

h·nu

Portable Applications Note #5

Monitoring 1,3 Butadiene for TWA PEL

Introduction:

1,3-butadiene (BD) is a colorless, noncorrosive, gas with a mild aromatic odor. The lower explosive limit is 2%, and the upper explosive limit is 11.5%. It is highly reactive, dimerizes to 4-vinylcyclohexene, and polymerizes easily. As a result of its low odor threshold, high flammability and explosiveness, BD has been handled with extreme care in the industry. The Chemical Abstracts service registry # is 106-99-0.

BD is a major commodity product of the petrochemical industry. EPA identified 140 major, minor and potential uses of BD in the chemical industry.

Industry	% Usage
rubber	60
adiponitrile	12
latex	8
ABS	6
miscellaneous	14

The balance is used in specialty copolymer resins and latexes for paint, coatings and adhesive applications, and lubricating oil additives. Non polymer applications include the manufacture of the agricultural fungicides, solvents & dyes.

Permissible Exposure:

According to OSHA standard number 1910., BD exposure may not exceed 1 ppm as an 8 hour TWA (time weighted average) PEL (permissible exposure limit) or 5 ppm averaged over a 15 minute time period (STEL).

Action Level:

The action level for BD is 0.5 ppm calculated as an 8 hour TWA.

Health Effects:

BD is a suspected human carcinogen.

Regulation for BD:

The new OSHA regulation (PEL) for BD was published on 11/04/1996; Federal Register 29CFR section 1910.1051. See also the OSHA home page on the web: [http// www.osha.gov](http://www.osha.gov). Click on standards, then 29 CFR and search on 1,3 butadiene.

Applications:

Monitor workplace for TWA PEL for personnel exposure to BD.

Additional Applications:

Stacks, & fenceline, specifically from ppb to ppm levels

Accuracy of Monitoring Methods:

Methods used to perform exposure monitoring must have an accuracy within +/- 25% (@ 95% confidence level) for BD at levels above the 8 hour TWA PEL or +/- 35% (@ 95% confidence level) at concentrations of BD between the action level and the TWA PEL.

Monitoring Equipment Available for BD from HNU Systems:

HNU has investigated chromatographic methods and detectors for the analysis of BD. We found that the Photoionization detector (PID) was considerably more

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than the flame ionization detector for BD as shown in the figure below:

runs was 5% for the PID and 20% for the FID. The level was at the TLV PEL of 1 ppm. Note that the both detectors produce considerably better results than the OSHA accuracy of +/- 25% but the repeatability of the FID is considerably poorer. Thus, the PID is the detector of choice for BD due to the improved repeatability and better detection limits than the FID.

The Model 101 and 102 can be used for leak detection and for detecting the high/low concentrations for collection of charcoal tube samples as specified by OSHA.

Three options for continuous monitoring of BD are shown below: portable GC, and two Automatic GC's for long term monitoring of multiple points.

Chromatogram with PID

The average reproducibility (std. dev./mean) (100) for 10 consecutive

Monitoring Equipment:



Portable GC for On-Site Measurements of 1,3 BD

GC311- Portable GC

- On-site measurements
- Packed or capillary columns
- Photoionization detector

- Easy to use Peakworks for Windows software with computer control

- Remote control of GC
- Multipoint (to 8 pt.)
- 19" Rack, bench or NEMA enclosure
- **Call HNU** about your specific application

Automatic GC for Area or Fenceline Monitoring of 1,3 BD

301-B Series- Compact GC



- Automatic GC with PID

Area or Process Monitor for 10 or 20 point Monitoring of 1,3



**Process Analyzers, LLC, 25 Walpole Park S, Dr., Walpole,
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See our home page @ - [http// www.hnu.com](http://www.hnu.com)**

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BD

501-B Series- Process GC

- Automatic GC with self diagnostics, MODBUS protocol and PID
 - Multipoint (10 or 20 pt.)
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