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New trends in work environment - New effects on safety

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Europe has been subject to tremendous changes in terms of flexibility of work and labour in response to macro trends like globalisation and the resulting fierce market competition. Such changes in the world of work can give rise to new safety risks. Although the effects of "changing work environment" are fairly documented for psychosocial and ergonomic risks, the subsequent effects on occupational safety are less investigated. The present paper sets a general framework on changing work environment presenting prominent definitions.

All new trends in work environment including new work organisational forms, new contractual relationships, new technologies and changes in the workforce are briefly presented. This paper reviews existing evidence on the effects of changing work environment on safety and occupational accidents. Finally it discusses safety prevention challenges to policy makers.

Keynote Lectures 1

Nanotechnology, engineered nanoparticles and occupational safety

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The significance of engineered nanoparticles (ENP) and nanotechnologies (NT) grows rapidly. NT applications may have a marked potential to improve the quality of human life e.g. through pure energy and pure drinking water technologies. Also, hundreds of consumer nano-based products are already on the market. However, very little is known of the risks of ENP to occupational health and safety (OSH), even though workers are probably at extra risk because the levels of exposure are usually higher at workplaces than in other situations. However, the knowledge of the exposure to or effects of ENP on human health and safety or the occupational environment is limited and does not allow reliable risk assessment of ENP on OSH. Several issues related to ENP in the workplaces require marked attention. The most topical issues include: 1) improved understanding of ENP metrics that determine their toxicity; 2) development of monitoring devices for ENP exposure assessment; 3) understanding the dynamic behavior of ENP aerosols; 4) understanding translocation of ENP, and effects of ENP; 5) development of tiered approaches for testing of safety of ENP; and 6) utilizing these data for occupational risk assessment. Available data on the ability of several ENP to enter the body and reach almost any organ, to cause pulmonary inflammation and fibrosis call for immediate action to identify those ENP causing OSH risks from those that are maybe innocent thereby allowing prioritization of regulatory and preventive actions at workplaces when necessary at national, regional and global levels.

Meeting Risk Perception Challenges for Rational Risk Evaluations

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Risk assessment by laypeople is often referred to as "risk perception", although this term is misleading since there exists no such entity named "risk" which can be directly, physically perceived (cf. Watson 1981). Rather, the focus is on the judgmental processes and aspects of the evaluation in regards to risk. In this context, risk perception is not understood in a restrictive sense as "observation", but instead on a broader scale as risk related judgments and attitudes (see note 1, p. 152, in Slovic 1992). Contrary to methods- driven procedures for risk assessment, these layperson processes can also be termed "intuitive risk judgments".

Although the first studies on risk perception were already performed in the early '60s (Bauer1960; Slovic 1962), the concept of "perceived risk" was only established in the mid '70s mostly through the works of Paul Slovic, Baruch Fischhoff and Sarah Lichtenstein (Fischhoff, Slovic, Lichtenstein, Read & Combs 1978; Slovic, Fischhoff & Lichtenstein 1977; Slovic, Fischhoff & Lichtenstein 1980). Their work was motivated by two problem areas: people's 'non-rational' adjustment to natural hazards such as floods and the public controversies about the risks and acceptability of modern technologies. Common to both problem areas was the observation that people often responded to risk in a seemingly irrational way – at least from the viewpoint of many experts.

With regard to coping with the threats of natural hazards (e.g. floods), many people seemed to 'misperceive' risks, that is they underestimated the probability of harm from specific hazards compared to statistical estimates, or even denied that there were any risks (Slovic, Kunreuther

& White 1974). Building on Simon's concept of bounded rationality (Simon 1955) and Tversky and Kahneman's work on cognitive heuristics and biases (Tversky & Kahneman 1974), Slovic and his co-workers argued that those faulty perceptions of risk could be explained as a result of the cognitive limitations of human beings (Slovic et al. 1977). These cognitive limitations were also held responsible for people's opposition to modern technologies, in particular nuclear power, which according to scientific risk assessments should have been regarded as safe, or at least acceptable, technologies when compared to other risks, e.g. from sports activities or lifestyle, which people were obviously willing to accept without complaint.

It was soon apparent, however, that the mistakenly assessed probability of damage might not be as significant as other aspects in the evaluation of risks by the general public. In an influential article that appeared in Science magazine in 1969, physicist Chauncey Starr provided an attempt at an explanation for the discrepancy between the scientific-technical assessment of the risks of technologies – especially nuclear energy – and the acceptance of these technologies by the public (Starr 1969). On the basis of statistical data on the mortality and economic development, he reached the conclusion that mainly three aspects are significant for the acceptance: the voluntariness of exposure to a risk, the benefit to society for accepting the risk, and the number ofpeople that will be exposed to the risk. Specifically, Starr concluded from his data that (a) the societal acceptability of a risk is roughly proportional to the third power of the average benefit of an option for a person, b) the limit of acceptance for a voluntary risk is approximately 1000 times higher than that of an involuntary risk, and (c) there is an inverse relationship between the acceptance and the number of people exposed to a risk.

Quantified assessment of existing, new and emerging occupational risk: supporting rational occupational risk management.

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This paper presents the fundamental concepts of quantified risk assessment and its application to occupational risk management. The importance of the duration of exposure to hazards in determining the risk of bodily harm owning to occupational accidents is discussed. Risk rates and risks per year for sixty three single hazards are presented along with a risk management method linking the root causes of accidents with the probability of fatality, permanent or recoverable injury. Occupational risks have been quantified in the framework of the WORM project of the Ministry of Social Affairs and Employment in The Netherlands.

A need for new theories, models and approaches to occupational accident prevention?

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The paper discusses challenges from a changing working life on occupational accident modelling and asks if ideas from models developed for high-risk, complex socio-technical systems can be transformed and adapted to occupational accident prevention. Are occupational accidents mainly simple component failures or is a systemic approach of some interest and value?

NEW OSH ERA - Coordination of OSH risk research in Europe

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European Research Area Networks (ERA-NETs) were introduced in the 6th Framework Programme to support the coordination of non-Community research programmes. It provides a framework to network and mutually open national or regional research programmes, leading to concrete cooperation. Meanwhile 71 ERA-NETs exist. So far, they launched 75 joint calls with a total budget of over 500 Mio €.
NEW OSH ERA started in April 2006 as an ERA-NET for Occupational Safety and Health (OSH). It aims at preventing new and emerging safety and health risks at work by promoting communication and cooperation between national funding institutions for OSH research in Europe, culminating in calls for transnational research activities. Therefore, NEW OSH ERA analyses national OSH research priorities and good practices in managing national OSH research funding. Currently, 20 member organizations out of 11 European countries and the European Agency for Safety and Health at Work form the NEW OSH ERA consortium.
Four phases are intended to establish transnational calls: (1) The information exchange phase revealed strengths and weaknesses in different ways of managing OSH research funding and identified national funding priorities by means of questionnaires. The NEW OSH ERA members concentrated in the areas “working environment”, “psychosocial factors, work organization and specific groups”, and “OSH management”. (2) While considering existing research gaps, new requirements, and obstacles and barriers for transnational co-operation, complementarities between existing funding activities were identified. Research priorities are in particular prevention of health problems caused by dangerous substances, issues of combined exposure to multiple risk factors, psychosocial risks, and as well as workers groups particular at risk. Common visions and strategies for future co-operation have been agreed upon. (3) Legal, contractual, and financial conditions of the transnational co-operation will be appointed in order to (4) bring up co-ordinated or joint calls for OSH research priorities.
Methods by means of which NEW OSH ERA identifies appropriate themes for and administrative ways of managing common calls will be presented.

Occupational and public safety. An integrated framework for risk assessment and prevention of accidents in a changing work environment.

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In the past years the work environment has undergone significant changes. These changes concern working hours and years of employment, the type of employment contracts and working conditions. For example, increase of retirement age, increase in daily and weekly working hours, "deregulation" of working hours, temporary and part-time work, labor leasing, workers mobility, down-sizing, increased workload and time pressure.

In this work we examined the main consequences of changes in the work environment and particularly:

• The disruption of human biological rhythms and the increase of workers fatigue due to changes in patterns of working hours and years, job insecurity and occupational stress, whose outcomes have serious consequences in workers health and may constitute a cause for an increase in occupational accidents.

• Unsafe work practices related to workload and time pressure.

• Difficulty in conducting effective occupational risk assessment, determining training needs and applying the corresponding safety measures. This difficulty may be due to changes in workers task and/or workplaces, instability in working hours, difficulty in applying TLVs, in controlling and monitoring the implementation of safety measures (e.g. in workplaces with multiple subcontractors).

• The impact on public safety (such as the probability of major accidents occurring, difficulties with regard to emergency procedures for industrial areas).

• The worsening of workers living conditions with respect to income, social- family life, and health and insurance benefits.

If these consequences are considered collectively, the following questions may arise:

- Can changes in the work environment actually be confronted effectively, by only modifying the methodological and legislative tools used in the field of OHS?

- Can flexibility actually be combined with security and OSH?

The study leads to the overall evaluation of relations of production, based on the criteria for overall protection of workers safety and health. Health is defined as full mental, physical and social balance and well-being and not only as "retaining of work ability".

Strategic approaches in occupational safety and health

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Due to the fast developing globalization there is a worldwide tendency to strengthen strategic approaches in occupational safety and health (OSH). In order to become a success story these strategies should be on every level in major parts in line with all relevant policy fields such as health, labour market policy, demography intervention, corporate social responsibility etc. Nonetheless OSH strategies off course have to be adapted to the individual needs of national or regional societies and economies. For a sustainable success of these strategic approaches in OSH it is essential to implement all relevant stakeholders in order to reach the goal of safe and healthy workplaces all over the more and more globalized world.

Also in Germany - under the auspices of the federal ministry for labour and social affairs - all relevant actors in OSH including the German Social Accident Insurance (DGUV) are on the way to establish a joint OSH strategy. The Common German OSH strategy (GDA) is an integrative part of the European Union (EU) Community Strategy for OSH 2007-2012. Very important in the framework of the strategic planning of the German OSH strategy in the first campaigning period 2008 to 2012 are the identification of priority areas of application and measures. Another important aspect is the establishment of (at best quantified) targets of which the relevant indicators are planned to meet within the campaigning period. Major elements of the EU and the German OSH strategies are presented.

Safety first!? Organizational efficiency trends and their influence on safety

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This paper questions the "Safety first!" argument that is commonly used in organizational work life by exploring the realities and consequences of balancing efficiency and safety. The relation between organizational efficiency efforts and safety has so far been difficult to identify, focusing on measurable indicators such as accident rates. This paper focuses on the less countable effects of efficiency trends observed in local work practices. We have conducted multiple case studies within two different sectors: healthcare and civil aviation. Specific change initiatives (e.g. national reforms, implementation of new systems and practices, harmonization, and restructuring) related to efficiency processes at different system levels (ranging from government to work operation) have been identified in the two sectors, together with consequences for conducting safe and efficient work practices. Results show that it is possible to identify efficiency-safety asymmetry in local work practices at different system levels. The examples we give from the healthcare and aviation sector show that organizational efficiency trends alter the framework conditions for safety, and in some cases reduce safety to a secondary goal. Top-down implemented reforms and restructuring efforts creating new organizational interfaces should according to our findings induce warning signals in order to uphold the "Safety first!" consensus.

Session 01: New work environment

Risk assessment and international cooperation

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Many owners of SMEs have already discovered that good health and safety standards in the workplace enable employees, and themselves, to achieve better working results. Having a healthy workplace is an integral part of a successful enterprise´s quality. With regards to this, risk assessment is particularly important.

Many national laws relating to health and safety at work require a risk assessment. Even without a legal requirement to perform an assessment, it is good practice to do so as it allows effective measures to be taken to protect workers´ health.

Without the support of specialists in health and safety, the owners of SMEs are often unable to carry out risk assessments; the direct result of which is that they are also unable to put into place measures to eliminate and reduce risks. For this reason, risk assessment tools, interpreted and written in plain language for owners, are necessary.

A coordinated procedure for risk assessment in many countries was one of the aims of the International Symposium, "Safety and Health at Work in SMEs," which was organized by the International Social Security Association (ISSA), in Prague, Czech Republic, in autumn 2007.

As a result of the symposium, risk assessment tools have been developed.

It is not necessary to carry out a risk assessment for specific groups of people, but one has to pay particular attention to those for whom occupational hazards may be more severe than usual, such as pregnant women, elderly people, workers with disabilities and of course young workers and job starters.

The accident rate for young workers and job starters is particularly high.

The bow-tie approach in a semi-quantitative assessment of occupational risks

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This work proposes a semi-quantitative risk assessment method, which was applied and tested in the Ship Building Industry. It covers a wide range of risks related to accidents at work in a shipbuilding yard environment, more specifically at Arsenal do Alfeite, a large shipyard in Portugal. The initial qualitative analysis focuses on the bow-tie diagram technique but it also integrates concepts and classifications schemes defined by the Eurostat within the ESAW Project (European Statistics on Accidents at Work). The structure of the diagram enables the identification of the relevant accident's causal pathways and their consequences at the same time as it identifies the existing or needed safety barriers. In what concerns the semi-quantitative assessment, the accident risk level and acceptance criteria were established through a scoring system, using national data on accident statistics for the sub-sector: Ship Building & Repairing (code NACE 35.1). The statistical data was supplied by GEP (the Planning and Strategy Office of the Portuguese Ministry of Labour & Social Solidarity). The authors present and discuss a specific case study, in the shipyard's technological area of surface treatment and protection, to demonstrate the method's applicability and usefulness.

