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NOTES

The BG Measurement System for Hazardous Substances (BGMG) and the Exposure Database of Hazardous Substances (MEGA)

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German employers' liability insurance associations or Berufsgenossenschaften (BGs)—institutions for statutory accident insurance—maintain a measurement system for hazardous substances, the so-called BGMG. The aim of the BGMG is to determine and document valid results of measurements of exposure primarily for prevention purposes. The data are collected systematically, in parallel to the sampling in a company. Parameters which are supposed to have a visible effect on exposure levels are documented. The MEGA database (documentation of measurement data relating to workplace exposure to hazardous substances) holds 1,629 million measurement values, which have been compiled in since 1972. The database offers a host of selection possibilities for assessments depending on the evaluation strategy.

BGMG exposure data MEGA exposure database

1. The Measurement System for Hazardous Substances of the German Berufsgenossenschaften (BGMG)

The handling of hazardous substances is a problem encountered to varying degrees at a great many workplaces in virtually all sectors. A range of activities by the legislator, German employers' liability insurance associations (BGs) and also manufacturers and users aim to replace hazardous substances with less hazardous substitutes, to organise safer working practices and to take effective preventative measures.

The BGs support employers in fulfilling their duty to protect employees against hazardous substances. The BGs are also obliged to act as an inspectorate. In this capacity, they measure the presence and concentration of hazardous substances under section VII (19) 1, 5 of the German Social Code, in order to identify and assess hazards and to propose or order measures, where applicable.

In the early 1970s, the measurement system of hazardous substances, the so-called BGMG, was developed by the BG Institute of Occupational Safety and Health (BGIA) in conjunction with the BGs for the industrial sector. This co-operation was later placed on a new footing by an agreement between all industrial BGs, the HVBG and the Central Federation of Public Sector Accident Insurers (BUK).

The BGMG is a monitoring system. It monitors workplaces according to national and European legislation. The organisation of the entire system, standardisation and testing of the measurement methods, analyses, documentation and—most importantly—the training of all people involved are ensured by the BGIA [1]. A quality measurement system according to DIN EN ISO 9001:2000 [2] supports the BGMG's goals. It is to be embedded

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through the qualification of personnel, continual improvement, internal audits, monitoring of test and measurement facilities, and planning and performance of measurement programmes [3].

The aim of the BGMG is to determine and document valid exposure measurement results as well as workplace-related data on harmful substances.

Within the BGMG, air samples are taken at the workplace in companies by the measurement services of the BGs that comprise 310 measurement experts and engineers. Air samples are collected using standardised measurement systems at the workplace. Most of the systems and samples are in-house developments of the BGIA. The conditions for sampling in a company's workplace are defined in detail by the BGIA. This includes the sampling system, the sampling medium type, the volume flow rate of the pump for 2–8 hrs of sampling and the maximum period of storage after sampling. A sampling time of 2 hrs is representative of the duration of the shift according to technical rules. In 2005, BGs' experts and engineers visited some 3,800 companies and took around 31,200 samples.

Parallel to sampling, a lot of company-related data is collected in the factory. About 250 individual pieces of information are determined for each sample taken. Every detail on data which has an influence on the measurement value is collected [4, 5, 6]. For this purpose the BGIA provides the measuring services with software to ensure that data collection takes place systematically. Code lists [7] are implemented in the software to ensure standardised and harmonised collection of exposure data all over the BGMG. Data collection serves two purposes. It is necessary for the analysis and measurement report for each specific case and also for the database for general assessments.

The samples are analysed by the BGIA. Its infrastructure enables standardised analysis methods, and measurement and testing apparatus for dust, fibres, metals as well as other inorganic, organic and biological substances. If necessary, the BGIA develops new analytical methods, especially for substances for which new limit values apply. In 2005 over 101,000 analyses of 564 hazardous substances were performed. When all analyses of a group of samples, which were taken in one factory, have been completed, the BGIA prepares an analysis report including an assessment of the measurement results based on the applicable technical rules and regulations.

At the same time the data is transferred to and documented in the central MEGA exposure database (documentation of measurement data relating to workplace exposure of hazardous substances) [8, 9]. The BGIA maintains and evaluates this database. Data recorded within the BGMG system are used by the BGs primarily to generate measurement reports, on the basis of which assessments are made, the hazardous substance situation at the workplaces concerned is evaluated and, where applicable, measures are proposed. The data are, however, available to the BGs for general prevention purposes, for in-plant prevention, and for workplace-related recommendations and advice. Also the data determined within the BGMG are used for legal proceedings related to occupational diseases. Furthermore the data is used for risk assessments, epidemiological research and for legislation.

2. The MEGA Exposure Database

Data on hazardous substances investigated by the BGMG have been compiled in the MEGA database since 1972 [10, 11, 12]. By the end of 2005, the database contained data records with 1,629 million measurement values with up to 250 pieces of information; information on 760 hazardous chemicals and 330 biological working agents which had been analysed; and information on 47,000 companies.

The results stored in the MEGA database are primary collected for insurance purposes and not for compliance purposes. Because of this requirement, the exposure measurements held in the database may be biased and may not be representative of workers' average exposure [13]. There is no direct access to the database for bodies other than those of the BGs. However, the assessments are continuously published in reports, e.g., for the European Union project "Existing commercial chemicals—Exposure at the workplace" [14]. Moreover, all results of the

assessments of 100,000 measurement results of quartz will be published in a revised edition of the 1997 BGIA quartz report [15] in 2006.

The MEGA database is available to solve problems of various kinds. A similar measurement strategy and systematic collection and documentation of data permit the multifunctional use of the MEGA database. Code lists of the line of business, the working area, professional activities and hazardous substances form the main basis of all assessments. It is possible to perform statistical evaluations according to a specific problem, e.g., according to a substance, a working area or the degree of concentration, room size, a capture system, a product or exposure peaks. This also includes questions related to the latest technical developments in certain sectors, regular trend analyses as well as questions regarding the effectiveness of technical and organisational protective measurements.

MEGA offers about 70 selection possibilities. The aim of the selections is to get a homogenous exposure group [16, 17]. The evaluation strategy is an iterative optimising procedure, which gradually includes more selection parameters, related to the question to be answered. Appropriate statistical parameters are chosen differently depending on the different questions posed to the atabase.

3. CONCLUSION

Within the BGMG monitoring system, the procedures relating to all aspects of the system are harmonised. These include

- choice of the measurement system, the measurement strategy and sampling,
- systematic collection of data,
- standardised analyses,
- documentation and assessment of representative measurement values.

These measurements and their results within the BGMG are representative of a specific workplace. BGMG experts have the know-how in their line of business and have gathered a wealth of experience over the last three decades. Because of a harmonised measurement approach defined by the BGMG, measurement values are comparable and can be assessed together. Furthermore, the BGs maintain permanent contact with their member enterprises to glean information about technical developments as early as possible and to take them into account in preventive measures.

Through measurements at the BGMG, the MEGA database will increase each year, further filling gaps in exposure data and hence enabling exposure descriptions and risk assessments to be made. Further development of MEGA is driven by an increasing demand for more and more differentiated evaluations against the background of projects concerning special working procedures and workplaces. At the same time, efforts are being made to underscore the validity of the data through comparisons with other international exposure databases. In addition, database evaluations will in future increasingly be compared with calculation procedures including probability models.

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