

THE IV INTERNATIONAL SYMPOSIUM OF THE ISSA* RESEARCH SECTION (22–23 October, 1992, Strasbourg, France)

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The control and monitoring of the workplace safety as well as the risk analysis and appropriate prevention strategies were general themes of the Symposium.

The Symposium was attended by 250 persons from 17 countries, including seven from Poland.

The plenary session took place on October 22. During the plenary session nine papers were presented. That was accompanied by an exhibition of 12 posters.

The Symposium was opened by François Duvernoy, Chairman of the ISSA Research Section, and then the following papers were presented:

A.K. Bensiali (United Kingdom) spoke about the probabilistic risk assessment and the development and use of a statistical model based on Bayes' theorem. The Probabilistic Risk Assessment in Safety Management (PRASM) Program will be firstly used during the development of an expert system phases and then its direct application for studying occupational health problems and accident risks will be relatively easy.

K. Meffert (Germany) presented the analysis and assessment of complex risks related to the development of new fields of technology such as power stations, systems of very speedy traffic, etc. The assessment of complex risks can provide their quantitative classification while the present assessment is rather of a qualitative nature.

The next paper of the plenary session was presented by P.T.W. Hudson and dealt with risk prevention strategies based on the experience of such major accidents like Piper Alpha, Chernobyl and Exxon. Since then many companies have wondered what safety measures will have to be taken to avoid future calamities. So far, vast amounts of money and much effort was directed towards improving the safety of industrial complexes but only hardware was the main target. Improvements in this regard have resulted in a decline of both the number and severity of accidents. Nevertheless, a further reduction in the number of accidents only seems possible if the problem of human error is tackled systematically. Extensive programs are available to industry offering a wide range of possibilities. The link between safety and quality in management was strongly stressed. Since 1986 a research project sponsored by Shell has been carried out in this field. During the studies a number of mechanisms contributing to the accident causation process has been identified and improper system of communication was listed as one of them. The author turned attention to these mechanisms called Error Generating Mechanisms which constitute a list of circumstances leading to errors and consequently to accidents.

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T.B. Leamon (USA) dealt with a multidisciplinary approach to problems in human – machine systems. The author strongly suggested developing a model based on the ergonomic analysis which could allow the ergonomic generalist to approach a workplace and to identify those interactions for which risks should be determined.

P. Flety (France) stated that the present zero-accident target, however, sound seems impossible to accomplish and it requires further thought and a degree of qualification. The author dealt with the issues and demonstrated that such results can be achieved: by chance, by calculation (grey areas in organised or random data) and even by an intended adulteration of statistics. Thanks to more than twenty-year experience of hazard control the author is in a position to support the preventive reflex which involves everyone participating in a given process.

K. Kuhn (Germany) studied new possibilities in occupational risk prevention through an active approach to working conditions. The author stressed that risk prevention cannot be achieved simply by administrative decision but it has to be “earned” and put into practice by everybody in a given company, for it is they who stand to benefit from it. Risk prevention makes sense when it involves the company as a whole. This requires indicators that translate it in terms of increased efficiency and economy for the company. Health insurance boards are now authorised to become involved not only in the economic condition of the company but also in its social and health policy. The author stated that the good health and well being of workers is an essential part of the added value process. They broaden the understanding of cost-profit ratios in quantitative and qualitative terms.

R. Cantin (France) presented a method for establishing a hierarchy of risks in firms, sectors of activity or geographical sectors, to facilitate the development of continuous, coherent plans of action to deal with the real problems that exist in the field. The practical solution was shown on the basis of the concrete case of a particular geographical sector: the Loire.

In the successive paper K.K. Häkinen stressed the significance of the risk analysis performed by those who work in production processes or project teams. The author outlined models for self-auditing for selected professionals.

The final paper during the morning session was presented by C. Aufredou (France). It was focussed on the occupational accident and disease prevention policy in the concrete manufacturing industry. The French Concrete Industry Federation adopted two main approaches: action directed at equipment manufacturers to obtain safer production plant and machinery, and action to offer French concrete manufactures better information on risks. This action is based on a detailed assessment of the safety function, accident facts, work situation and potential risks as well as on training for all members of staff. The attention was also turned to the question of noise in the concrete and cement industry.

During the poster sessions the following findings were presented:

O.A. Adamov et al. (Russia) – Universal workplace wellness program.

G.V. Bektobekov (Russia) – Boolean algebra for hazard identification and analysis in production process.