Session 02: Risk assessment

Methodological Framework for Conducting a Risk Assessment Study

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Scope: This two-phase study presents both a method for recording the potential incident scenarios and the danger sources they originate from as well as a model for calculating the incident scenarios likelihood coefficient L, thus limiting the assessor’s subjectivity influence on the results. Method: In phase A, the associated risk assessment terminology is clarified. Tables of potential danger sources, their associated dangers and the resulting potential incident scenarios are presented. All scenarios were linked to three categories of managerial root causes and namely lack of (a) health and safety system, (b) communication and (c) enforcement. In phase B, the tools were used to acquire incident field data from actual facilities. The recorded total potential incident scenarios were linked to the immediate, basic and managerial root causes responsible for triggering the incident chain mechanism. Statistical data processing revealed a strong linear relationship between the managerial causes present, the remaining (active) potential incident scenarios and the likelihood of their occurrence, which allows the calculation of both the likelihood coefficient L used in the quantitative risk assessment models as well as the residual risk. Results: The potential incident scenario table and the questionnaire provided can be used to obtain field data results and an accurate identification of the total number of potential incidents in the great majority of operations. Equations are provided allowing assessors to calculate rather than speculate on the incident likelihood of occurrence directly from the number of total and active incident scenarios identified by the assessor, as well as an estimate on the minimum (non-zero) residual risk. Tables of the most frequent immediate, basic and managerial causes are also provided.

Risk Analysis

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A typical definition of the word safety is the elimination of all types of hazard. Despite this, a few human activities are absolutely safe upon this definition. In the same sense, a few industries are completely safe. So, we draw the conclusion that implicit safety doesn't exist, thing which form the basis of risk assessment.

The fundamental aim of risk assessment is giving the opportunity to the employer to make the appropriate measures for the health and safety protection of the personnel. In cases that hazard can not be fully dispelled, there must be taken steps in order to reduce risk in lower levels. The relation of the cost and the intended risk level is determined by the fundamental of ALARP (As Low As Reasonable Practicable), which emphasizes the fact that risk level must be decreased as much as it is practical feasible. In a subsequent stage, within the framework of a revision schedule, there must be a re-estimation of the residual risk, so as to be conducted a review of the potential for further reduction.

The methods that are used for risk assessment are the qualitative, the semi-quantitative and the quantitative. Each of these methods evaluates in its unique way the activities risk, through the two parameters that define the risk, i.e. the possibility of an incident occurring and the consequences which will take place if this incident happens.

The purpose of this report is to point out the advantages and disadvantages of each method, stressing the cases in which these methods must be employed in order to improve the safety and health conditions. Consequently, accordingly to the aims we set in the safety sector, we must select the suitable method of risk assessment among the three above mentioned.

A new Methodology for the Quantified Assessment of Occupational Risk and Human Vulnerability Case Study: Individual Risk in Sites with Dangerous Substances

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The objective of this work aims at establishing a new integrated methodological framework for the systematic risk analysis at different working environments and a tool for the quantified occupational risk assessment. The proposed methodological approach has been developed at the Technical University of Crete and is based on the principles applied in risk assessment for the control of major-accident hazards involving dangerous substances. The index of 'Individual Occupational Risk' is introduced and defined as a probability, function of four variables, normalized over real working time: the frequency of an active hazard, the probability of an employee being present at a workplace, the extent of distinct consequence zones and the employee vulnerability. The model variables are quantified in terms of actual operational conditions and observations on process- and working conditions by formulas that require the least possible subjective judgment in frequency and severity rating. The implementation of the methodology in several industrial plants indicated its direct and practical applicability and its potentiality for a successful elaborated and realistic analysis of the working conditions

Evaluation and the Management of Dangers in Work Area

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Introduction: The international organization of work estimates that every year 2,2 million people die from work accidents and diseases.

Aim: The aim of the present study was the estimation of the dangers under which professionals of health work in the job environment and the presentation of suggestions for the improvement of work conditions. Material-Method:Theresearchwasconducted inaGreekgeneralhospitalanditwascarriedoutduringaperiodofamonth. Results: Nurses are exposed to several dangers, which threaten their health and safety. These dangers vary from biological to ergonomic, chemical and physical. Injuries and diseases have an important, negative impact on nurses’ employment and restraint in the places of care, especially in taking care of patients. Conclusions: Some strategies, which can be adopted with the aim of the work conditions improvement are the personnel increase, the improvement of evaluation and the management of dangers which threaten the health of people, who are occupied in workplace, the education of these people, the decrease of the working hours and the increase in salaries, which will result in the moral satisfaction of people, who are occupied in those places.

Work-related musculoskeletal disorders prevention using FAST ERGO_X

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Work-related musculoskeletal disorders associated with repetitive and strenuous working conditions continue to represent one of the biggest occupational problems in companies. Despite the variety of efforts to control them, including engineering design changes, organizational modifications and working methods training programs, workrelated musculoskeletal disorders account for a huge amount of human suffering and economic costs to companies and to healthcare systems. This paper presents an ergonomic analysis tool, FAST ERGO_X, design to support ergonomic auditing activities related with WRMD. This tool can be used to analyze workplaces regarding potential ergonomic risks. The FAST ERGO_X is a fuzzy expert system designed to help the identification, assessment and control of the risk factors present in the work system, due to lack of adequate ergonomics. Based on objective and subjective data, the system evaluates the risk factors that can lead to the development of WRMD, and presents the findings resulting from such evaluation. The system also presents recommendations to eliminate or at least reduce the risk factors present in the work situation under analysis.

Application of a Participatory Risk Assessment Model - Safety Hazards Identification in the Metal Industry in Greece

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The occupational accidents incidence rate for 1.000 workers in the metal processing industry was 17.14 in 2005 that is 2.3 times higher than the general rate calculated for a total of 48 industries.

The aim of the present study was to describe safety conditions in the metal processing industry in Greece. A cross sectional study was conducted in 4 industries located in Attica, Thessaloniki and Viotia from the metal processing industry (NACE code 28).

In the present study a participatory approach on risk assessment was applied. Subjective questionnaires investigating safety hazards were distributed to employees in the production area. Additionally safety audits were conducted with the use of specialized check lists.

The most commonly self-reported safety related hazards among metal industry employees were the flammable materials (53.5%), tools (46.9%), slippery floors (40.4%) and electrocution (40.4%). Additionally, a relatively high percentage of workers (33.3%) reported that they have experienced accidents at work. The most commonly reported accidents were amputations, burns, hand and foot fractures.

The findings of the audits were that a large percentage of the machinery audited was not CE marked. A significant number of machines (particularly presses, lathes and grinding machines) had obsolete technology and bear no protective devices. Another important finding was that parts of several machines have been modified without conducting the necessary technical studies, resulting in machines not conforming to safety requirements.

Text-mining of insurance-based information: Decision support for local safety management

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Based on underlying perspectives, different data tend to be included in reporting systems for occupational accidents and injuries. Information sought mainly for medical, legal, economic or statistical reasons can reduce or misrepresent the information needed for prevention.

Actual detail of accident processes provided by local operators in verbatim will serve to counter misconceptions of risk distributions in the organisation and direct the focus to possible prevention measures.

The analysis of free-text reporting of traumatic injuries, accidents and incidents promise to better represent the dynamics and detail of exposure and accident process and, when applied to valid and representative insurance data on occupational injury with the help of suitable text-mining software, will provide industry groups and local companies with decision support for prevention and safety management.

The trial and development of text-mining software for injury prevention, in conjunction with the industry group safety information system, is described and examples from different exposure areas are given.

General Model of Accidents Caused by Malfunctions of Machinery Control Systems

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The main objective of this study is to develop a general model of accidents caused by improper functioning of machinery control systems based on identification of most important phenomena that emerge in the accident course. For this purpose the data on about 700 accidents were analyzed. As a result of accident analysis, 144 accidents caused by the operation of a machine were identified. 36% of them were caused by improper functioning of the machine control systems. An analysis showed that in this group of accidents serious accidents happened much more frequently (41%) as compared to the group of accidents with no relation to the control system (7%). The lack of safety functions is the most common cause (58%), which means that the accidents might have been prevented if the designer used proper safety function(s). Another group (26%) comprises the accidents caused by a random failure of a control system due to either an improper choice of safety performance level or inadequate fulfilling of the requirements. Other accident causes, i.e., errors made in defining safety functions (the definition of safety function did not predict all possible events, 4%), errors made in the course of design (errors in the control system software, 6%), and inadequate resistance to environmental impacts (6%) constituted a considerably smaller percentage of all accidents. Therefore, the analyses carried out proved that behind the majority of incidents caused by improper performance of safety functions were the errors committed the designers. The practical verification of the model developed has proved that it can be successfully applied to further analyses of accidents as a tool for choosing of most proper means for accidents prevention in industry

Comparison of selected accident investigation methods

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The aim of this paper is to give a brief description of selected accident investigation methods, namely: FTA, MORT, MES, CTM, OARU, AEB, SCA, TRIPOD, ISIM, NSB, WAIT, HSG245 AND 3CA and evaluate them in terms of compliance with the purposes served by the accident investigation undertaken by the Labour Inspectorate. The purposes of an accident investigation are legal, descriptive, causal, prevention and research and they are achieved by the identification of a set of specific and more tangible requirements. The accident investigation, undertaken by the Labour Inspectorate should therefore be legal, descriptive, revealing, consequential and quantitative. The selected methods are compared according to the above mentioned requirements. The comparison of the selected accident investigation methods reveals the need to further examine a more integrated framework, which could serve the official investigation of accidents.

Human factor and port safety after the container revolution: relationship between workplace, organizational factors and occupational injuries.

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Several factors can affect occupational accident frequency, namely economical factors, technologies used (low automation, discontinuous operating) job design, organization of work/environmental conditions and human factors. In particular, technological advances in industrial activities can give rise to improvement in productivity and in occupational health and safety, but not necessarily simultaneously. The beginning of the container transport dates back to fifty years ago, but while containerization changed everything, from ships and ports to patterns of global trade, its impact on work injuries was not explored at all. The aim of this paper is to investigate the relationship between work organization, job experience, productivity and occupational accidents, from the starting of the container expansion to nowadays, considering Genoa port (Italy), one of the largest of the Mediterranean Sea. In order to minimize possible reporting biases, such as underreporting or reclassification to a lower level of severity, injury statistics are elaborated starting from data collected directly on site, from internal accident or medical-aid reports. An in-depth statistical analysis on occupational injuries in the years 1980-2001 is carried out, with reference to frequency indexes, mechanism of injury and material causes. The increase of container-ships traffic and, consequently, the sharp change in port infrastructure involved a rapid modification also in the work organization, with particular reference to the number and characteristics of workforce (decrease from 5783 to nearly 1000 employees and increase of low experience workers from 28% to 74%). The striking high percentage increase of young or low experienced workers in handling container (and performing correlated new tasks) caused a remarkable increase of the risk for occupational injuries. In the studied port, we recorded an increase of the frequency index FI from 13.0 to 29.7. It results that the increased expansion of shipping container utilization is not connected to a correspondent human factor safety implementation. We must notice that higher injury frequencies are associated to risk transfer (with the elimination of a specific hazard by transferring the risk to another task or another group of workers). Main risk factors are pointed out, revealing an increase of accidents due to transport vehicle (+8.3%) and a reduction of accidents caused by substance or materials (-4.5%). These factors show a statistically significant correlation with the new job tasks. Consideration of these findings may enable managerial solutions and workplace organization interventions for the prevention of injuries and safety performance improvement in port activities.

Accidents induced by movement disturbance: new model prompts new prevention

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Accidents whose causal system includes disturbance of the victim's movement (especially falls on the level) which are a great ratio amongst occupational accidents cannot be explained through phenomena involving an encounter between a person and a hazard. The hazard would be defined as a component incompatible with human presence and, thus, necessarily external to man. Indeed, in the event of an injury induced by a movement disturbance, the cause of damage is partly found in the movement energy of the victim himself. Based on this initial observation, this paper first recalls the challenge represented by preventing this type of accident at national level in France: a reminder that runs counter to the generally accepted idea that these occupational accidents would be minor. Secondly, the authors identify aspects specific to the accidents considered, particularly in exposure and hazard terms, prior to discussing the consequences of the identified specific characteristics on the difficulties, even impossibility, of contemplating prevention focusing on risk, stricto sensu. Finally, two acknowledgements appear essential: the need to widen one's view of the genesis of such accidents to prompt emergence of prevention possibilities and the importance of seeking a typology for such accidents.

Jobs with high incidence of ocular injuries in industry

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Aim: to analyze the incidence of ocular injuries in retrospective cohort of shipyard employees.

Methods: detailed data for all ocular injuries that required hospital care (i.e. severe) were collected from occupational health department archive during 1960-84 and 2001-05. Throughout these periods, study population ranged yearly between 1400 and more than 6000 persons.

Results: During the first 5-years severe ocular injuries were very frequent (Table 1). Following that a sharp reduction was monitored and thereafter a steady reduction was observed.

Table 1 Ocular injuries required hospital care (monthly mean per 1000 employees)

Employees (n)	Ocular injuries
1960-1964	3576 32.87
1965-1969	3967 6.16
1970-1974	5716 6.02
1975-1979	4900 3.66
1980-1984	4326 3.90
1985-2000	na* na
2001-2005	1662 2.02

* data not available or not analyzed

Foreign bodies were the most frequent cause of severe ocular accidents ranging between 45-64% per year followed by thermal or chemical burns and other injuries. Based on the relative frequency of ocular accidents among the various job titles chippers-riveters (11.8%), carpenters (5.2%), pipe fitters (4.4%), welders / flame cutters (4.3%), platters 3.6%), and electricians (3.3%) were the most groups.

Conclusions: the higher incidence of ocular injuries during the first years of operative works in this industry excused by the steadily increasing rate of work combined with the little experience of workers. In addition, not proper and limited use of personal protective equipment holds a significant role. It is worth mentioning that through the consistent monitoring and analysis of injuries is possible to identify work groups or procedures prone to specific kind of accidents. This would led to implementation of proper and focused protective measures and consequently in the reduction of injuries.

