
DETERMINATION OF VOCs ON BOARDS OF CHEMICAL TANKERS

**Diane AERTS², Anna BUCZYNSKA¹, Patrick DECLERCK², Dirk DUBOIS²,
Ana Flavia Locateli GODOI⁴, Werner JACOBS², Marianne STRANGER³,
Rene VAN GRIEKEN¹**

¹*Micro and Trace Analysis Centre, Department of Chemistry, University of Antwerp, Universiteitsplein 1, B-2610 ANTWERP (Belgium);* ²*Antwerp Maritime Academy, Noordkasteel-oost 6, B-2030 Antwerp, (Belgium);* ³*Department of Design Sciences of the Hogeschool Antwerpen, Ambtmanstraat 1, B-2000, Antwerp, (Belgium);* ⁴*Positivo University, Av. Prof. Pedro Viriato Parigot de Souza, 5300 Curitiba - PR, 81280-330, Curitiba, (Brazil)*

Release of toxic vapors of a cargo to the atmosphere on the ship and in its close neighborhood is unavoidable. The fumes from the engines and vents of bunker tanks can also be considered as a possible source of toxic vapors. Several studies suggested a relation between sailing as a crew member on chemical tankers and increased risk of various types of cancer [1, 2]. Only few studies have dealt so far with on-board sampling and identifying the cause. The aim of this study was to give a general overview on the concentrations of toxic vapors in different locations on boards of two chemical tankers (112 m length, equipped with 17 cargo tanks, with an overall load capacity of 10.000 m³). The ships were trading between Rotterdam and the Baltic Sea area. The sampling was performed during the sea voyages as well as during the stay in the ports. Radiello[®] (Fondazione Salvatore Maugeri, Padova, Italy) passive diffusive samplers and GC/MS analysis were used to determine the concentration of several volatile organic compounds (VOCs), namely toluene, ethylbenzene, o-, p-, m-xylenes, 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene, over varied periods of sampling (8-100 hours). The concentration of all measured compounds was found to be relatively high in the engine rooms (up to 608 µg/m³ for toluene during the tank-cleaning and up to 1550 µg/m³ during stay in port of Rauma). Accumulation of toxic vapors was found to take place indoors, what indicates insufficient ventilation (sucking the vapors by the ventilation intake). Personal exposure of different crew members was investigated. Engineers were exposed to the highest concentrations, with the exception for toluene vapors.

References:

- [1] Nilsson, R.I., Nordlinder, R., Hörte, L.G. and Järholm, B. Occupational Environment Medicine. 55, 517-521 (1998).
- [2] Saarni, H., Pentti, J. and Pukkala, E. International Archives of Occupational and Environmental Health. 59, 613-619 (2002).