A. F. Glowacki (USA) – Using computer simulation to analyse risk in longwall mine emergency evacuations.

T.G. Hiebert (USA) – The International Society for Workfitness.

L.M. Karamova and R.A. Sulejmanov (Russia) – Prevention strategies of



emergencies occurring at oil refineries and chemical factories. Application of simulation.

G.A. Kulkibaev (Kazakhstan) – Preventive and treatment actions for workers in the yellow phosphorus industry. The author stressed the significance of proper nutrition and administration of vitamins, verospirone and zicsorine.

D. Lafon and C. Lemarchand (France) – Method for the assessment of toxic risks in offset printing. The attention was turned to emission of organic solvent vapours, printing ink and the presence of aerosols of these substances.

D. Lhuillier and A. Joie (France) – An assistance method for the design of decentralised safety and risk prevention action plans in gas and electricity production plants.

J.M. Martin et al. (France) – Monitoring occupational risk: methodological questions. Application of computer techniques in developing occupational history files that chart exposure to risks throughout a person's working life.

A. Parenti (France) – A "control panel" for small and medium-sized enterprises as a tool which could help them to keep occupational risks under control.

J. Pavlicek (Czechoslovakia) – System on accident and fault investigation at enterprise level. The author deals with the question of responsibility for accidents and the PC analysis of accidents and errors.

Y. Pierron et al. (France) – Research and development of new occupational risk prevention strategies. The issue of risk and accidents in workplaces, where work is performed in a context of variable activities, surroundings and technologies, was presented on the basis of data on workers involved in gas and electricity installations.

During the first day of Symposium three parallel workshops took place between 15:00 and 18:00. They were devoted to the following issues:

Workshop 1: Measuring atmospheric pollution at the workplace – Biological monitoring.

Workshop 2: Personal protective equipment: effectiveness and ergonomics.

Workshop 3: Changing technologies and human reliability in production systems.

Workshop 1 covered 8 papers delivered on October 22 and further 8 papers presented on October 23 before lunch as well as a special session composed of 18 poster presentations.

H. Blome et al. (Germany) presented paper on assessing risks of exposure to toxic substances with special reference to carcinogens. Risk assessment should include work area analysis models, recommendations on measurement and assessment, data on apparatuses put into use after testing, "measuring data" documentation, dossiers, instructions, knowledge of the properties of substances. Authors turn attention, among others, to the fact that harmful effect can be diminished when powdered substances are not sprayed in the working environment.

S.R. Uts et al. (Russia) devoted their presentation to occupational allergodermatoses and broncho-pulmonary allergoses and methods for detecting these diseases. The authors mentioned a differentiated sensibility to chemicals used in the agriculture and reaction of the organism to industrial allergens in terms of time.

S. Adelman (Germany) was involved in the Accident Prevention Rule (UVV) "Biotechnology" which became effective on January 1, 1988 and covered employees working in the chemical and pharmaceutical industries. The UVV describes protective measures for the safe handling of natural and genetically modified

biological agents. Two video films gave basic information on genetic engineering processes and the necessary technical facilities and safety measures. According to the Rule only those whose state of health is suitable can work with biotechnological materials.

M. Bandmann (Germany) dealt with the questions of work in contaminated areas which does not refer to fixed work-places but it is particularly risky in those areas because of the presence of complex mixtures of substances, including toxic and carcinogenic substances. The author stressed the role of methodological monitoring based on the results of preliminary surveys and in-depth analyses. Once the workplace characteristics have been defined, biological monitoring can help to identify the most critical cases of exposure. That helps to apply appropriate measures for workers' protection.

N. Lichtenstein (Germany) spoke about exposure monitoring of toxic substances at the workplace. In Germany a metrological system for dangerous substances has been developed. Each year some 25 00 samples are analysed and the system covers 200 substances.

R. Vincent et al. (France) developed the method for statistical processing of measured levels of exposure to chemicals: STARTREX software. The method is for use in assessing and classifying exposure to chemicals in terms of the probability of over-exposure. The statistical analysis of exposure levels used to calculate this probability takes the form of characterisation of the distribution of atmospheric sampling results and mean value and standard deviation of this distribution. The STARTREX software can be considered as a decision-making aid for all those involved in industrial hygiene.