Accident prevention at shared workplaces

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An analysis of accidents occurring at shared workplaces in Finland indicates that we should pay attention to the aspects listed below with respect to work in such places. The analysed data came from 171 fatal accident cases that occurred in Finland in 1999-2004 and from 48,500 cases of non-fatal accidents that occurred in 2003-2005.

- At shared workplaces special attention should be paid to tasks requiring workers to move about. It is usual that moving is not considered to be a work task that needs attention. However the work environment is changing continuously.
- Repairing production breakdown is also a risky work task.
- At shared workplaces, control and a lack of supervision are very important factors in accidents, as are risk management and the way that actions are carried out.
- The risk behaviour of every worker, especially the personal identification of risk and safe behaviour, is important.
- Emphasis should placed on the role of orientating new employees, even if they have prior experience.

At many shared workplaces, the following practices have been found to be effective:

- The client defines basic demands of safety for all suppliers.
- From the suppliers' fulfilled basic demands, a list of so-called accepted suppliers is drawn up. These suppliers are assessed regularly.
- The list of accepted suppliers is used in the pre-selection of suppliers, or the suppliers to whom the calls for bids will be delivered are selected from the list.
- The client defines the rules for managing subcontractors, especially with respect to the chains of contracts.
- Suppliers are obligated to talk through all indentified risks and their management.
- Suppliers are also obligated to hold weekly safety toolbox meetings with workers.
- The material and methods of every supplier undergo an initial inspection in which the content is checked before work is started (e.g., qualifications, tools, protectors, etc.).
- The client reacts to safety deviations consistently and regularly.
- Fast feedback on, and motivation for, the safety performance of workers and subcontractors is given.
- Strong safety management is in place (e.g., safety matters should be dealt with in every project meeting).

Using Coroner's Narrative Data to Identify Work-Related Road-Traffic Fatalities in Ireland

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International research shows that the true extent of work-related road traffic deaths is not reflected in official statistics because of limitations in data collection systems. In Ireland, and other countries, it is difficult to ascertain how many road traffic collisions involve persons at work; however, it is known that many employees drive for a living, work close to public roads, and are at risk as pedestrians and as passengers in vehicles in the course of their work. Road transport is the dominant mode of moving goods in Ireland (about 93%) and is likely to remain so.

The aim of this study was to explore the differences in the work-related road traffic fatality data collected by different agencies in one administrative geographical area (a county), in the Republic of Ireland. The study explored the differences over three years (2002-2004), with three national datasets: the County's coronial road traffic records; fatality data from the national Health and Safety Authority; and the National Roads Authority dataset.

Narrative data in 45 road traffic coronial files were examined, and classified (independently by 2 researchers) as: worker death, by-stander death, death with worker involvement, or not work-related. Cases were matched with data in the other datasets.

Eighteen percent of the 45 road traffic fatalities identified in the coroner's data placed the victim either at work or killed as a result of another person's work activity (by-stander). When 'worker-involvement' cases are included, 36% of the fatal road traffic incidents directly or indirectly involved at least one person who was at work.

Results revealed flaws in the work-related death data capture system, which result in failure to capture occupational road fatalities, and underestimation of the extent of the problem. Use of narrative coroner data facilitated identification of cases of work-related death and highlighted the need for occupational road risk prevention strategies.

Assessment of acute effects for fire-fighters during a fuel-tank fire

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A methodology is presented for the identification of risk zones for the first respondents (fire-fighters) during a fuel-tank fire. For the numerical simulations of the current study CFD techniques were used. Finite Volume Method (F.V.M) was employed along with the SIMPLEST algorithm. Three different scenarios for crude oil were examined with three wind velocities of 7 m/s, 9 m/s and 11 m/s, respectively. According to the parametric analysis for the conditions examined the safety limits are not exceeded.

Risk management in Greece, in the framework of Seveso II Directive

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There will be presented the way that the Greek establishments under the provisions of Seveso II Directive apply the risk management principles. The following topics are considered and estimated: risk identification, consequence analysis, mitigation measures, emergency planning and public information. All the above technical analysis is taking into account the sitting of the establishment, as also the number of the citizens living or passing by the greater area.

An integrated methodology for the analysis of management shortcomings and other underlying causes of major accidents in Chemical Industry

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An integrated step by step methodology has been developed for accident analysis and investigation, in particular of the management and organizational causes, to help avoid future incidents involving dangerous substances in chemical industry. The basis of the method is the classical FTA (fault tree analysis) and the generic fault trees developed for 'Seveso' accidents by previous research. It is postulated that an initiating event in a generic fault tree occurs when the organizational and management factors affecting and controlling that event fail to operate properly and as a result fail to prevent the events initiation. The actions needed to be accomplished for each organizational and management factor, in order to operate effectively, are modeled using an innovative model of Safety Management System involving work-flow loops. When identified actions produce a less than adequate result during their execution the performance of the system is decreased and safe operations may be challenged. The reliability of the safety management system is assumed to depend on multiple shortcomings of essential managerial and organizational factors. For the modeling of an integrated system, encompassing accident analysis with underlying organizational factors, the IDEF0 method has been used. IDEF0 is a technique which is widely used for modeling business processes. The model is applied in a real accident in the chemical industry. By using workflow modeler and workflow simulator software interesting results and conclusions were extracted. The innovation of the approach relies on the ability of the tool to provide support for analyzing a major incident and certain safety procedures related to the supporting of safety management system.

Safety assessment in drinking water chlorination stations

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Chlorine is still widely used as disinfectant in drinking water in many parts of the world. It is produced relatively easy and cheap and is more effective in low consumptions. Chlorination of water by liquid chlorine is a common practice in water treatment plants, while by chlorine gas is done just before consumer's premises in special stations. Tehran's drinking water system has 24 chlorination stations, each of which has 2 rooms named as cylinders and chlorinator rooms. The main accident which can happen in stations is chlorine gas release into atmosphere. For assessing safety in stations FTA was used. By visiting all stations and interview with involved employees all data about stations, chlorination process, work procedures and etc. were collected. Then FT for chlorine release was constructed. There were 1224 Basic Events (BEs), which were in fact 16 different events, each of which were repeated for many and different times across the tree. All BEs were categorized in 4 groups as Human Errors (HE), Management Oversights (MO), Design Faults (DF), and Hardware Failures (HF). Distribution of 16 different BEs in these groups showed that the highest percent of BEs are in HE group (43.4%) and the lowest in HF group (0.8 %). Doing work in wrong way with 46.99% was on top of HE group and less experience (6.39%) was in the bottom. Totally 2083 minimal cut sets were identified, 370 of which were in undesired stations. Due to some differences between stations they were grouped as suitable & unsuitable stations. Probabilities of top event in chlorinator room (12.5 /y) was 1.43 times higher than in cylinders room (8.73 /y). Also the probability of top event in suitable stations (103.62×10^{-1} /y) was less than half of that in unsuitable stations (212.25×10^{-1} /y). Lack of proper training for all employees, which directs them in to different errors, was concluded as the main cause of accidental release of chlorine gas in stations.

Using Network Methodology to Define Emergency Response Team Location: The Brazilian Refinery Case Study

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The main objective of this study is to define Emergency Response Team Location in a specific area based on the risk of plants and facilities. The Center of Gravity and Haikini Network methodologies are the two different approaches used to define the location in a network based on index values and distance between locations. These methodologies are different in regard to one basic concept concerning the possibility of defining critical locations in the network in the first case and their boundaries in the second case. The index in this case will be the frequency of hazardous events in each facility or plant located in the network. The two methodologies will be implemented and the results will be assessed. Therefore, a sensitivity analysis will be carried out looking at specific elements such as alternative routes and population dislocation in the case of accidents. Furthermore, the real historical data and the usual data used in Brazil in hazardous event will be assessed to check the influence on final results.The refinery case study will be carried out to define the Emergency Response Team location in a Brazilian refinery.

Risk and identity: A theoretical and empirical reflection

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This paper discusses how people in interaction with others construct risk-understandings, and that different perspectives on risk may be understood as interpretations of the situated contexts of a working situation. In an attempt to argue for - and explain this risk perspective the significance of identity and identification in the construction of risk is used. The relevance of identity in relation to risk is connected to perspectives on identity and identification as constituting models of selves and models of others. In a working context these models of selves and others are influencing the construction of models of work, e.g. how work should be executed.

The paper is empirically based on a subsurface gas blow – out on an installation in the North Sea, which by the Norwegian Petroleum Safety Authority (PSA) is characterized as one of the most hazardous incidents in the Norwegian petroleum history.

The impact of national legislation of safety and health at work regarding workers with a fixed-duration employment relationship or a temporary employment relationship - A national study

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Background:

Several international surveys have revealed the impact of temporary work on safety. Francois and Lievin, 2000; Morris, 1999 observed that the risk of accidents for workers on fixed term contracts and temporary work appears to be higher. A Scandinavian study, from 1995-96, estimates that the rate of accidents for temporary workers in industry is 10-15% higher than for workers in permanent jobs. In Greece it is estimated that 11.7% of workforce consists of temporary contracts that is almost equal to the European average (10.9%).

Aim:

The aim of the present study was to describe the impact of national legislation of safety and health at work regarding workers with a fixed-duration employment relationship or a temporary employment relationship in Greece. This study was part of a European study: “Study to Analyse and Assess the Impact of National Legislation of Safety and Health at Work relating to Council Directive 91/383/EEC” conducted by a consortium of national institutes with Project Leader the “Labour Asociados, S.L.L.”. The survey was conducted for the benefit of the DG Employment, Social Affairs and Equal Opportunities of the European Commission.

Method:

In the present study a qualitative approach to the subject was adopted. 25 representatives of key social partners such as top rank union representatives, employers associations representatives, representatives of workers in temporary employment agencies, officials of the Labor Inspectorate etc,. were interviewed between June and October 2006. A common set of questionnaires was utilized to provoke answers easily comparable. All available studies and data related to the matter were also taken into account.

Results:

So far, there have been no statistical studies in Greece relating occupational accidents and diseases with the form of employment. No discriminative practices regarding safety measures against workers with fixed-duration employment as opposed to workers with permanent employment relationship have been observed. After processing all answers and data we came to the conclusion that the prominent problem for both these types of workers is the form of employment and more precisely the uncertainty deriving from their disadvantageous employment status. The stressful environment in their professional and personal life alike makes them vulnerable and susceptible to compromises in occupational health and safety matters. There have been no targeted information campaigns and actions for these types of workers and the safety policy of undertakings do not take in consideration the form of employment as a determinant factor in health and safety matters. There are no exceptions from potentially dangerous jobs and duties, on the contrary they are assigned the least favourable jobs at the workplace since they are in general new at the job and in less advantageous position than their permanent colleagues. Therefore we can conclude that temporary workers tend to be more exposed to safety risks comparing to workers with other contracts. Besides health and safety issues, the general working status was examined as well as the terms and conditions of employment.

The results of a pilot statistical study have not shown any correlation between annual frequencies of occupational accidents and the respective frequencies of temporary workers in Greece. Nevertheless, it is questionable if these results represent the actual national situation, since there are several other factors affecting the integrity of the data (i.e. poor reporting of the occupational accidents, especially those of temporary workers).

The challenge for a multilateral risk assessment in the light of new trends in the working environment.

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The acceleration of global competition has brought very important changes in the working environment. Some of these changes, such as increasing part-time, temporary or self- employment (either virtual or true), intensification of labour productivity, etc. have a significant impact on workplace risk.

These important changes require respective updating of the whole approach of workplace risk assessment. The significance of human factors is continuously increasing, as a result of the enhancement of workplace systems by means of complexity, reliability and optimisation.

Especially in small enterprises (SE's), as well as in autonomously operating departments, risk assessment is a technical study, where workers are examined as a stereotype element of the system with a predictable behaviour. This approach, enhanced by the main target of compliance with the technically oriented occupational health and safety legislation, usually sets the focus on the technical side only.

Workplace risk assessment in such enterprises is usually restricted by requirements for applicability and simplicity on one hand and completeness on the other. Thus, the involvement of human factors takes place only to large extent or specific workplaces (e.g. nuclear power plants).

To respond to the new requirements for risk assessment, a multilateral approach is required, where technical analysis will be complemented by human factors' analysis, both in voluntary (risk perception) and involuntary (human error) level. Additionally, to keep up with the requirement of simplicity, this analysis has to be as simple as the technical analysis. Tools for the codification of typical (voluntary or involuntary) behaviour phenomena in workplace have to be developed in order to assist safety engineers taking into account these human factors.

Of course, this analysis will not be scientifically precise but neither the technical analysis usually is. In any case, the final result will be better than not taking human factors into account at all.

Safestart: Basic Safety Training for Jobseekers and Temporary Workers.

DE LANGE H. *Prevention & Interim* *BELGIUM*
DE RO K. *Prevention & Interim* *BELGIUM*

Safestart is a European initiative designed to enhance work floor safety through the development of an e-learning programme. The user can acquire basic knowledge of safety in a user-friendly way and prepare for the "VCA basic safety" training certificate, which is mandatory in some European countries, at his own pace.

Improving Work Safety for low-skilled and high-risk work.

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The composition of the labour market is changing due to trends in society such as globalization, the opening of borders and increasing flexibilization in work. Particularly the lower part of the labour market is evolving rapidly, with workers from new EU member states increasingly being engaged to do low-skilled and usually risky work. This includes work involving exposure to dangerous levels of radiation and substances as well working with machines, working on height and aggression on the work floor. This risky work is often performed by 'vulnerable' people such as low skilled employees, older employees without proper qualifications, 'drop outs', ethnic and/or migrant workers and so on. It has also been found that 20% of the victims of fatal industrial accidents are 'non-Dutch residents' (CBS, 2007).

