

## Report on the 6<sup>th</sup> Workshop “How to handle Import Containers safely”, Hamburg, Germany

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**Xaver Baur**

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The 6<sup>th</sup> workshop “How to handle Import Containers safely” of the University Medical Centre Hamburg-Eppendorf, Institute for Occupational and Maritime Medicine, took place on 11 November 2009 and focused on the issue of how health risks due to fumigant residues and toxic industrial chemicals in import containers can be prevented (Baur et al. 2009; Baur X. 2010). The workshop was for the first time bilingual, in English and in German, and was attended by 140 international participants.

At the beginning, the main focus was on practical demands, e.g. at customs, where potentially contaminated, non-labelled containers have to be controlled. The Work Safety Office in Hamburg pointed out the required standardization and quality assurance during the measurement of hazardous substances and presented a recommendation for the screening of these agents in import containers – Minimal Requirements for Measurement and Assessment – developed in cooperation with the department of Toxicology and Molecular Biology of the Institute for Occupational and Maritime Medicine in Hamburg. This internationally successfully applied regulation for the first time assures qualified analyses and a clearly structured measuring record (leaflet M 52).

Dr Budnik demonstrated the problems of risk assessment and pointed out that carcinogenic hazards (e.g. due to halogenated hydrocarbons and benzene) must not be neglected. After long-term contact, the widespread fumigant bromomethane can trigger prostatic cancer.

Another focus was directed towards aspects of measuring techniques. Apart from a few exceptions (e.g. formaldehyde), the gold standard is TD-GC-MS. It permits the selective identification and qualification of target substances (e.g. frequently applied fumigants or toxic industrial substances) as well as unexpected agents (new or unusual fumigants). The recently extended method TD-2D-GC-MSD/FPD can also sensitively detect hydrogen phosphide. The further developed stationary SIFT-MS (Voice 200) still has some disadvantages with regard to specificity and sensitivity of

bromomethane and dichloroethane although it showed a satisfactory agreement with MD-GC-MS data regarding benzene at higher concentrations. The portable GDA 2, providing findings within a few minutes, also showed itself to be insufficiently sensitive with regard to the maintenance of workplace limit values. However, restrictions have to be considered due to the technically caused group detection of the instrument. Thus, frequently highly toxic or carcinogenic substances cannot be differentiated from less hazardous agents. Absorption tubes, which are often used because of their simple handling, provide measuring data with limited sensitivity and specificity.

We hope that the development of new instruments will eliminate the existing disadvantages of in-situ measurements.

A further activity that will improve prevention is the Hamburg database “FumiGate”, which will be introduced in 2010. It centrally registers reported fumigated containers and other containers identified to be contaminated by fumigants. The obtained information will be available to all control organs and authorities. A supra-regional extension involving the logistics industry and the informing of recipients of fumigated goods should be considered.

A special problem arises with the fumigation of cargo (e.g. cereal) on bulk carriers which are mostly of an older age and not gastight. Contrary to the former Technical Regulation Concerning Hazardous Substances (TRGS 512), a gas tightness certificate by a classification institution is no longer required. At present, a simplified control with the use of smoke generators (smoke test) is usually performed.

The final topic of the workshop was the summarized presentation of about 60 intoxications, mainly in The Netherlands in the logistics industry, which were registered in import containers in recent years (Dr. Verschoor) and in Germany (Dr. Preisser). In addition to the principally detected cerebral symptoms, other organs, dependent on the substance, were also affected.

The concluding discussion dealt mostly with difficult aspects of comprehensive risk assessment, the still deficient in-situ measuring analyses frequently lacking in specificity, and the barely calculable health risks of the recipients of goods.

The next workshop ("Safe Handling of Import Containers") will return to these subjects. It will be conducted in Hamburg on 10 November 2010.

For more detailed information see:

[www.uke.uni-hamburg.de/institute/arbeitsmedizin](http://www.uke.uni-hamburg.de/institute/arbeitsmedizin)

## REFERENCES

1. Baur X, Poschadel B, Budnik LT. High frequency of fumigants and other toxic gases in imported freight containers – an underestimated occupational and community health risk. *Occup Environ Med* 2009 Oct 26. [Epub ahead of print].
2. Baur X. Editorial *Zbl Arbeitsmed*, in press.

## Leaflet M52

Screening of hazardous substances in import containers. Minimal requirements for measurements and assessment.

