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## Field validation of the Radiello® sampler for 1,3-butadiene

This study aimed at verifying the performance of the Radiello® diffusive sampling method for 1,3-butadiene in the field. This task was accomplished by measuring workers' exposures, in real-world conditions, by parallel, side-by-side samplings by diffusive sampling and by active sampling OSHA Method 56.

The diffusive method involved sampling onto Radiello® samplers containing a cylindrical adsorbent cartridge filled with Carbopack X 40/60 mesh and a 5 mm thick, porous polyethylene hollow cylinder as the diffusive membrane. After sampling, the adsorbent cartridges were analysed by thermal desorption on an automated, two-stage thermal desorber and subsequent GC. For calculating the diffusive sampling results a sampling rate value of 30,5 mL/min was applied.

The OSHA Method 56 approach involved pumping the air through tert-butylcatechol (TBC) treated activated charcoal tubes, followed by solvent extraction (carbon disulphide) and subsequent GC.

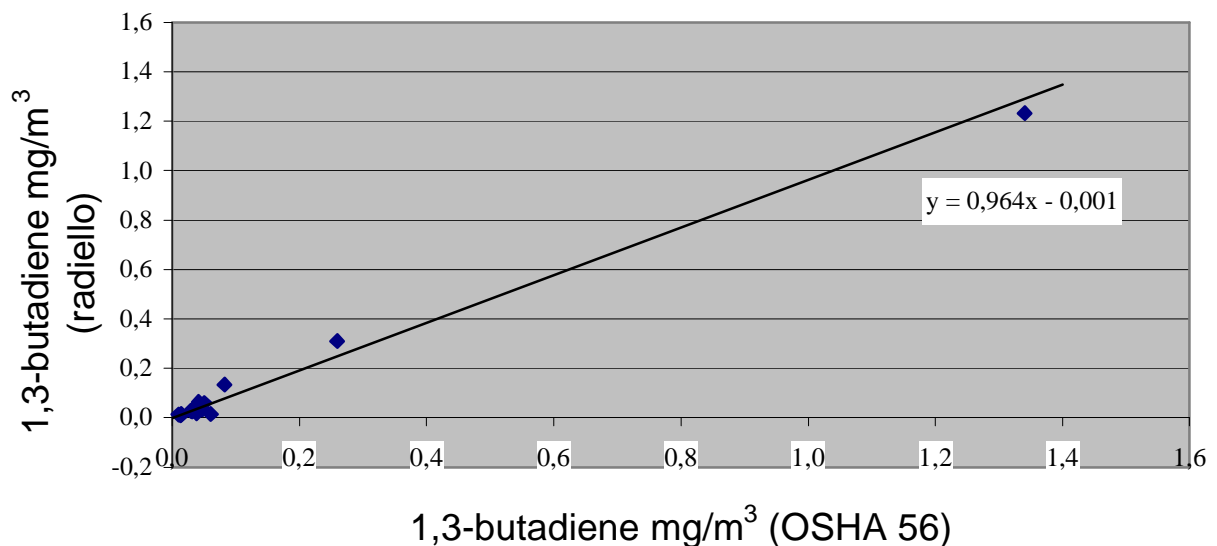
The field comparison was carried out by having workers wearing both samplers, side-by-side in the breathing zone, for a whole work shift. 18 data pairs were obtained.

The results were compared by means of the method described in the standard ISO 13752. The OSHA Method 56 was considered as the reference method, which the diffusive method was to be compared against. The following optimised regression model was obtained:

$$\text{BDE-rad (mg/m}^3\text{)} = -0,001 + 0,964 \text{ BDE-OSHA (mg/m}^3\text{)}$$

where BDE-rad represents the 1,3-butadiene concentration measured by the diffusive method, BDE-OSHA stands for the concentration measured by OSHA Method 56. The exposure concentrations measured with the two methods are plotted in the graph below, along with the optimised regression line.

Diffusive vs. pumped 1,3-butadiene measurements in workplace





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Intercept and slope values ( $-0,001 \pm 0,004$  and  $0,964 \pm 0,064$ , respectively) were shown to be not significantly different from the ideal values, i.e. intercept = 0 and slope = 1.

According to ISO 13752, the expanded uncertainty  $U$  is 25,0% at 0,1 TLV-TWA ( $0,44 \text{ mg/m}^3$ ); when calculated at TLV-TWA ( $4,42 \text{ mg/m}^3$ ),  $U$  is 7,9%.

For more details on this field study on 1,3-butadiene sampling with the Radiello sampler, please contact the Fondazione Salvatore Maugeri, Padua/Italy under [info@radiello.com](mailto:info@radiello.com).

Radiello diffusive samplers are commercially available from Sigma-Aldrich.

More information on the Radiello Sampler line in general can be obtained on [www.radiello.com](http://www.radiello.com) or [www.sigma-aldrich.com/radiello](http://www.sigma-aldrich.com/radiello).