Existing approaches to stimulate behavioural change and safe behaviour on the work floor level fail to devote explicit attention to the great diversity of people (and their different perceptions of work and safety) in terms of age, language, culture, religion, gender and also health status. In this research existing, mainly participative, (safety) programmes, are assessed on their usefulness and effectiveness. Especially we have been looking for ways to adjust these programmes to the specific needs of the target group: the lower part of the labour market. In this study, knowledge of diverse disciplines, such as safety sciences, HR policy, social innovation and health promotion I used.

In 2007 an exploratory study was carried out of current practices that were aimed at the prevention of unsafe conditions in low-skilled work. This has lead to a framework and a set of do's and don'ts for concrete intervention methods. This research is performed in co-development with companies in the following industries: Construction, Transport; Industry, Agriculture (greenhouse horticulture) and Cleaning.

Health and safety in PPC SA's contractors

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PEPHANIS M. *Public Power Corporation S.A.* *GREECE*

PPC (Public Power Corporation) SA is the greatest company in Greece employing 28.500 persons, all over Greece, in Lignite Mines, Energy Production, Transportation and Distribution and services. Its personnel execute high risk tasks.

PPC SA has a fifty year experience in health and safety. During the recent years its Health & Safety Department was organized taking into account not only the legislation requirements but also the rules of good practice to eliminate risks

Although the field of the work increases, the number of personnel degreases. So PPC is in the constant need of external collaborators. Moreover as the years go by, not only do the number of contractors, subcontractors and its personnel increase, but also the severity and the risk of the tasks they execute has expanded.

On the other hand occupational accidents of PPC personnel gradually degrease. Unfortunately, those of contractors increase; mainly the severe and fatal ones.

PPC, as the owner of the work, has to set rules for H&S and coordinates contractors and subcontractors

The decision of Top Management of PPC was to include contractors in its H&S policy. Therefore the Health and Safety Department had to discus the issue with all the Departments of PPC, in order to find applicable practices. As a result of this dialogue, Health and Safety Department has introduced to the Top Management the final proposals, which were taken unanimously. The proposals include amendments to contracts and internal guidance for the contractors' supervisors.

PPC has already informed the contractors about the issue, put into practice its decisions and is looking forward for the results.

Prevention of harm to cleaning workers

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TREGENZA T. *European Agency for Safety and Health at Work* *SPAIN*

Cleaning is a task that is carried out in all economic sectors, yet cleaning workers are often the forgotten people in an enterprise, their safety and health forgotten when it comes to risk assessment and the implementation of prevention and control measures.

Cleaning workers are at risk from a variety of hazards, including exposure to chemical and biological agents, noise, vibrations, electrical and machinery hazards, the risk of slips and trips, musculoskeletal disorders, and psychosocial issues.

Preventing harm to these workers is not easy, as they are often contractors, working part-time at unsocial hours. However, changing attitudes, and approaching the protection of cleaning workers within the structure of the European directives transposed into all Member States can significantly reduce the risks to this vulnerable group of workers. Not only do employers have to manage the occupational safety and health of the cleaners, but they may also have to consider their procurement policies.

This presentation will consider the structural issues relating to preventing harm to cleaning workers and the practical steps that can be taken to reduce the toll of accidents and ill-health to this worker group.

Improving chain management of contractor safety

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It's getting more and more common for construction work to be organized into short-term projects. The short-term nature of these projects implies that employees are only temporarily needed. Specialised other companies and their employees are hired to perform the work better, faster and usually cheaper. Not only do employers hire contractors, these contractors usually hire subcontractors and a chain of companies emerges (Goudswaard, 2002). A disadvantage of this organisational form is that the number of people and companies involved rises and it becomes more difficult to co-ordinate responsibilities and to monitor the work process. Difficulties in controlling occupational risks arise, leading to an increase in accident rate amongst (sub)contractors (Amerongen 2007, Zwanikken 2001) In January 2007, the Dutch TV programme "Netwerk" powerfully illustrated this problem when it broadcasted a documentary entitled 'The Promised Land'. Netwerk reported a story of an industrial accident involving a Polish employee working via a subcontractor. Netwerk concluded that the company where the accident occurred had shifted its responsibility to the subcontractor: a Polish employment agency that supplies cheap labour.

These notions underlie a research effort on contractor safety and actor chain co-operation/management by TNO Quality of Life (2007-2010), in close co-operation with the Dutch Ministry of Social Affairs and Employment. The project aims to identify opportunities for improving occupational safety in the chain of clients, contractors, subcontractors, and other relevant stakeholders.

The project aims to develop tools or methodologies that help companies in complex chains to better control occupational risks. This should lead to:

- a diagnostic instrument enabling the identification of opportunities for improving occupational safety in the chain;
- specific instruments for resolving commonly experienced problems and issues, published in a "catalogue for chain management".

Major construction or maintenance projects typically involve a prime contractor who makes use of subcontractors. These subcontractors, in turn, engage other subcontractors who, likewise, may also hire further subcontractors. In the resulting complex chain of companies, responsibilities must be closely co-ordinated and monitored to ensure that work can be carried out safely. The large number and the diversity of actors involved appear to have negative consequences for attention paid to safety (Habilis Ltd, 2004; Zwetsloot, 2007). For these reasons and because TNO had previous experience in the building industry, TNO choose to use construction as the subject for this study.

This paper contains the 2007 results and an outlook into 2008 and further.

Managing Quality, Safety, Occupational Health and Environmental Matters in an Integrated System

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BICKEL M. *European Commission-Joint Research Centre* *BELGIUM*

The Institute for Reference Materials and Measurements (IRMM) located in Geel is one of the seven institutes of the Joint Research Centre of the European Commission (EC, DG JRC). The institute was founded in 1960 as a nuclear research centre, but has gradually shifted its activities to also include 'non-nuclear' domains, mainly in the areas of food safety and environmental surveillance.

As the activities on the IRMM site are currently quite diverse, the segregation of nuclear controlled areas, bio-safety restricted areas and chemical laboratories is required. Therefore, the care for occupational health and safety and for environmental protection has to take various types of hazards and threats into consideration. Recently an integrated management system according to ISO-9001, ISO-14001 and OHSAS-18001 was implemented. The integrated system combines quality, occupational health and safety and environmental issues vertically and covers the nuclear, biological and chemical fields horizontally.

The presentation aims to outline the advantages (and some limitations) of having such an integrated management system as opposed to striving for certification for each separately. It will give various practical examples where synergies between these three systems can be applied:

- the overall policy;
- the assessment and ranking of all risks and the identification, in a combined way, of the appropriate prevention measures;
- the planning and review of related actions;
- the monitoring, auditing and registration of anomalies and incidents and the definition of corrective actions;
- the training of personnel based on lessons learned from past experiences;
- the organisation of an internal emergency plan dealing with each hazard type;
- how an institute's safety culture can be enhanced by tackling these three areas together.

Holistic approaches to safety performance evaluation

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The evolution of safety performance evaluation, from incident-based to prospective and recently to holistic approaches, follows the similar evolutionary path of accident causation and safety management. Holistic approaches are characterised by an integrated use of technical, organisational and human factors for the development of a set of safety performance indicators. The aim of this paper is to offer a critical insight in different holistic approaches to safety performance evaluation. Six such methodologies have been selected and reviewed in relation to their conceptual, methodological and practical characteristics.

Contractors works safety management in refineries and petroleum indurstries

DEMENEGAS E. *Hellenic Petroleum* *GREECE*

Management of an Organization, as a refinery or a Petroleum Industry, should have a written and well communicated to all the personnel (organization and contractors) Policy for Health and Safety in the Work places.

The main goal of Refineries or Petroleum Industries Health and Safety Policy is the effective Management of Health and Safety in all the enterprising activities. Is should include the obligation of the Management for the continual improvement of Health and Safety Performance and the installation of an effective Safety Management System that will commit for the continual improvement of the progress in Health and Safety subjects of personnel, through the definition or the revision of goals and targets for Health and Safety based on Tasks Risks Assessment for each activity, Safety Legislation/Regulations and best available techniques.

‘Aiming for zero. Development towards World class safety levels, combining safety culture with management systems within the working environment’.

ANDREW M.A. *BPE Deaside* *GERMANY*
LE GUEN L. *BPE Bonn* *GERMANY*

Over a period of four years Ball Packaging Europe Deeside manufacturing facility has shown a correlation between the numbers of behavioural safety based observations taking place on the one hand and the incidence of accidents occurring in the workplace on the other hand. In simple terms the more observations that take place the lower the amount of accidents that occur. Consistently over the four year period the months that have had the highest amount of observations carried out the accident rate has been zero. There is evidence that the change of the situation which from the majority of observation cards returned being unsafe acts into the situation in which the majority of observation cards returned noting safe acts has undoubtedly contributed to a decrease in accident rates by 68% coupled with no lost time or recordable accidents since 29 August 2004. Ball Packaging Europe has developed a progressive safety programme with the ultimate aim of reducing the incidence of work place accidents to zero.

Ball Packaging Europe has also integrated five key elements of health and safety systems into a Key Performance Indicator (KPI) model that is used by the facilities to concentrate on the areas that have and will continue to drive down their accident rates. Raising safety awareness amongst employees is not just a matter of giving out relevant information but backing that up with practical solutions such as carrying out safety observations that keep employee health, safety and welfare at the forefront of a company’s operations.

Getting to zero harm by effective workforce involvement

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Research from various Member States reveals that trade union Health and Safety Representatives can have a major impact in assisting organisations reduce injuries at work. Most models have been based on trade union supported Health and Safety Representative consultative mechanisms, yet many employees are not in unionised organisations.

By reviewing current research, analysing a series of case studies and workplace initiatives the paper will:

a. identify the main reasons why trade union Safety Representatives are effective;
b. identify the obstacles in health and safety management systems to effective workforce involvement;
c. identify what needs to be in place to ensure all employers can achieve effective workforce involvement, particularly in small-to-medium sized businesses; and
d. how health issues can be addressed at workplace levels, not just safety.

Risk regulation in the North Sea: A common law perspective on Norwegian legislation

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In legal science, there is a distinction between the concept of common law as opposed to statutory law. The current legislation related to safety in the petroleum sector in Britain (UK) as well as in Norway (NOR) has traits from both those two legislative concepts; though the British judicial and administrative traditions are relying much more upon the concept of common law than the Norwegian are. The purpose of this paper is to use the distinction between these two concepts as a framework for an assessment of the development of the Norwegian risk regulatory system. We expect to find strong traits of the common law principle in the Norwegian legislation as well, partly because of the strong bilateral influence between the UK and Norway in the petroleum sector and possibly due to an increasing use of legal standards in the legislative texts used for safety regulation purposes. The method is to analyse the legislation as written text.

An accident investigation method for Labour Inspectors in Greece

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The Body of Labour Inspectorate in Greece is the authority responsible for ensuring the protection of workers at work and promoting legislation adapted to changing needs in the workplace. This paper describes the development of a practical new method for investigating and analyzing occupational accidents, especially designed for Labour Inspectors (LIs) that takes into account 4 areas: workplace, human, management and legal factors. The method is called MILI (Method of Investigation by Labour Inspectors). MILI process breaks down the 4 areas into simpler components with the aid of classification schemes aiming at an integrated accident reconstruction. Results from the application of MILI can reveal patterns of associations between factors, which may form the basis to support the decisions and planning of the relevant Ministry of Employment and Social Protection in terms of policymaking, prioritization of actions, campaigns and accident prevention programs. The method has not yet been validated.

A co-operation process Between Brazil and Cape Verde in OHS Education

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This paper describes the process of cooperation between the Labor Inspectorate of Cape Verde and FUNDACENTRO, the Brazilian Institute of Occupational Health and Safety. The goal of the cooperation was to train inspection personnel aiming at improving the quality of their actions. Accident prevention was established as of paramount importance in Inspectorate Public Action. This paper describes this education program, its conceptual framework and the underlying pedagogical principles. The actual challenge to Labor Inspectorate is to implement a system for occupational injury surveillance, which is in its very begining.

More responsibility concerning occupational health and safety for employers - experiences with implementing a new regulation for the prevention of accidents in German companies

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In 2005 the statutory accident insurance institutions in Germany introduced a new regulation for the prevention of accidents "occupational health physicians and occupational safety engineers" (BGV A2). This regulation contains new concepts for occupational-medical care and safety-related support of companies. The new regulation's goals were not only to create uniform and valid regulations for all industries but also to improve occupational health and safety particularly in small businesses. The BGV A2 differentiates between "standard support" and "alternative support", which companies with up to 50 employees can choose between alternatively. In 007 the Institute Work and Health of the German Social Accident Insurance (BGAG) evaluated the implementation of the regulation for different institutes for statutory accident insurance and prevention (the BGs), among them the BG of the ceramic and glass industry (BGGK). Goal of this evaluation was to gain insight to which extent the companies actually implemented the requirements of the new health and accident prevention regulation. Both entrepreneurs who had chosen alternative support and standard support were asked to participate in a mail survey. A total of 446 entrepreneurs sent back the questionnaires. Nearly 80% of the ones with alternative support and with 10 or less employees did a risk assessment in the last 3 years. Over 75% of these then implemented measures of industrial safety due to the risk assessment. Results of the standard support group with small businesses (up to 0 people employed) were similarly positive. Additional to the quantitative evaluation, the quality of the risk assessment was examined in 56 companies in the context of a site inspection, which confirmed the survey's results. The findings of the evaluation point out that strengthening the entrepreneur's responsibility concerning industrial safety in connection with information and motivation courses can have positive effects on occupational health and safety.

The German guideline on risk assessment

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Aims

The monitoring of health and safety in Germany is executed by two different inspection organizations. A part of the companies and/or OSH requirements were surveyed and advised by the state labour inspection authorities of the German federal states ("Laender"), the other part of the companies and requirements by the inspection services of the statutory accident insurance institutions.