K. Wilson (United Kingdom) presented the philosophy, principles and practice of biological monitoring in the United Kingdom. The Occupational Medicine and Hygiene Laboratory is responsible for developing biological monitoring techniques with the aim of monitoring the effectiveness of control procedures and identifying potential health problems in workers exposed to industrial hazards and agrochemicals and microorganisms.

K.H. Schaller et al. (Germany) presented the determination of platinum in blood and urine of workers employed in the assembly of motor vehicle catalyzers and engine recycling. The development of an analytical procedure based on adsorptive voltammetry with extremely high power of detection (2 pg Pt) for the determination in body fluids made population studies reliable and practicable. Employees engaged in various workplaces with the manufacturing and recycling platinum containing catalysts showed much higher platinum levels ranging from 21 to 2 900 ng/l urine and 32 – 180 ng/l blood. These levels exceed by many times MAK concentrations of 2 $\mu\text{g}/\text{m}^3$.

K. Benczek (Poland) described the procedure which permits the prediction of the emission of toxic substances such as organic solvents, chromic acid (mist), etc. in painting, chromium electroplating, turning, grinding, making glass reinforced polyester laminates and lead batteries charging processes.

G. Grimmer et al. (Germany) displayed the results of the determination of metabolites of polycyclic aromatic hydrocarbons in the urine of coke plant workers. Among others, phenanthrene, fluoranthene, pyrene, chrysene, benzo/a/ – anthracene and benzo/a/pyrene were determined in 24-hour urine samples.

L. Maestri et al. (Italy) discussed the results of their studies on inhalation



anaesthetics in doctors and other staff of operational theatres. Levels of nitrous oxide were determined by using several methods (forane, fluothane and ethrane). The relationship between concentrations of nitrous oxide and other anaesthetics was indicated. On the basis of this relationship the biological exposure index for N_2O can be estimated at workplaces.

J. Angerer et al. (Germany) determined 1-hydroxypyrene in urine by means of HPLC. This metabolite is found in persons exposed to polycyclic aromatic hydrocarbons. The studies were performed on employees at a domestic waste-fuelled heating plant and on a group of workers employed in the graphite anode industry.

J. Gartzke (Germany) advised thin layer chromatography for determining C_1 and C_2 alkylbenzene compounds as an almost ideal solution. This method is particularly useful in the case of workers exposed to toluene, xylene, ethylbenzene and styrene.

R.C. Mociran et al. (Romania) investigated the exposure to manganese among electric arc welders. This group of workers presents a complex pattern of occupational exposure to heavy metals but the determination of manganese by atomic absorption spectrophotometry permits to assess the level of exposure. An increased concentration of manganese in urine was observed by the end of the working week.

R. Delia et al. (Italy) presented the determination of the risk index for rural workers subsequent to the release of radioactivity into atmosphere. They evaluated the radiological impact on the environment in the Lazio Region following the nuclear accident in Chernobyl. The risk index obtained was subsequently verified by controls carried out on products of the land for consumption by human beings. The studies were performed over a period of five years.

U. Lucht Moller et al. (Denmark) presented the Danish results of a survey on the exposure of workers employed in auto repair shops. Data on the chemical composition of 960 products used in the automobile trade have been registered in the Danish Product Register database (PROBAS). Altogether 234 auto repair shops were investigated and toxic substances were classified into four major groups.

In addition 18 posters, including 5 from Poland, were presented during **Workshop 1.**

Workshop 2: Personal protective equipment: effectiveness and ergonomic — was chaired by Professor D. Koradecka from the Central Institute of Labour Protection, Warsaw, Poland. During two-day sessions 15 papers and 3 posters were presented.

Questions concerning the type and ergonomic properties of protective clothing were dealt with by J. Arteau (Canada), D. Giguere (France), M. Jędrzejewska et al. (Poland), J. Molnár (Hungary), H. Peter (Germany) and A. Rekkab (Algeria).

Masks and other respiratory protective devices used in the case of risk caused by toxic gases and vapours were discussed by G. Blume (Germany), G.P. Bosnyatskiy, V.M. Rogalskiy, B.M. Kats and M. Yu. Lasarev (Russia) and M. Henry et al. (France).

Quite a number of presentations was devoted to devices protecting the organ of hearing: J.P. Brion (France) raised the question of hearing threshold and warning signals which can be heard due to the use of a protective device; K. Körpert (Austria) turned attention to Hz frequencies as a hearing impairment factor; J. Mery (France) presented standards and regulations on industrial noise; A. Sergio and S.R. Miguel (Portugal) and B.H. Pfeiffer (Germany) spoke about the ergonomic strategy for hearing protector selection.