<http://www.hamburg.de/publikationen/973872/bestellung.html>

<http://www.hamburg.deportsafety/>

<http://www.hamburg.de/contentblob/1972238/data/schadstoffscreening-engl.pdf>

<http://www.hamburg.de/startseite-branchen/121012/containergefahren.html>

## Downloads

Musterbetriebsanweisung: Entladen von Importcontainern mit belasteter Atmosphäre

*MSWORD, 264.19 KB*

Musterbetriebsanweisung: Entladen von Importcontainern mit belasteter Atmosphäre

*PDF, 147.07 KB*

Schadstoffscreening im Importcontainer, Mindestanforderungen an Messungen und Gutachten.

*PDF, 354.43 KB*

Hazardous substances in freight containers, Requirements concerning measurements and assessments

*PDF, 178 B*

Abfertigung von Importcontainern (M 52)

*PDF, 128.01 KB*

Processing of Import Freight Containers (M 52)

*PDF, 131.12 KB*

Gefahren beim Öffnen von Containern (M58)

*PDF, 144.25 KB*

Öffnen und Freigabe begaster Transporteinheiten (M59)

*PDF, 61.33 KB*

Technische Regelungen für Gefahrstoffe "Begasungen" (TRGS 512)

*PDF, 218.20 KB*

Merkblatt: Einweg-Gasfeuerzeuge (M12)

*PDF, 70.07 KB*

Gesundheitsgefahren durch giftige Gase in Importcontainern und Containerwaren"; ZfAM Merkblatt

# 6<sup>th</sup> Workshop “How to handle import containers safely”

## Summaries of presentations

**Holger Riemann**

### **MEASURING TECHNIQUES: WHAT IS NECESSARY, WHAT IS OPTIONAL?**

At customs, potentially exposed but unlabelled containers must be controlled. The applicability of a measuring technique has to be simple to protect the employees of Hamburg Port customs office from hazardous substances.

**Detlef Boels**

### **MINIMAL REQUIREMENTS FOR MEASUREMENT OF TOXIC SUBSTANCES IN IMPORT CONTAINERS**

Standardization and quality assurance are required for the measurement of hazardous substances. The Work Protection Office of the Free and Hanseatic City of Hamburg stipulated new regulations concerning minimal requirements for measurements and assessment.

**Lygia T Budnik, Stephan Kloth, Xaver Baur**

### **RISK ASSESSMENT RELATED TO THE HANDLING IMPORT OF CONTAINERS**

Increased phytosanitary demands in globalized container transport provide uncertainty in health-risk assessment for container workplaces. We list herein factors relevant for health based risk assessment and show why the existing methods need re-evaluation. In addition to fumigant residues, toxic industrial chemicals are frequently found in container atmospheres, which have to be taken into account.

**Svea Fahrenholtz, Xaver Baur, Lygia T Budnik**

### **ANALYSIS OF FUMIGANTS BY TD-GC-MS**

Thermal Desorption-Gas Chromatography-Mass Spectrometry (TD-GC-MS) provides an excellent method for the comprehensive, precise analysis of volatile organic substances in freight container air samples. Enrichment, separation, and identification detection of substances allow not only the exact quantitative analysis of target analytes but also the discovery of non-target analytes such as unexpected, new fumigants.

**Bernd Poschadel, Lygia T Budnik,  
Svea Fahrenholtz, Xaver Baur**

### **DEVICES ON SITE GDA AND SIFT**

Due to economic globalization, the majority of freight traffic is carried out via containers. Numerous investiga-

tions have shown that, in addition to the prescribed fumigations of containers and their goods according to ISPM no 15, imported products have been exposed to toxic industrial chemicals and release gas. In general, the transport papers do not indicate exposures. To exclude the health risks to employees performing controls, transport, and storage, as well as of ultimate consumers, analysis of air before entering or unloading these containers is required. In our study, we compared the results of two user-friendly in-situ measuring instruments with stationary laboratory analysis. The outcome shows that these in-situ devices lead in the Selected Ion Flow Tube mass spectrometry (SIFT) to false positive as well as false negative results of the, until now, limited number of pre-defined chemicals to be analyzed simultaneously. The gas detector array (GDA) produces, with regard to qualitative and quantitative values, frequently false positive results. An improved measuring technique should be envisaged in cooperation with manufacturers.

**Ilona Koronczi, Felix Schmidt**

### **ELECTRONIC NOSES FOR MEASUREMENT OF FUMIGANTS — A VIEW INTO THE FUTURE**

Electronic Noses (ENs) have been established for about fifteen years for the integral detection of gas atmospheres or odours. By means of innovative pattern recognition methods, individual gas components can be detected from an EN's integral signal patterns. ENs have a high sensitivity for a wide range of gas classes. Additionally, they can easily be customized for new detection tasks via a software update. Consequently, they have a high potential for solving analytical problems concerning on-site detection of hazardous gases. This article specifies some recent developments and lists what additional development has to be made in order to enable reliable hazard detection in freight containers.