To ensure a uniform level of inspection, consultation and guidance the risk assessment guideline was made. This guideline describes the minimum requirements of a risk assessment as well as the documentation of the assessment which the inspection services ask for. Furthermore, the possible sanctions are listed that can be imposed if the minimum requirements are not met.

Among other things, the following regulations are listed in the guideline on risk assessment:

- definitions
- list of risk factors
- process of risk assessment
- documentation of the risk assessment especially for small businesses as well as non-stationary holdings
- proceeding Approach of the supervisory personnel in the review
- proceedings in advising

In order to guarantee an optimal and harmonised level of inspection, regular exchanges of experience among the inspection services will be executed.

Safer construction through the regulation of subcontracting: the case of Spain

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The building industry has a workplace accident rate, which is much higher than the accident rate in other economic sectors. This is a common situation in most industrialized countries, and is a constant source of worry for both government agencies and official organisms. In recent years, great effort has been made to develop policies with a view to improving work conditions at construction sites.

Although Spain has essentially the same safety regulations as other European Union countries, and has made the improvement of work conditions one of its priorities, the accident rate in the building industry is still higher than the European average. It is believed that this problem is partly due to subcontracting, one of the principal causes of work accidents. In 2007 the government passed Act 32/2006 which regulates subcontracting in the construction sector and RD 1109/07, which further develops this law. The objective of this legislation is to establish and regulate the conditions in which subcontracting is permitted in construction work. This article examines those aspects of the regulation of building industry subcontracting, which are unique to Spain and which do not have antecedents in other European countries. This allows us to evaluate the possible effects that this legislation will have on the construction industry, an extremely complex sector characterized by a high accident rate.

The Occupational Risk Model and the ORM tool

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This paper presents the occupational risk model (ORM) and the software tool developed under the WORM project for quantifying occupational risk. ORM quantifies occupational risk of a worker, by taking into account his various tasks, activities and their hazards. Risk is evaluated for three types of consequences: recoverable injury, permanent injury and death. The occupational risk model is based on a set of 63 bowties, which assess risk owing to different hazards such as fall from ladder, scaffold, roofs etc. Data for quantifying these models come from the analysis of 9000 occupational accidents in the Netherlands in the period 1998-2004 and of the corresponding exposure data of activities and working conditions of the Dutch working population. ORM calculates also the risk profile of a company, consisting of several workers with different jobs. Furthermore, ORM is a tool for risk optimization, since it evaluates alternative risk reducing strategies by taking into account monetary cost, risk of recoverable injury, risk of permanent injury and risk of fatality. Occupational risk assessment and risk optimization together with the software tool will be demonstrated with a case study from an industrial sector. The reported work was performed on behalf of the Ministry of Social Affairs and Employment of the Netherlands under the name of WORM (Workgroup Occupational Risk Model)

Human factors and organisational subsystems in occupational accidents

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In The Netherlands an extensive program of work by the Ministry of Social Affairs and Employment was undertaken to improve worker safety. Within this program the Workgroup Occupational Risk Model - WORM - developed a model for quantifying work activity risks. This model was further developed and turned into a working software tool, the occupational Risk Assessment Model – RAM. The numerator data for the model were extracted from results of the detailed analysis of around 9000 inspector investigations of reportable accidents. The analysis used the software Storybuilder for capturing the richness of the data in a graphical bowtie structure. 36 hazard type structures were built resulting in the identification of 420 safety barriers with a total of 16,314 identified and 8117 unknown failures. Of identified barrier failures there were 16007 known organizational failures across 8 management delivery systems: motivation, procedures, communications, ergonomics, competence, availability, equipment, conflict resolution. This paper concerns the analysis of these delivery systems failures. The results show differences in the dominant organisational failure types according to hazard type. This suggests that organizations require emphasis on different management delivery systems for different hazardous activities.

Risk reducing measures in the Occupational Risk Model (ORM)

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This paper presents a set of measures capable of influencing working conditions with the objective of reducing risk of recoverable injury, risk of permanent injury and risk of fatality. The set is collected on behalf of the Minis-try of Social Affairs and Employment of the Netherlands under the WORM (Workgroup Occupational Risk Model) project for quantifying occupational risk.

Within WORM approximately 10.000 occupational accidents, investigated by the Dutch Labour Inspectorate, have been analysed. This analysis gave insight in root causes for barriers to fail, including the main barrier control task responsible for their failure and the underlying management factors contributing to the main barrier task failures. All this data has been used to define a set of measures that is capable of improving the working conditions that lead to barrier failure and thus reducing the risk. In total some 350 measures have been defined capable of influencing approximately 1100 causes. Apart from detailed information on the measure itself, including its rela-tions to norms and standards, each measure is described by the causes it affects, how it affects these causes, the effectiveness of the improvement of working conditions and the average costs for implementing and sustain-ing the measure. The effectiveness and costs are of critical importance of the risk optimisation in the ORM soft-ware tool.

The effectiveness of the measure is defined on a measure-root cause level and is based on a measure categori-sation scheme (making use of a division of technical, behavioural and organisational measures) that predicts a base effectiveness for each measure. The paper will show how the categorisation can be used and how it can be improved. The categorisation can also be used in determining risk reducing strategies by sorting measures on their characteristics. Outside the ORM tool the measures are available in a database and can be used separately for exploring and querying.

Exposure of workers to occupational hazards and risk related working conditions

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In the Netherlands a model for quantifying occupational risks (Occupational Risk Model - ORM) was developed within the framework of a large program of the Ministry of Social Affairs and Employment to improve occupational safety. For quantification of this model data on exposure to activities and specific working conditions in the Netherlands were collected in internet surveys.

In 2006 and 2007 internet surveys were carried out in two consecutive steps. First, a survey was executed among a representative sample of 30.000 workers in the Netherlands. This survey aimed to deliver data showing the total number of hours workers in the Netherlands are exposed to each of the 64 occupational hazards defined for ORM. Subsequently, per hazard a separate & bowtie specific & survey was conducted among a sample of about 400 exposed workers, to achieve data on risk related working conditions. For each hazard, a set of PIEs (Probability Influencing Entities) was established per barrier or basic event corresponding to concrete, specific and detailed factors concerning behavioural patterns, hardware presence, and rules etc. which affect the quality of safety barriers. The occurrence of these PIEs relative to the total time workers are exposed to the hazard was assessed.

The data resulting from the internet surveys provide a unique set of exposure data that made risk calculations for ORM possible. Moreover, given the magnitude of the exposure data assessed, further analysis will provide a wealth of information relevant for policy and decision makers at national, sectoral and professional level. The data on exposure to hazards are representative for the working population in the Netherlands, which total around 7 million workers, and incorporate many variables that enable the analyses of exposure data on the level of subgroups like sector, job or age. Examples of the exposure data will be presented.

A Fuzzy Inference System for the Estimation of Hazards in Modern Manufacturing Systems

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Modern manufacturing systems generally consist of a combination of mechanical or chemical processes, machines and devices for material handling and storage. These systems are designed to be easily regrouped with other devices in order to permit rapid changes in the manufacturing process. Although such systems have been extensively studied in terms of cost and quality, the issues of risk assessment and hazard prevention require further attention. Risk assessment in such reconfigurable systems is a complex task since, usually, there does not exist explicit mathematical models that relate accidents to the layout of processes.

This paper presents the design and implementation of a Hierarchical Fuzzy Inference System for the determination of: i) a Hazard Index for each process, ii) a Hazard Index due to the proximity of any two processes and iii) a Safety Index for the combination of multiple processes. In order to determine these indices the following were taken into account:

a) Hazards related to the materials handled by the process, according to their classification by the National Fire Protection Association and their marginal concentrations, in accordance to the SEVESO II directive.

b) Hazards associated with the nature of the process itself.

c) Hazards due to the specific operating conditions of the process.

A specific fuzzy controller was designed and implemented for the estimation of each type of hazard described above, and all three fuzzy controllers were hierarchically combined to determine the proposed hazard indices. The principles of fuzzy inference were used in order to combine the knowledge provided by the experts with available measurements in hazardous situations.

The proposed Fuzzy Inference System was evaluated and tested on 640 characteristic examples of processes and it successfully produced the related indices in each case.

The proposed system was found very satisfactory in producing valuable information for the specific process layout and plant design that minimizes inherent hazards, for the localization of hazard sources that may cause major accidents and by providing appropriate safety measures that minimize such dangers.

Effectiveness of safety experts in German enterprises: A long term survey

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The German federal law obliges all enterprises to employ skilled safety experts. Extent and coverage of their mission is stipulated according to dimension and nature of the relevant establishment. The introduction of a reformed education system was the occasion to ask for their overall effectiveness and for changes in their real and perceived occupational role. Moreover, it was to anticipate the further development with regard to deregulation, demographic factors and structural changes in industry. Therefore, the German occupational accident insurance launched a comprehensive survey to sample some 2.500 concerned persons about their cognition by online interviews. Managers an employee representatives are likewise interrogated to cross check the results. The first stage of three within a total of seven years has shown some interesting facts: Safety experts spend much more attention to adjust the hardware against accidents than to a social, ergonomic and healthy working environment. As more they use integrated approaches, e.g. holistic risk assessments, the more they estimate their efforts successful. An interrelation between size of the enterprise and the level of subjective effectiveness could not be found. The survey will be closed and published in 2011. The long-term design will allow conclusions about capital trends and will have a major influence of future national regulation and training programs.

Ageing and occupational safety

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The aim of this article is to look into the possible effects of an ageing workforce on occupational safety in the Netherlands, and to use this information to draw conclusions about effective age-related staff policy. The article analyzes data on occupational accidents in the Netherlands, demographic and personal variables and work-specific characteristics from the Netherlands Working Conditions Survey 2005 by means of multivariate regression analysis. The results show that the overall rate of accidents and the rate of occupational accidents resulting in absence drops as workers become older, while the rate of occupational accidents resulting in absence of at least a month increases slightly with age. The interaction effects identified show different effects of age on the risk of accidents in certain sub-groups. The age-related drop in the risk of occupational accidents does not apply to all workers or all sectors. As young workers are most at risk of incurring an occupational accident, an increase in the number of older workers will have a positive effect on the total number of occupational accidents in the Netherlands.

Effects of the increasing use of mobile information and communication technology at work on OSH

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Mobile information and communication technique (ICT) enters the world of work with a speed corresponding to the technical development of information technology in general. But the needs of working people using mobile ICT are often neglected although their impact on the efficacy of the use of mobile ICT at work is crucial.

Mobile ICT-supported work is a complex socio-technical system which comprises not only technical attributes, but also organisational, technical and social aspects of how an individual using mobile ICT at work is integrated into the work process. Health and well-being are therefore also key factors in mobile ICT-supported work.

The use of mobile ICT is a specific field of interest for research in occupational safety and health since existing standards for work at non-mobile ICT work places, cannot be simply applied to a mobile setting without any adaptation.

Accordingly, there is a demand for an approach to define requirements for healthy mobile ICT-supported work and to design and implement appropriate prevention measures. The interdisciplinary project "Design of mobile ICT-supported work" by the German Social Accident Insurance aimed to determine problems evolving in mobile ICT-supported work by literature analyses and analysis of case studies made in several occupational settings. Further on, it intended to identify focal points for supporting measures, and to provide guidelines for the design of mobile ICT-supported work in order to correspond to the requirements of human-centred work.

The article will provide main results from this research project.

On new Invariants for Occupational Safety and Health for Mobile IT-supported Work

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Today, more and more areas of work face an increasing pervasion by mobile computing. Traditional areas of work are evolving to mobile computing based processes; new areas of work are emerging due to the potential of mobile computing. In parallel the organisation of work and the ratio of work and time in life demand new strategies. Thus, working in a safe and healthy way becomes more and more important for the working individual's health. Work science and occupational safety and health (OSH) today have well investigated the traditional, e.g. technological and ergonomic aspects of mobile IT-supported work. Practical experience leads to the conjecture that in addition business processes as well as enterprise culture have to be adjusted to mobile IT-supported work appropriately, in order to obtain long-term effects on the individuals' well-being.

In this paper the concept of invariants for OSH is used for demonstrating why traditional methods of OSH based on certain invariants, e.g. like work place and work time, are no longer sufficient to and in some cases even invalid for designing healthy conditions in mobile IT-supported work. Furthermore, new invariants for mobile IT-supported work are identified based on which new forms of OSH could be defined. These new forms of OSH shall reflect the special aspects of mobile IT-supported work that are crucial for its healthy design more appropriately. It is shown that, according to the conjecture mentioned above, the most promising way of designing mobile IT-supported work in a healthy way is to include process design and cultural aspects into OSH. Finally, some impulses and directions towards a new understanding of OSH for new forms of work based upon information technology, especially mobile IT-supported work, are given.

Occupational Health and Safety management system in plastics industry.

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Plastika Kritis S.A. is one the most promising organization in region of Crete, expanding its business to all over the world. From the early years till nowadays, company remains sensitive to employees safety and since 2003 runs according to OHSAS 18001 for Occupation Health and Safety management.

Company has developed a systematic way through checklists in order to identify all occupational hazards among working places. Risk assessment is implemented through a mathematical formula in order to make risk classification and plan appropriate preventive or corrective actions. Special Health and Safety Programs had been scheduled referring to identified risks e.q. use and storage of chemical substances, fire safety plans, safety while loading and uploading, protection from rotating and moving parts etc. Additionally, special medical care is provided to all employees from two special Occupational Health Doctors and medical exams are operated every year in order to identify possible health risks.

Through this innovative management system, Plastika Kritis succeeded to minimize accident frequency and absence factors, contributing to employees safety among all companys activities.