Several papers focussed on the protection of workers in the event of a fall J. Arteau (Canada), R. Mattern et al. (Germany). K. Jung (Germany) discussed the ageing behaviour of protective helmets and R.L. Unger (USA) the application of special additional elements of personal protective equipment in the coal mining industry.

The paper of K. Sołtyński et al. (Poland) presented during this session deserves a special mention. The authors dealt with the body heat balance in men wearing protective clothing measured in a climatic chamber by the thermometric method.

Finally, T. Hettinger (Germany) discussed risk prevention possibilities in manual handling. Carrying heavy objects can create a risk of injury to muscular and psychomotor systems.

Workshop 3: Changing technologies and human reliability in production systems provided an opportunity for presenting 16 papers and 15 posters.

A. Russo (Italy) dealt with the management of occupational safety and health in research laboratories on the basis of his 10-year experience with the Italian National Research Council.

D. Reinert (Germany) spoke about the risk related to the microprocessor-based safety devices. There has been a preliminary standard in Germany since 1990 which defines the general conditions in which microprocessors may be used in safety-related systems.

E.J. Falconer (United Kingdom) stressed the significance of workers' participation in developing control systems designed to reduce the risks from a particular hazard.

B. Ludborz and H. Nold (Germany) shared their experience concerning the research in the field of psychology applied to safety.

C. Davillerd (France) discussed risk factors and preventive action related to the development and use of lasers in various industries and firms. The author indicated two different categories of risk: one when the equipment is generally fixed and the other where the laser equipment is either mobile or constantly changing.

E. Cloutier (Canada) presented effects of safety of unsuitable machinery in the forestry sector.

C. de la Garza and A. Weill-Fassina (France) devoted their paper to the control of risk from rail vehicles in track maintenance work. A method for analysing hazard control patterns was based on the Hale and Glendon model.

P.C. Cacciabue and E. Hollnagel (Denmark) developed simulation approaches for the formulation of a System Response Generator (SRG) in the form of a software tool. A similar question related to man-technical system interactions was dealt with by E. Fadier et al. (France) and F.J. Larrainzar Gonzalez (Spain).

F. Luc (Belgium) wondered why good and bad procedures are not always clear cut.

C. Macchia (Italy) discussed training and technological changes in the construction sector.

Relations between production systems and real situations at work were presented by B. Michez (France).

A. Seppälä (Finland) dealt with motivational models of accidents caused by workers and suggested her own model applied in a plywood factory.

S.I. Sukhachev (Russia) described the method which uses the simulation of technology-related accidents taking into account stochastic as well as determinate



destabilising factors. He suggested a procedure which can provide a list of possible accidents in a given enterprise and technical and social preventive measures.

M. Viossat and B. Melier (France) presented an ergonomic analysis of welding activity taking into account per cent of time spent on welding and on other related activities.

During the Symposium a number of posters was presented. Some of them were devoted to risks from visual display terminals and various radar systems (J.J. Lavallee (USA)). The author postulated to lower the present limits of exposure from 10 mw/cm^2 for one-tenth of an hour to 1 mw/cm^2 during the same time, and M. Molnar (Austria) who also dealt with work at visual display screens stressed the significance of rest periods and programme of relaxation exercises.

Several findings raised the question of man-machine interaction in robot systems (M. Neboit, D. Pagliero (France) and R. Wagner (Luxembourg) and others).

On October 23, poster sessions were reported and then a round-table conference took place. L. Rosenzweig — a journalist was its moderator. The following persons participated in the conference: P. Brunet from the EEC, W. Coenen from Germany, J. Molnar from Hungary, D. Moyon from France, K. Noha from Germany and W. Thiel from Austria.

W. Thiel, a representative of the Austrian Insurance Company closed the Symposium.

Papers and posters presented during the Symposium referred to many aspects of occupational medicine and work-related risks. It seems that papers which displayed new hazards for workers' health resulting from the use of new equipment and new technologies deserve special attention. Presentations on work and application of computer models and an ergonomic analysis were of great value. Among particular issues, risks from operating computers and monitors, new chemical hazards associated with technological progress, e.g. determination of platinum in workers engaged in production of vehicle catalyzers, are worth mentioning.

Finally, still wider use of methods for computer analysis both in studies on causes of accidents and in developing preventive measures based on simulation should be also stressed.

