

NOTES

Polish System of Assessing Occupational Risk Posed by Chemical Compounds

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According to the Polish Labour Code (Ustawa, 1974) employers are legally obligated to provide workers with information about occupational health and safety risks. Maximum allowable concentrations (MAC) and the results of determining chemical compounds in workplace air are used for assessing occupational exposure and risk.

A computer-assisted system STER, developed in the Central Institute for Labour Protection, helps to register and document occupational risk assessment and all actions resulting from those assessments.

risk assessment chemical compounds computer-assisted system

Risk assessment is the overall process of estimating the magnitude of risk and deciding whether or not the risk is tolerable or acceptable. The process of risk assessment is a systematic examination of all aspects of work undertaken to consider what could cause injury or harm, whether the hazards could be eliminated and, if not, what preventive or protective measures are, or should be, in place to control the risks. According to the Polish Labour Code (Ustawa, 1974), employers are legally obligated to provide workers with information about occupational health and safety risks.

Assessment of occupational risk posed by chemical compounds is a very complicated problem because of traceable concentrations and

multicomponent mixture of these compounds. Maximum allowable concentrations (MAC) and the results of determining chemical compounds in workplace air are used for assessing occupational exposure and risk. In Poland, MAC for chemical compounds are established by the Interdepartmental Commission for Maximum Allowable Concentrations and Intensities for Harmful to Health Agents in the Working Environment. The Commission includes representatives of health and labour administration, various sectors of the industry, trade unions, and research institutes in occupational medicine and work safety. MAC values refer to airborne concentrations of substances and represent conditions to which it is believed workers may be exposed during their whole productive life, without any adverse health effects to them (also when retired) or to the next generations, either. According to the type of biological effects, the following categories of MAC values are used:

- NDS-MAC (TWA): MAXIMUM ALLOWABLE CONCENTRATIONS—the time-weighted average concentration for a conventional 8-hr workday and a 42-hr workweek,
- NDS-MAC (STEL): MAXIMUM ALLOWABLE SHORT-TERM CONCENTRATIONS—the short-term exposure limit being an average concentration for an exposure, which may last together no longer than 30 min during a workday, and
- NDS-MAC (C): MAXIMUM ALLOWABLE CEILING CONCENTRATIONS—concentration, which should not be exceeded even momentarily.

MAC are based on information available from experimental human and animal studies, as well as from industrial experience. For carcinogenic agents, the Commission has adopted the socially accepted risk at the level of 10^{-3} to 10^{-4} .

The Commission has proposed to the Minister of Labour and Social Policy maximum allowable concentrations of occupational exposure on the basis of health criteria and assessment of health risk with the use of the latest scientific data. The health-based documentation for recommended exposure limits for each compound includes information relating to physical and chemical properties, toxic effects on human and experimental animals, carcinogenicity, mutagenicity, teratogenicity, embriotoxicity, and effects on reproduction, mechanism of toxicity, combined effects, bases for proposed MAC values and biological tolerance limits, methods of determining the substance in workplace air and biological material, and

also pre-employment and periodical medical examinations. Documentation on MAC values is published in the bulletin of the Interdepartmental Commission for Maximum Allowable Concentrations and Intensities "Principles and Methods of Assessing the Working Environment" (Koradecka, 1999; Skowroń & Gołofit-Szymczak, 1999).

Moreover, the Commission proposes methods for determining chemical compounds in workplace air. The procedures of air sampling and analysis, developed on the basis of experimental studies in laboratory and industrial conditions, are accepted by the experts of the Standardisation Commission for Chemical and Aerosol Hazards in the Working Environment and are established as Polish Standards by the Polish Committee for Standardisation. Standardised methods for determining chemical agents are obligatory in Poland. All occupational hygiene laboratories and sanitary stations should perform the analysis of air pollutants using the analytical procedures contained in the Polish Standards in the area of air purity protection (Augustyńska & Pośniak, 1999). These standards assure selectivity in the cases of the analysis of multicomponent mixture, the suitable precision of results and detectability at the level of 0.25 MAC.

The Minister of Labour and Social Policy approves hygienic standards and they are obligatory for all branches of national economy. Today on the list of MAC values there are 352 chemical substances (Figure 1) and 17 dusts, and 380 Polish Standards with measurement procedures for chemical compounds. MAC values for 63 new substances and about 70 new standardised methods were developed in 1998-2000 as a result of the Polish National Strategic Programme "Occupational Safety and Health Protection in the Working Environment."