Inclusion or exclusion: Two different approaches to safety management when working with contractors

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This paper discusses the organizational challenges regarding safety management and the use of contractor workers as integrated parts of the work processes of an organization. The discussion is based on studies of two organizations in the oil and gas industry (a refinery and a floating production storage offloading vessel), heavily dependent on contractor workers in their work processes. In this paper, we present two different approaches towards safety management regarding contractor workers. One of the organizations studied applies a formalistic approach, focusing on defining interfaces between operators in terms i.a. of responsibility and authority. The other organization seems to emphasize the "inclusion" of the contractors, and to limit the formal interfaces in the daily work activities. These different approaches seem to have different consequences for the contractors' commitment towards the safety measures taken by the managers. We claim that these differences are partly a result of the approaches to safety management.

Managing Safety from a tower of "Babel"

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The scope of this article is to assist us identify the reasons that contribute to ineffective communications between the safety professionals and or, our customers. The focus of this effort is to become aware of potential communication barriers, and how to overcome them. A theoretical model that describes the process which prevents effective safety communications is proposed but was not evaluated for effectiveness.

Finally our objective is for us to increase the clarity of our communications to a level that will effectively reduce the probability of accidents and thus control operational costs.

Biological and Ambient Monitoring of Phthalates in a PVC Proccessing Indurstry

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Phthalates like DEHP (Diethylhexylphthalate), DiNP (Diisononylphthalate) and DiDP (Diisodecylphthalate) are high volume industrial chemicals mainly used for plasticizing PVC. Phthalate content in soft PVC varies between 20 and 40%. Certain phthalates (e.g. DEHP) are endocrine disruptors in animals and have recently been labelled by the EU as suspected human reproductive and developmental toxicants. Phthalates are not chemically bound to the polymer, thus they gas out or leak and expose both the employee and the final consumer. While exposure of the general population to phthalates is well described, data on occupational exposures are sparse. Within this study we examined 12 employees in a PVC processing industry at four different workplaces (extrusion, hotwelding, heatcutting, administration) regarding their external (personal air monitoring) and internal exposure (biological monitoring) to phthalates. All workers carried personal air samplers for 2h during their workshift. We determined twelve different phthalates with limits of quantification (LOQ) <0.025 mg/m3. For biological monitoring we analysed respective pre- and postshift urine samples for 22 phthalate metabolites (representing 11 phthalates) with LOQs <1 µg/l. Air measurements indicated external DEHP exposures during extrusion, hotwelding and heatcutting between 0.023 and 0.56 mg/m3 and to DiNP between 0.026 and 0.41 mg/m3. The German occupational limit value for DEHP (10 mg/m3) was not exceeded. No other phthalates were present above the LOQ. Results varied strongly for identical workplaces and different workplaces could not be distinguished based on ambient exposure measurements only. Biomonitoring results showed significant work-related exposures to DEHP, DiNP and DiDP. In contrast to ambient monitoring, all three workplaces could be distinguished based on biomonitoring results. Employees in hotwelding exhibited highest exposures to all three phthalates 10 to 50-fold above background levels of the general population. In conclusion, biomonitoring can be considered to be a specific and sensitive tool to assess phthalate exposure at the workplace.

Safety aspects of management of change in the process industry

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This presentation deals with management of change in process industry. It provides a connection of theory and practice and presents three accident cases that are affiliated to change.

Change is a must of every business sector and process industry is not an exemption. The importance of management of change and the safety aspects of it are recognized in the regulations like SEVESO II directive, API recommendented practice and OSHA regulation 29 CFR 1910. But these documents provide a high level approach, based mainly on the requirement for proof of efficiency (no accidents). This paper proposes a framework for management of change, in a form of an eight steps procedure.

The paper presents three accidents that are affiliated to change. They are cases that management of change proved insufficient or absent.

1. The first is a fire in a hot oil furnace. It is an example of a change in maintenance procedures
2. The second is an occupational accident, related to change in personnel stuffing of the plant and specifically to outsourcing of maintenance jobs.
3. The third one is a minor fire in a chemical additives vessel that was due to a change in the machinery during maintenance.

The last two are from the author's personal experience as a safety engineer in a process industry.

"Safety matters have become too important for management to leave it up to the joint safety and health committee"

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Corporate social responsibility has become a new buzz word that many larger companies have adopted in their policies. The present study investigates changes in social responsibility on four large-scale construction projects in Denmark, namely the construction of the Great Belt Link, the Oresund Link between Denmark and Sweden, the Copenhagen Metro Link and the National Broadcasting Corporations' Multimedia House. The abstract title is a quote from a safety representative who participated on one of these projects. The aim was to investigate the impact on safety management in the construction industry.

Method: A comparative study based on field data, focus group interviews and administrative data was used to investigate changes in the relationships between internal and external stakeholders in relation to safety management.

Results: New demands from the companies' environment entail that work safety becomes strategically more important for management. This strategic focus contributes to a pivotal shift in the development of work safety, from worker representatives being the primary stakeholders to a shift where the fulcrum of safety development lies between management and stakeholders in the companies' environment.

Discussion and conclusion: For the external relations of the companies this involves an increased awareness of the improvements of performance measurements, and the explication of corporate responsibility directed towards external stakeholders. Internally, this implies that the workers experience that they are left out of work safety matters, as the importance of corporate social responsibility intensifies. It is concluded that CSR compels managers to have a stronger focus on performance indicators, encouraging a tendency to 'cook the books' instead of implementing true safety prevention. Number of accidents becomes more important than severity. These adverse effects of corporate social responsibility are discussed in relation to the four large-scale construction projects.

Evidence-based Prevention through Prevention-based Research

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Even the most scholarly and successful occupational injury research is of little value if the results are not adopted and implemented in the workplace. For science to lead to prevention, researchers must ensure that prevention studies are relevant and applicable to real workplace risks and settings, and that there are appropriate partners or stakeholders who are prepared to carry the results into action for prevention. The endpoint of research plans and protocols should go beyond publication of findings in the literature to include attainable steps to transfer successful findings into workplace policies and practices. Research partners such as industry, trade associations, labor groups, training organizations, manufacturers, regulators and standards-setting groups play an important role in moving research to practice. Involving such partners and attending to their input at every stage of the research, from conceptualization to implementation of results, will help ensure that results are relevant and acceptable, and will promote shared ownership by those who can facilitate adoption and implementation of prevention findings in the workplace. Conversely, industry prevention practitioners who stimulate collaborative occupational injury research, particularly intervention development and evaluation studies, benefit from resultant evidence-based prevention strategies.

Examples of successful research partnership efforts are provided to demonstrate their value and impact in evidence-based occupational injury prevention. Examples include research partnerships with: manufacturers who develop and market safety technologies; education and training organizations who translate research findings into training materials and worker guidance; regulatory agencies and consensus standards groups who develop or modify safety regulations and standards; and safety practitioners and companies who adopt and implement new injury prevention measures. Collaboration between researchers and relevant partners and stakeholders, from project conception to conclusion of research efforts, is critical to transferring research results into injury prevention action.

Examples of evidence-based approaches in accident prevention

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The term “evidence” is most widely used in legal and scientific contexts in the sense of information that would tend to establish a fact. In the medical field, what is known as “evidence-based medicine” seeks to optimize health care. The evidence-based practices used in medicine are now being applied in other fields, including occupational safety and health (OSH). But what does evidence-based safety in OSH really mean and how can it be achieved? A number of projects in Germany have been implemented on the evidence-based model and have reduced accident levels, e.g.

- The use of safety devices has reduced needle stick (puncture) injuries in the health professions.
- A preventive training programme has reduced occupational injuries in the metal and glass industry.

These examples show that the evidence-based prevention approach covers everything from best practice in companies up to scientific expert reviews. Further activities are being developed in other countries. By using all the available scientific knowledge and practical experience in OSH, evidence-based practices can not only successfully prevent occupational accidents, but also improve working conditions and boost productivity.

Measuring enterprise proactiveness in managing occupational safety

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The aim of this paper is to communicate results from and lessons learned from developing and applying a national questionnaire study named ‘Surveillance of health and safety activities in enterprises 2006’ for measuring the initiation of occupational safety activities in Danish enterprises. The questionnaire is designed to capture the level of enterprise pro- activeness by measuring a range of working environment preventive safety activities initialised inside the companies one of these being the management of occupational safety risks. The design of the questionnaire is based on a model that allows us to compare the level of proactiveness along company size and industrial sectors. The questionnaire is send to around 10.000 public and commercial enterprises. The response rate is approximately 76%. The idea behind the questionnaire is to make it possible to identify knowledge aspects, safety climate parameters, and concrete actions in the preventive safety and occupational health activities of the enterprises and public organisations. The questionnaire is centred on the work place assessments carried out inside the companies and it is the third in row of studies that measure the impact of the law enforced initiative into the enterprises and public organisations. Trends from a 5 year period reflecting the changing practises on the enterprise management of work place assessments, extracted from the three studies in 2001, 2004 and 2006, are presented. Likewise we present results from applying the pro-activeness index for comparing the management of occupational risks along company size.

Quality of Prevention - Indicators, Effects and Effectivity

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The research project ”Quality in Prevention – QdP“ examines prevention services of the statutory accident insurance in Germany with regard to effectiveness and efficiency of these measures.

Prevention services are aimed at obtaining, protecting and promoting health, quality of life, mobility and employees’ capability to work. Thereby, a part of the current financial expenditures of the statutory accident insurances, particularly those for occupational diseases, working accidents and following costs for rehabilitation and pension benefits, can possibly be decreased.

The project ”Quality in Prevention“ pursues a number of objectives, e. g. the practically oriented description of the quality of prevention services as well as the identification and development of applicable quality indicators.

In general, the project ”Quality in Prevention“ should form a basis for the optimisation of prevention services in the German accident insurances with regard to their effectiveness in the company and for its employees, evaluate the quality and provide assistance for the German accident insurances prioritisation concerning demand-oriented application of the prevention services.

Networking of competencies: reciprocal action between the BG prevention services

ZIESCHANG H. *German Social Accident Insurance (DGUV)* *GERMANY*

An examination of the tasks encompassed by the BGs' prevention activity, such as regulation, consultation, training, research, etc., soon reveals that these aspects do not act independently upon an enterprise, but that changes to one prevention service frequently have ramifications for the other services, and in turn for their impact. The services therefore act reciprocally upon each other, and at the same time have a joint impact upon the enterprise.

The "Quality in Prevention" project studied the reciprocal effects of the BG prevention services in greater detail. The objective was to identify the actual effects, the services generating the greatest effects, and those most influenced by them. The BGs' research activity was found to deliver major input for the other BG services. Research results, however, do not generally find their way immediately into in-plant OSH activity, since their content must first be prepared for transfer to the conditions in the field. This task falls to the services which are more the subject of influence by other areas than they are the cause of it. Such services include consultation, information, communication and training. These "transfer functions" are performed by the prevention services in the individual BGs. In many cases, one BG employee fulfils a number of functions: he or she may advise enterprises, whilst also serving as a lecturer in seminars and compiling information material. Reciprocal influence between the services is thus direct in this case.

These results must now be followed by consideration of how content from the services with the greatest influence, such as the results of research and development activity, can be channelled effectively into the "transfer functions". A systematic procedure should be developed which ensures that valuable results are actually incorporated into BG prevention activity: comprehensively, swiftly and effectively.

Guidelines for the safer confrontation of seismic riscs in industrial environments

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SALI T. *Architect-Archaeologist* *GREECE*
PETSA K. *Architect* *GREECE*

The objective of the present paper is the gathering, stating and codification of the measures to be undertaken by an industial enterprise, in order to responce in the most proper way to the riscs of a major seismic event, not only as regards to its buildings, but also as to the safety of the personnel, the nonstructural components, the mechanical equipement. The optimum scope is stated to be that the enterprise will operate properly after the earthquake, or at least that it will be back to normal aw soon as possible. The building response to the ground motion is analyzed and there iw a thorough reference to the structural problems that emerge during the seismic design of an industrial plant, dealing with the site, the architectural configuration, the foundations and the structural members of its buildings. Then follows the analysis of the vulnerability of the structural and non structural components, the mechanical and electronic equipements and the mechanological network of the industry and are proposed sertain measures of seismic reinforcement. An individual chapter describes the vulnerability evaluatin method "ΤΑΣΤΡΩΚ" At last is described stage by stage the emergency responce plan for an industry.

Accidents as opportunities for improved prevention strategies in SME's.

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HESELMANS M. *K.U.Leuven* *BELGIUM*
VAN PETEGEHME J. *K.U.Leuven* *BELGIUM*

As in almost all countries of the European Union, Belgium can be proud of a systematic decrease of the number of occupational accidents over the last decades. This decrease shows however a slower evolution as hoped en in addition to that, there are indications that, accidents causing a partial but remaining injury show on the contrary a relative increase. In all E.U. countries small and medium sized enterprises (SME) show proportionally more and more serious occupational accidents . If Belgium really aims to realize one of the principal goals of the E.U. strategy for health and safety at work 2007-2012 (i.e. to reduce the number of occupational accidents by 25% by the end of 2012), the safety behaviour in SME's has to be reconsidered with a intensified attention.

The Belgian Federal Government therefore has decreed recently already a voluntary policy focusing on the reduction of the number of major occupational accidents. The situation for smaller companies will get special attention.

This paper describes the renewed legal framework and analyses critically the investigation results for some fifty recent and major occupational accidents in SME's. The aim is to come to some very clear and essential lessons learned from the experience with that renewed legal approach.

EEC machine directive: effect on safety at work in small and medium sized enterprises

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Purpose of this paper is reporting on INAIL studies on impact of EU "Machine Directives" (89/392/CEE, 91/368/CEE, 93/44/CEE e 93/68/ CEE) on safety at work in the SME (Small and Medium sized Enterprises) since acknowledgement in Italy (1996). The approach of Deming circle: Plan – Do – Check – Act, is proposed to evaluate the law, its effects and improve the Directives.