**Wolfgang Wiluda, Anita Plenge-Bönig,  
Andreas Sammann**

### **FUMIGATE — A HAMBURG DATABASE FOR FUMIGATED CONTAINERS — CURRENT STATE AND FUTURE DEVELOPMENTS**

The administration involved in fumigation surveillance in the Free and Hanseatic City of Hamburg (FHH) has started a project to create a database for fumigated containers

– FumiGate – with the goal of simplifying administrative tasks and increasing operating efficiency.

This database is also expected to make a profit for fumigation companies active on the market in Hamburg and for the port economic system in general (keyword electronic government).

**Anita Plenge-Bönig, Udo Sellenschlo,  
Andreas Sammann**

### **CONTROL AUTHORITIES' REGULATION CONCERNING THE FUMIGATION OF BULK CARRIERS**

For the export of corn on bulk carriers from Germany into some non-European countries, a fumigation of the grain is mandatory for phytosanitary reasons. Mainly hydrogenated phosphor is used, which is highly poisonous to humans. In Hamburg about 50 ships are fumigated per year. Target organisms are the Grain Weevil (*Sitophilus granarius*) and the Khapra Beetle (*Trogoderma granarium*).

The three commonly used fumigation methods Standard System, J-Stream and Mini-Ropes® are described regarding aspects of effectiveness and security, and the national and international regulations for the fumigation of bulk carriers are presented. These put a great amount of responsibility into the hands of the fumigator, the ship owners, and the captains, and the possibilities of administrative surveillance seem to be limited. Fundamental inconsistency exists in the fact that on one hand, security systems on board may not be set out of function during the transit of the ship, and on the other hand, this may be necessary to prevent dissemination of the noxious gas outside the cargo hold. From an administrative point of view, a better security situation through more modern and more effective fumigation methods and gas-tight ships should be considered.

**Jörg Nobis**

### **TESTING THE GAS-TIGHTNESS OF CARGO HOLDS IN BULK CARRIERS**

Our practical experience shows that cargo holds usually cannot be made 100% gastight. However, a smoke test helps to find hidden leakages in order to achieve sufficient safety for entering adjacent rooms or spaces. Furthermore, the remaining risk will be mostly excluded by the required gas concentration safety checks during transit. The most important question for conducting a smoke test is how many smoke candles are needed for each cargo hold. Only when

a certain pressure inside the cargo hold is reached does such a smoke test make sense.

**Atie H Verschoor, Henk J van Leeuwen,  
Louis Verschoor**

### **HEALTH PROBLEMS IN HANDLING GASSED CONTAINERS**

The use of containers in maritime transport is enormous: in the year 2000 four million containers arrived at Rotterdam. Sixty per cent of the containers are gassed, of which 25% show levels above the MAC value (TNO 2007). All gasses currently used pose health problems for workers. The most commonly used gasses are phosphine, methyl-bromide, and 1,2 dichloroethane. In one year (Oct 2008–Oct 2009) we investigated 33 victims of acute (incidents) or chronic exposition to gasses. Most workers were exposed to 1,2 dichloroethane or phosphine.

Nearly all workers showed dysfunction of the central nervous system: especially decreased concentration and short-term memory; some also exhibited changes in personality. Phosphine and methyl bromide also give rise to painful peripheral neuropathy, the latter also to seizures. Carbon dioxide together with low oxygen leads to severe headaches, dyspnea, and tightness of the chest. Depending on the severity of the intoxication, revalidation programs can achieve better health perspectives. Unfortunately, not all patients recover completely.

In order to solve the health problems associated with the use of gas in containers the gasses would have to be banned by legislation in containers or 100% control ensured.

**Alexandra.M. Preisser, Xaver Baur**

### **INTOXICATION BY DIFFERENT FUMIGANTS – CLINICAL FINDINGS. IS DIFFERENTIA- TION POSSIBLE?**

The typical complaints and examination findings of 26 patients who fell ill due to the inhalation of highly toxic fumigant residues are presented. 1,2-dichloroethane, methyl bromide, hydrogen phosphide, and dichloromethane were identified. The most frequent symptoms were headaches, concentration disorders and memory loss (partly persistent for several months), dizziness, nausea, irritations of the skin and mucosa, and reduced physical capacity. Fourteen out of twenty-six patients developed reactive airways dysfunction syndrome (RADS). The symptoms caused by different fumigants did not differ much.