To help enterprises in assessing occupational risk, the Central Institute for Labour Protection (CIOP) has developed an assisting tool: a computer program for risk assessment, STER. The program helps to

- collect and analyse information about the analysed workplace necessary to identify hazards: name (code) and localisation of the workplace and the number of people working there, description of the technological process and the materials used, description of machines and other technical devices used at the workplace and basic instrumentation and equipment significant for occupational safety and comfort, description of basic activities and when they are performed (the so-called time-keeping), identification of danger zones (with possible illustrations; Figure 2);

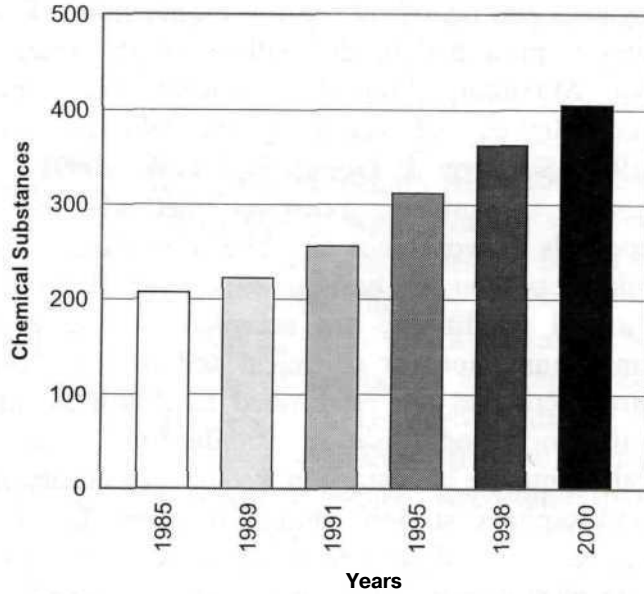


Figure 1. Number of chemical substances for which the Interdepartmental Commission for Maximum Allowable Concentrations and Intensities for Harmful to Health Agents in the Working Environment established MAC values in 1985-2000.

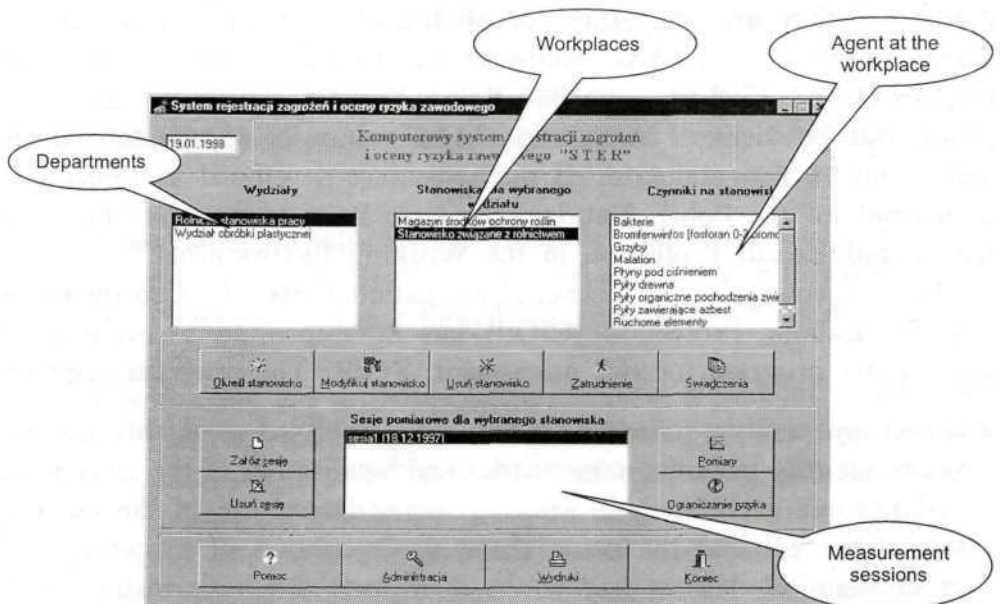


Figure 2. A window of a measurement session for a selected workplace.

- assess risk connected with those hazards. The user of the system receives a proposition of risk assessment for harmful chemical substances and other agents most frequently appearing at the workplaces, such as, for example, noise, vibrations, radiation, microclimate, and also mechanical agents causing accidents. For each of the identified and listed agents the system asks for the parameter measurements characterising the exposition and after they are loaded, it compares the results of the measurements with the admissible values set on the basis of legal regulations, standards, or other sources currently in force. On the basis of the measurement data, the program develops a so-called agent measurement card stored in its database (Figures 2, 3);
- identify and properly document actions that should be taken as a result of risk assessment.