About 2 millions of small companies have a predominant role in Italian economy, therefore it is necessary to assure them a support holding in due consideration small companies characteristics, their great flexibility and the need for optimization of timing and work methods, guaranteeing, at the same time, quality of supplied product and services, compliance with environmental, safety and health regulations and codes. In order to improve safety, legislation has recently entrusted INAIL with the task of setting up a system providing companies with incentives through the funding of technological innovation projects in the field of prevention. These incentives were addressed to five fields of possible improvement of work safety: replacement of machines without CE mark with machines with CE mark; new equipment installation or plant modification to improve safety; measuring machines installation for evaluation of working environment contamination; working environment renovation; safety management system implementation.

Almost 34% SME's applied the incentives first field: around 294 million euro will be expended for machinery renovation. A statistical evaluation on the accidents at work and professional diseases on the machines is necessary. The activities are: investigation on the number of accidents at work on the machines and how they are happened in two period - the years before and the years after - the acknowledgement of the directives, the number of accidents at work on the machines and how they are happened in the young enterprises. Ten years since acknowledgement of "Machine Directives", in the Italian representative sample of SME in the private sector, the result is a decrease of machine injuries, while total injuries are increased. The given points are a first approach to the topic, and for each of them more specific consideration could be developed. In the future it will possible investigate, also, how many machines with CE mark are not agree with directives requirements.

An Integrated OSH web Platform with innovative tools for SMEs training

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An integrated web-platform for training SMEs on Occupational Safety and Health (OSH) was developed under the MIKROKAT HELPDESK project. The Microkat Helpdesk Platform (MIHELP) encompasses e-learning services and interactive tools in occupational risk assessment and accident prevention practices, providing systematic support in companies. The core element of the platform is a risk factors classification approach taking into consideration fifty five (55) principal harmful factors of the working environment. The platform includes: (a) updated information on occupational risk management matters such as work good practices, occupational risk assessment guidelines, hazards checklists in specific activities; (b) innovative Web-based Occupational Risk Assessor Software (WORAS); (c) e-learning course on OSH; and (d) interactive communication system (forum) for personalized recommendations by OSH experts. This paper presents the prototype platform's tools aiming at improving safety culture and working conditions by proposing good practices for the protection of SMEs employees and thus minimizing risks and preventing occupational accidents.

Have Small- and Medium- (and Micro-) sized enterprises to be bundled together in the OHS issues?

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CAGNO E. *Politecnico di Milano* *ITALY*

Not surprisingly it has been shown that there are higher accident rates in small- and medium-sized enterprises (SMEs) if compared with the case of the larger ones. Estimates suggest that SMEs have serious problems aggravated by limited access to human, economic and technological resources. Moreover, it is now acknowledged that methods developed specifically for large enterprises cannot be simply transferred to smaller enterprises. On this subject, in Italy the decree 626/94 (national implementation of the European Council Directive 89/391/EEC) is argued to fit only large enterprises. Although the debate concerning the size of the enterprises and their corresponding accident rates is ongoing, very little attention is paid to the difference between the small-enterprises (SEs) and the medium-sized enterprises (MEs). In the majority of the cases, SMEs are considered as a whole, in opposition to the large enterprises. In some cases SEs and MEs are studied separately, but only the difference in terms of accident rates is highlighted. Instead, very important information in terms of organizational, cultural and economic differences between SEs and MEs exist, which are useful to design an efficient and effective customized Organizational Safety and Health (OSH) Management System. The identification of these differences have been performed on the basis of two existing data sources: the database of the territorial office of Lecco (a province in Northern Italy) of the Italian Workers' Compensation Authority (INAIL), containing data ranging from the causes of the accidents to the characteristics of the worker for the years 2003-2005, and a survey on the economic, legislative and operational-organizational criticalities that SMEs have to face to achieve the required Occupational Health and Safety (OHS) conditions and to comply the regulations in place prepared and tested in collaboration with API (Industrial Association of SMEs) in the province of Lecco

Identification of OHS-related factors and interactions among those and OHS performance

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MICHELI G.J.L. *Politecnico di Milano* *ITALY*

An enterprise can modify several factors that impact on the Occupational Health & Safety (OHS) performance. Within the E-merging project – to improve safety in SMEs – development context, a thorough literature review, supported by later practitioners' suggestions, has been performed in order to identify the factors which can be related to the OHS issue. Then, the mutual interactions among the identified OHS-related factors and the interactions among the OHS-related factors and the OHS performance have been identified and characterized. This allows to understand the root causes of some evidences and to plan interventions for the improvement of the OHS performance on the basis of a cause-effect link, without invalidating the overall business performance. Finally, some of these links have been tested, through the analysis of two existing data sources.

Evaluating safety management and culture interventions to improve safety: effective intervention strategies & lessons learned

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GULDENMUND F.W.	*DELFT University of Technology*	*THE NETHERLANDS*
VAN LOENHOUT P.L.C.H.	*Ministry of Social Affairs and Employment*	*THE NETHERLANDS*
OH J.I.H.	*Ministry of Social Affairs and Employment*	*THE NETHERLANDS*

The Dutch Ministry of Social Affairs and Employment has provided subsidy over the last three years to a number of companies to introduce changes aimed at reducing accidents by changing their safety culture and aspects of their safety management. As part of the programme a scientific evaluation was set up to assess the effectiveness of the interventions in 17 of the projects covering 29 companies. Before and after studies were made of the companies, documenting the state of their safety management and risk control efforts and their accident rates before the intervention, the changes made over the study period and the resulting changes in a range of measures aimed at assessing the success of the changes. The analysis led to a categorisation of the projects according to their degree of success

This paper describes the patterns of interventions distinguishing between successful and not successful projects and discusses the mechanisms lying behind them.

The authors wish to thank the Dutch Ministry of Social Affairs and Employment for their generous support in funding this evaluation study.

The evaluation and future of the program “Improving Occupational Safety” in the Netherlands

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SOL V.	*Ministry of Social Affairs and Employment*	*THE NETHERLANDS*

From the years 2003 till 2007 the Ministry of Social Affairs and Employment invested into a large policy and research program to improve occupational safety in the Netherlands. During this conference several papers will be presented which will deal with various aspects of this unique program. In essence the program used three startegies: strong communication and publicity aimed at politics and the internal organization to create support and commitment; Gathering knowledge about occupational incidents through the analysis of 9000 investigated incidents and using this as a basis to build a quantified risk model for occupational safety and in the process taking the understanding of how occupational incidents occur to the next level; Encouraging experiments in companies to strengthen safety culture and -awareness resulting in decreasing the numbers of incidents up to 90%. The presentation will focuss on the evaluation of these aspects from the viewpoint of policymakers and politicians in the ministry, the impact it had both national as international and will discuss the opportunities for the future.

Facts and figures learned from the analysis of 10000 incidents

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Approximately 10.000 occupational accidents, reported and investigated by the Dutch Labour Inspection, have been analysed. This analysis took approximately five man years of work, in which the barriers that failed have been identified, including the main barrier control task responsible for their failure, and the underling management factors contributing to the main barrier task failures.

Many things can be learned from this rich source of analysed data. Some examples are provided. For each industrial sector, the corresponding failed barriers are a good basis to develop inspection list of labour inspectors that allow them to focus their on site inspections towards the critical barriers that are responsible for most accidents in that sector.

The failed barriers are grouped into archetypes. Further analysis is done to find out if these archetypes have different patterns of failure in terms of failed barriers and underlying factors. This knowledge might be used to explore which measures might fit best to prevent the various archetype barriers to fail.

Accident prevention in SME using ORM

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DUIJM N.J. *Technical University of Denmark (DTU)* *DENMARK*
TROEN H. *KemiRisk* *DENMARK*

Risk perception in SMEs is normally low, and this is closely related to the fact that the chance of a mall enterprise experiencing a serious accident is very small compared to companies that employ a large workforce. This is a fact even though the SMEs together have a higher accident frequency compared with large enterprises.

To reach the SMEs we must find a way of supporting them, because they normally have neither the time nor the resources to acquire the knowledge and awareness necessary for working with their own safety.

The Occupational Risk Model (ORM) developed by the Dutch Workgroup Occupational Risk Model WORM has been transferred to a Danish context, with the aim of creating a more simple system particularly for SMEs. The ORM identifies the activities in a person's daily work that contribute most to the person's risk and also identifies what conditions need to be changed in order to reduce that risk. Our investigation seeks to determine whether we can use the ORM method to collect information about the risks in SMEs and whether we can present this information in a way that allows the SMEs to use it constructively. Finally we seek to evaluate the impact of this method on occupational safety in SMEs, as the project also focuses on management factors that can motivate the SMEs to increase their risk awareness and own initiatives. The project is now half way through the project period.

October 2, 2008

Human behaviour: The first safety theory

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VAN GULIJK C. *DELFT University of Technology* *THE NETHERLANDS*
ZWAARD W. *Trainer and Advisor* *THE NETHERLANDS*

Industrial accidents are covering a wide area, starting from relative simple accidents, like slips, trips, and falls to the more complex process accidents. Models to understand these accidents originate from the start of the 20th century. While industrial disasters in that period were still considered as acts of God, causes of occupational accident were found either in the workers' capacity to handle hazardous situations, or in environmental causes, like the speeding up of machines and the increased pressures of work. A strong advocate of the so-called 'individual hypothesis' was the Safety First Movement. This movement started in 1906 in the US as a private initiative of the steel industry, and later spread out over Western European countries. Thirteen years later, this focus on human error gained its scientific justification from statistical studies conducted by the British Industrial Fatigue Research Board. This theory, which later became known as the accident proneness theory, assumed the existence of 'the careless worker'. The popular 88-10-2 rule of Heinrich is another expression of a similar principle: 88% of accident causes are human error, and 10% is hardware failure, and 2% are acts of God. Another strong picture is the famous presentation of Heinrich's domino's, with 'unsafe acts' at the centre of a row of falling domino stones. More recently, Behavioral Based Safety programs have been introduced in many companies to reduce accident figures. Critics argue that a 'blaming the victim' explanation of accident causation has returned into the safety discussion by reducing causes of accidents to determinants of behavior.

Best Behaviour: Cognitive and Social Skills for Safety

FLIN R. *University of Aberdeen* *UNITED KINGDOM*

High levels of protection and redundancy are built into modern work environments, but as the hardware and software have become increasingly reliable, the human contribution to accidents has become ever more apparent. Analyses in a number of industrial sectors have indicated that up to 80% of accident causes can be attributed to human factors (Reason, 1990). This means that managers also need to understand the human dimension to their operations, especially the behaviour of those working on safety-critical tasks – at the 'sharp end' of an organisation. Psychologists have long been interested in the factors that enhance workers' performance and minimise error rates (Munsterberg, 1913). We know that human error cannot be eliminated, but efforts can be made to minimise, catch and mitigate errors by ensuring that people have appropriate non-technical skills to cope with the risks and demands of their work.

Non-technical skills are the cognitive and social skills that complement workers' technical skills and contribute to safe and efficient task performance by addressing the causes of human error (Flin et al, 2008). They are not new or mysterious skills but are essentially what the best practitioners do in order to achieve consistently high performance and what the rest of us do 'on a good day'. The aviation industry recognised their importance 30 years ago and continues to sponsor research into pilots' cognitive and teamwork behaviours in order to enhance training and assessment procedures. This presentation argues that the focus on non-technical skills should be extended into other safety-critical work environments, beyond aviation, including heath care. It describes the basic cognitive and social skills, explains why they are important for safe task performance and suggests that they should not only be formally trained but also assessed.

Design for Patient Safety

CLARKSON P.J. *Cambridge Engineering Design Centre* *UNITED KINGDOM*

In 2002 the UK Department of Health and the Design Council jointly commissioned a scoping study to deliver ideas and practical recom-mendations for a design approach to reduce the risk of medical error and improve patient safety across the UK National Health Service.

The study was undertaken by the Engineering Design Centre at the University of Cambridge, the Robens Institute for Health Ergonomics at the University of Surrey and the Helen Hamlyn Centre at the Royal College of Art. The research team employed diverse methods to gather evidence from literature, key stakeholders, and experts from within healthcare and other safety-critical industries in order to ascertain how the design of systems – equipment and other physical artefacts, working practices and information – could contribute to patient safety.

This paper presents the outcome of the study, the government's response, and details of subsequent projects and research that have been undertaken since the initial recommendations were published.

A Nordic questionnaire for assessing safety climate (NOSACQ)

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POUSETTE A.	*University of Gothenburg*	*SWEDEN*
KINES P.	*National Research Centre for the Working Environment (NRCWE)*	*DENMARK*
MIKKELSEN K.L.	*National Research Centre for the Working Environment (NRCWE)*	*DENMARK*
LAPPALAINEN J.	*Finnish Institute of Occupational Health*	*FINLAND*
THARALDSEN J.	*International Research Institute of Stavanger (IRIS)*	*NORWAY*
TOMASSON K.	*Administration for Occupational Health & Safety*	*ICELAND*

There is increasing scientific support for the causal relation between safety climate and safety performance. Many safety climate questionnaires are available, but their theoretical basis is sometimes unclear, and different types of psychological constructs intermixed. A questionnaire with documented validity and reliability in different contexts would make for better co-ordination of research in comparative studies. Theoretical advances concerning safety climate are also a prerequisite for effective practical use in working life. The aim of the present work was to develop a Nordic questionnaire for measuring safety climate, based on theory and previous empirical research. The Nordic development team of the Nordic Safety Climate Questionnaire (NOSACQ) had participants from all five Nordic countries. The work commenced in 2000 and was based on consensus meetings. Based on literature, safety climate was defined as shared perceptions among the members of a social unit, of policies, procedures and practices at management and group level, influencing safety in the organization at a given time. Dimensions to be included were to be selected on the criterion of substantial theoretical or empirical support for their validity for safety motivation or safety outcome. Items were compiled from literature and additional items were construed, when needed. The prototype questionnaire was administered in the construction industry in all five Nordic countries, in three consecutive pilot tests. The questionnaire was subsequently also tested in a sample of workers in the Swedish food processing industry. Instrument reliability was tested using structural equation modeling and Rasch analysis. The results of the pilot tests confirmed reliability and validity of the questionnaire. This supports the generic value of NOSACQ and that it has a potential for use in different industrial contexts. The instrument was also found to be valid for predicting self rated safety behavior, a proximal criterion of safety performance.

