

## MAPPING OF TOXIC VAPORS ON BOARD OF CHEMICAL TANKERS

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During normal management of a chemical tanker, the crew will perform operations in the cargo part of the vessel, like entering tanks, cleaning lines, connecting and disconnecting of the manifold, sampling and maintenance of specific equipment. Under these circumstances there will be a higher risk of direct contact with the cargo and cargo vapors. These vapors can be taken up by ventilation intakes, bringing the cargo fumes into the accommodation and engine room. The aim of this project is to give an overview of the btex concentrations on board of these vessels. A precise and selective sampling system was used. Radiello<sup>®</sup> passive samplers offer several advantages for this application, including no electricity use, small sizes, adjustable exposure times and especially a precise and selective measurement of air concentrations.

Especially the benzene concentrations on board were relatively high. The cargo on board can explain a lot. During our stay on board benzene has been loaded in three tanks and later on these tanks have been cleaned and ventilated during our measurements. The International Maritime Organisation (IMO), recognized that chronic exposure to very low concentrations of benzene vapors in air, of the order of a few parts per million, may cause leukaemia. According to Madl, benzene exposure on board of crude oil and chemical tankers do not pose a health risk to deck crewman. Further interpretation of the results will soon demonstrate if we can confirm Madl's statement on board of this type of vessels.

On the other hand we measured the concentrations of toxic vapors over relatively short periods, during well specific operations on deck. Here the concentrations were measured with the 'PAC III' apparatus of Draeger<sup>®</sup>. The results of this investigation have to be compared with the TLV-TWA and TLV-STEL values. Conclusions here should encourage the optimization of the use of respiratory protection aids during cargo operations.

### References

- International Maritime Organisation MSC circ. 1095, 2003. Revised minimum safety standards for ships carrying liquids in bulk containing benzene.
- Madl A.K. *et al.* 2005. Exposure reconstruction of historical airborne benzene concentrations: case study of a deck crewman on board crude oil and chemical tankers. Poster presentation at the Society of Toxicology (SOT) Annual Meeting 2005 New Orleans, LA.