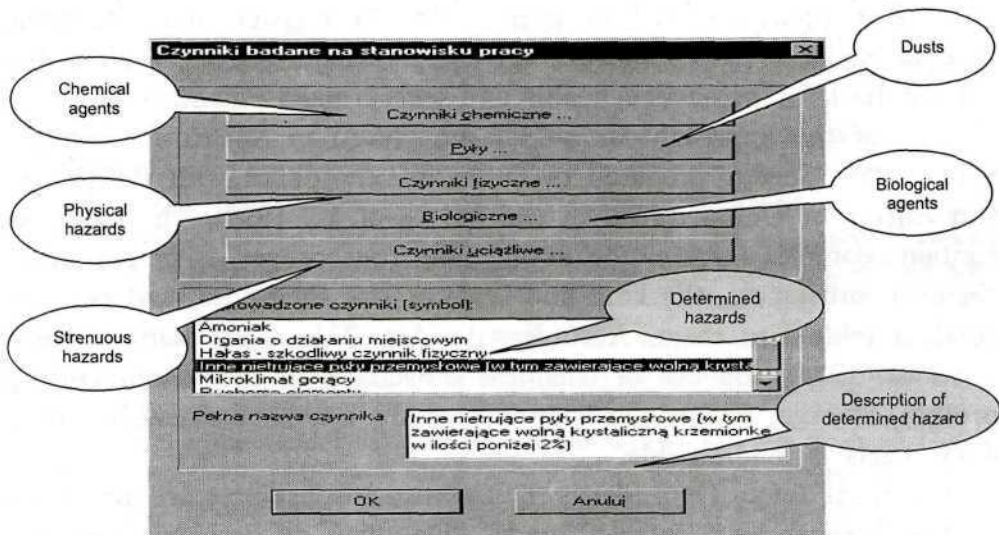


Figure 3. A window with the list of harmful agents in the assessed workplace.

The system contains a database of regulations in Poland and it automatically selects admissible values for indicated agents.

To estimate the risk, a three-level scale has been accepted. This three-level scale of risk assessment—according to which risk can be defined as low, medium, or high—allows easy comparison of the assessment with the regulations in force. In the case of the influence of chemical agents (except for carcinogenic ones), risk is assessed as low if

the worker's exposure does not exceed 0.5 MAC, medium if it is higher than 0.5 MAC but it does not exceed that value, and high if hygienic standards are not met. Risk connected with the appearance in workplace air of a carcinogenic agent while exposure is lower than MAC is always assessed as high (Pośniak, 1997).

High risk always means that requirements have not been complied with whereas medium risk is connected with the necessity to undertake economically justified actions in order to secure better protection of the employees. If risk is defined as low, existing protection measures are considered satisfactory.

STER allows to print a document registering all data characterising a station, data necessary for risk assessment as well as the results of the assessment and recommendations concerning preventive activity with their deadline, and the name of the person responsible.

This computer-assisted program helps to register and document occupational risk assessment and all actions resulting from it. It is also a good tool for pro-active health and safety management.

One of the important databases introduced in STER is Chemical Safety Data Sheets, prepared in CIOP in accordance with Polish law and European Union directives (Puchalska et al., 1999). The database contains complex information about dangerous properties of particular chemical substances, the kind and scale of risk they pose, and rules of conduct related to them. According to Art. 221 of the Labour Code (Ustawa, 1974), the use of chemical substances in the manufacturing process, storage, and transportation that do not have chemical safety data sheets is inadmissible.

Chemical Safety Data Sheets for hazardous substances are developed by the Programming Policy Council, "Database on basic requirements for safety, health and environment protection at the stage of production, transportation and use of chemical materials according to the EEC and UN requirements." Specialists from Polish scientific centres and institutions responsible for production, use, transportation, and neutralisation of chemical substances and prevention and protection of health and human life are members of the Council.

Chemical Safety Data Sheets contain the following obligatory headings: identification of the substance, composition, hazards identification, first-aid measures, fire-fighting measures, handling and storage, exposure controls, physical and chemical properties, stability and reactivity, toxicological, ecological, disposal, transport, and regulatory information.

The system of assessing occupational risk makes possible proper management of occupational safety and hygiene in Polish enterprises using chemical compounds in technological processes. Reduction and elimination of chemical hazards in the working environment is the main task of that system.

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