alarm thresholds to be set. It provides high system functionality together with robust operation and can be individually configured. In addition, digital and analog outputs enable communication with process control systems as well as remote maintenance. For enhancing selectivity standard FID may be exchanged with ECD, FPD or PID.

Applications

Dimethyl sulfate and diethyl sulfate

Despite their toxicity, these two substances are widely used as alkylation agents. However, they can be detected reliably at values well below the existing limit values using the SAM GC-600 Chemical Hazards Monitor. The low detection limit (< 0.1 ppb) enables an early response before any serious threat to human health occurs.

Bis(chloromethyl)ether (BCME)

This highly toxic substance is formed spontaneously when formaldehyde is used in the presence of hydrogen chloride (chloromethylation reactions). BCME's workplace limit of just 1 ppb indicates how dangerous it is. Thanks to the ability to reliably detect concentrations as low as 10 ppt, the SAM GC-600 keeps people and companies on the safe side.

Detectable substances		
Substance	**Exposure limit [ppm]**	**Detection limit [ppm]**
Acrylaldehyde	0.1	0.001
Acrylonitrile	3.0	0.03
Benzene	2.5	0.01
Bis(chloromethyl)ether BCME	0.001	0.00001
2-Chloro-1.3-butadiene	5.0	0.05
2-Chloroethanol	1.0	0.01
1-Chloro-4-nitrobenzene	0.075	0.001
1.2-Dibromoethane	0.1	0.001
1.3-Dichlorobenzene	3.0	0.05
1.4-Dichlorobut-2-ene	0.01	0.0002
Diethyl sulfate	0.03	0.0001
Dimethyl sulfate	0.02	0.0001
Epichlorohydrin	2.0	0.01
Ethylenoxide	1.0	0.01
Methyliodide	0.3	0.003
Nitrobenzene	1.0	0.01
Propylenoxide	2.5	0.01
Styrene oxide	1.0	0.02
1.1.2.2-Tetrabromoethane	1.0	0.01
1.1.2.2-Tetrachloroethane	1.0	0.01
Carbontetrachloride	10.0	0.1
Tributyltin chloride	0.002	0.00005
Trichloromethane	10.0	0.1

Table 1: The list shows a selection of chemical hazards and is expandable on request. All values of exposure limits are based on German and Swiss guidelines (MAK, TRGS).

Figure 3: Multiposition valve

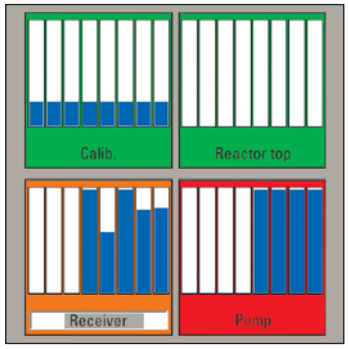

Figure 4: Alarm status

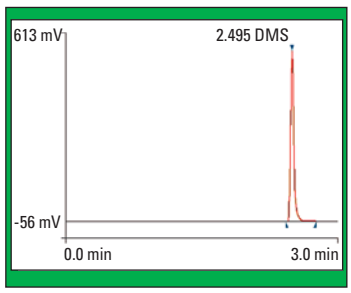

Figure 5: Chromatogram dimethyl sulfate (40 ppb)

Solvias AG
P.O. Box · 4002 Basel · Switzerland

Tel.: +41 61 686 61 61
Fax: +41 61 686 65 65
www.solvias.com · info@solvias.com