Evaluating Safety Culture 10 years On – The Contribution of Behavioural Safety Programmes

MEARNS K.	*University of Aberdeen*	*UNITED KINGDOM*
MCLELLAN P.	*Rwe Npower*	*UNITED KINGDOM*

In 1998 a safety climate study was conducted across a series of geographically dispersed Thermal Power Stations in the UK. The assessment drew attention to the importance of working culture and its contribution to safe working and reduction in harm to people at work. The traditional view of improvement through regulatory compliance and structured safety management systems were identified as a key basis for good performance, but to optimise and achieve excellence a "new ingredient" was required. Given the origin of the safety climate work in the UKCS Offshore E&P Industry, the experiential exchange highlighted that employee-led behavioural modification could be the missing factor.

In early 2001, an in-house programme was devised and implemented across the operating assets. The programme functioned through the collaborative working of local core teams (multi-discipline and in a non-hierarchical form) and the programme is still running today.

Ten years later in collaboration with the Industrial Psychology Research Centre of Aberdeen University, RWE Corporate OH&S repeated the exercise with the following prime objectives.

- To gain an overview of the current safety climate/culture as perceived by personnel (management, supervisors and workforce) during face to face interviews.
- On completion of the interviews, the safety climate survey instrument (previously used successfully in the oil and gas industry) was customised and circulated to gain feedback on attitudes, perceptions and beliefs concerning safety to 632 personnel across the 3 participant sites.
- The data were interpreted to prove meaningful feedback in the form of participant site specific reports.

The paper will present details of the measurement methodology and an overview of how the results are being used to further drive and highlight safety at the operating level.

Influence of Group Level Characteristics, Safety Climate and Trust on Safety Performance on the UK and Norwegian Continental Shelves

THARALDSEN J. *International Research Institute of Stavanger (IRIS)* *NORWAY*
MEARNS K. *University of Aberdeen* *UNITED KINGDOM*

The results of the study are based on self completion questionnaire data from two samples of personnel on offshore oil platforms on the NCS and UKCS. The response rate was estimated at 67% on both shelves with N=170 in the UK and N=621 in Norway. Our results showed that shelf belonging exerted a more stable influence on safety performance than installation belonging. However, the impact of shelf seemed to be mediated by Safety compliance and Safety participation. We also found that Work area, status on the installation and shift rotations had a significant impact on safety performance. Surprisingly employees who had a nomadic status on the installations and who had the least regular shift rotations showed to have a lower risk of being involved in incidents than those being mostly or always on the same platform and having the most regular rotations. Employees judging Trust in workmates showed lower exposure of being involved in incidents, but for Trust in supervisor commitment to safety we did not find a significant impact on safety performance. Two of the safety climate dimensions did show a significant influence, but only safety compliance in a reasonable manner. Risk taking behaviour and Safety prioritization were not showing a significant impact on safety performance.

Do differences in languages correspond with the differences in fatalities?

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ERONEN J. *Helsinki School of Economics* *FINLAND*
HAMALAINEN P. *Tampere University of Technology* *FINLAND*

Background: A previous study in Finland showed that the Finnish-speaking workers had 30-40% higher injury rate than the Swedish-speaking workers. This difference can be attributed to languages and mental models rather than to legislation and safety regulations. The differences between Finnish and Swedish languages were shown to be in mental models. Later these differences were also found among many other languages.

Hypothesis: The longer distance is between languages of two cultures, the bigger is the differences in the occupational fatal injury rate between these countries.

Methods: The Institute of Occupational Safety Engineering at Tampere University of Technology carried out in collaboration with the International Labour Organization (ILO) a data set about occupational fatal injuries during 2001-2006. Our data set covered fatalities from 92 countries. The differences between languages were measured by two different ways: An American measure developed by West and Graham is based on the monogenesis hypothesis and alleged genealogical relations. The alternative structural approach is based on the number of basic grammatical traits.

Results: The product-moment correlation between occupational fatality rate and the American measure was .47 showing that the longer was the language differences, the greater difference was between the fatality rates. The correlation between the structural measure of language difference and fatality rate was .31. However, the regression analysis showed that the gross national productivity predicted the fatality rate better than the language difference. Women's participation in work life was a weaker factor.

Conclusion: This preliminary study showed that some features of languages are related to the occupational fatal injuries. Mental models behind languages are one possible explaining factor to these results.

Safety Culture improvement - Energizing Hearts and Minds in improving Company's Safety Culture.

PAPAHARISIS D. *SHELL HELLAS SA* *GREECE*

This paper aims to describe the steps followed by Shell Hellas A.E, during the implementation of a behavioral program following the Company's decision to focus on a more systematic way to improve the Safety Culture of the organisation.

Shell Hellas is a company of the Shell Group, and operates in Greece since 1926.

Historically the Safety records of Shell Hellas are remarkably good. As a member of the Shell Group, Shell Hellas has the benefit to participate at the Group's Safety programs and initiatives and accumulate experience out the Group's long journey for a continuous improvement on Safety.

Safety is a core value for Shell and it is reflected in all Business Activities (from Operations to Sales, Production to Transportation, Office to Field activities).

This priority is expressed trough the Company's Policy and Commitment to Health Safety Security and Environment (HSSE) and the subsequent HSSE Management System.

This approach is not new for many Companies and especially for those in the Oil Sector.

Formal and Informal Safety Management

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BACHARIAS Y. *Erasmus University of Rotterdam* *THE NETHERLANDS*
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Purpose of this paper is reporting on INAIL studies on impact of EU "Machine Directives" (89/392/CEE, 91/368/CEE, 93/44/CEE e 93/68/ CEE) on safety at work in the SME (Small and Medium sized Enterprises) since acknowledgement in Italy (1996). The approach of Deming circle: Plan – Do – Check – Act, is proposed to evaluate the law, its effects and improve the Directives.

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A plan to improve the occupational safety and health in the construction industry from the governmental point of view

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Cyprus is in urgent need for a modern, effective and comprehensive strategic plan that would set the framework and pace the way for improving the occupational safety and health (OSH) in the construction sector. The plan should engage, involve and give roles to all social partners, and other organisations involved in the construction sector in the Republic of Cyprus.

This paper promotes and describes, in the form of a plan, an approach that combines a mix of education, training, advice and information, incentives and enforcement that will lead to sustainable and substantial improvements in the field of OSH in the construction sector. The expected gains from the implementation of the proposed plan are of both financial and social nature. The proposed approach is consistent with the reported attitudes, behaviours and idiosyncrasies of employers, employees and other parties involved.

Preventing accidents in ERGOSE' s worksites

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ERGOSE S.A., a subsidiary company of the Hellenic Railways Organization (OSE), was established in 1996 to undertake the management of the Organization's Investment Portfolio which is co-funded by the European Union. ERGOSE is implementing its Portfolio having committed itself to completing it under the safest working conditions for all its worksites all over Greece. For this reason from 2003 ERGOSE has been implementing its Safety Management System. In 2007, the Safety Management System was certified according to the OHSAS 18001:1999 standard by the Certification Body Lloyd's Register Quality Assurance. The purpose of this paper is to present the progress that has been made from 2003 until the end of 2007, referring to the management of the Health & Safety issues in ERGOSE's worksites. More specifically, the paper aims to present the Company's practice for the prevention of accidents in its worksites, to analyze how information from lessons learnt is applied to future projects, to demonstrate three cases of best practice resulting from accidents and to show the Company's achievements with regard to accident prevention within the period 2002-2007. In addition, ideas are also presented on the current status and culture regarding the application of safety measures in the Greek construction sector, including ERGOSE's future plans concerning both Health & Safety and Environmental issues.

Health and Safety management in quarries industry

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Quarries industry in Greece, continually improves all its economy indexes following the growth of the construction market. However, quarries are still hard and dangerous working environments with many serious accidents, even fatality incidents. Statistics prove that a lot of aspects should be taken under consideration, in order to improve health and safety standards in this kind of enterprises and maintain employees safety. To achieve maximum effectiveness in Health and Safety management in quarries, a methodological tool is proposed and described. The research team has carried out detailed and analytical hazard identification among working places and equipment of a quarry industry in East Crete. According to the results, most hazards involve moving heavy vehicles, rotating machinery parts, constructions integrity, explosives, dusty and noisy working places. As hazards are identified, risk assessment is implemented through a quantitative model and a dynamic list of risks is generated. For the most critical risks, corrective or preventive actions are proposed according to worldwide best practices in quarries industry. Finally, training programs and instruction leaflets are proposed for employees awareness.

Emergency Management for Crisis Situations at the Workplace

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Crisis awareness is essential to ensure that effective provisions are put into place. Crisis plans need to be drawn up and an early warning system should be installed to indicate impending crisis situations and specify clearly the course of action to be taken. Damage limitation is the primary objective. Post-crisis evaluation is also extremely important and supplies feedback on how the crisis plans should be adapted.

The Berufsgenossenschaft institutions provide support to their member companies and their members' employees to help them handle crisis situations.

"Grubenrettungswesen" Mine Rescue Service

In order to counter the particular risks prevalent in mining, well-trained mine rescue teams are on hand to deal with emergencies, conduct rescue operations, fight pit fires and protect plant. They are supported centrally by the Mine Rescue Service of the Berufsgenossenschaft responsible for the mining industry.

Rescues from heights and depths

Work involving a risk of falling from a height requires personal protective equipment to be used. Persons who fall must be rescued as quickly as possible.

Berufsgenossenschaft institutions offer the necessary training to enable employees to conduct rescue operations at height/depth.

In addition to the various rescue techniques, the training presents the necessary emergency equipment and provides an opportunity for employees to practise using it. It also provides information on specific first aid issues, e.g. measures to be taken when a person has been suspended on a rope for a long period of time.

First aid at the workplace

In order to cope with workplace emergencies, all companies need to have the relevant organisational structure, personnel and equipment in place.

Company first-aiders have an important task within that set-up. They receive initial training in first aid, followed by further training every two years.

Measuring the effectiveness of the H&S Management System of ERGOSE S.A. and increasing personnel's involvement in H&S related matters

SPYRAKOS V. *Ergose S.A.* *GREECE*
DOUVI E. *Ergose S.A.* *GREECE*

ERGOSE S.A., a subsidiary company of the Hellenic Railways Organization (OSE), was established in 1996 to undertake the management of the Organization's Investment Portfolio, which is co-funded by the European Union. ERGOSE is implementing its Portfolio, having committed itself to complete it under the safest working conditions. In this context, ERGOSE has developed a Safety Management System covering all Company's activities. The Safety Management System started in early 2003 and in 2007 the Company obtained the relevant compliance certificate, in accordance with the requirements of OHSAS 18001:1999. In June 2007 the effectiveness of the Safety Management System was measured for the first time using a questionnaire. The scope of this study is to present this Questionnaire's results and how these results are going to be used in the future in order to improve the System's effectiveness. The Questionnaire was used to measure the existing contribution of the H&S Department to the current H&S status of the Company, the efficiency of employees' knowledge on how they are planning to react in cases of emergency, their interest in using the Health & Safety Intranet Site and the degree in which personnel is interested in the information that is issued by the H&S Department. It also measures the interest of the personnel in participating in events organized by the H&S Department (seminars, drills etc), helps discover areas for further training and urges people to report accidents and near misses that occur within the Company's working environment. Based on the results, actions were taken like immediate changes in the Health & Safety Intranet Site in order to make it more useful and implementation of seminars according to the needs and other similar actions.

An analysis of the integration of quality, environmental and safety management systems in Brazilian construction companies

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This paper analyzes the adoption of an Integrated Management System - IMS model for quality, environmental, health and safety at work in small and medium construction companies operating in the residential construction segment in Brazil. An analysis of the integration of quality, environmental and safety management systems practices is developed based on study cases. These cases evaluate how companies in this segment develop strategies and models to bypass all adversities found in the market environment and create effective and efficient management systems to implement and monitor continual improvement in their operation field. The Building Construction Industry sector in Brazil is characterized by permanent instability and huge ups and downs in short periods of time. This is highly influential in the implementation, operation and integration of Management Systems leading to certification. These management systems are implemented using ISO 9001 for quality management systems, ISO 14001 for environmental management systems and OHSAS 18001 for heath and safety at work management systems. As a result of this study we found that once applied, these management systems promote positive results rationalizing operational processes and optimizing productivity, supplying these companies with basic conditions to overcome market environment problems. The analysis of the establishment of this methodology for the implementation of an IMS is based in the study of fifteen Brazilian construction companies. Two questionnaires were applied and thirty six managers were interviewed. The implementation of an IMS proposed system was checked against their traditional practices for quality, environmental and safety management. The operation of a safety management system in a IMS environment, including mandatory Federal, State and Municipal, legislation and regulatory rules was evaluated. Final results and a discussion is also presented.

Causes and Circumstances of Accidents to Cleaners in the Portuguese Service Sector

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This paper characterizes work accidents at Portuguese industrial cleaning companies, operating in the service sector, through the application of ESAW methodology. Data was codified based on the analysis of 748 accident claims to insurance companies (number of days lost ≥ 1 working day) in 3 large industrial cleaning companies for the period 2001-2003. Slipping and falling in the same level was the main deviation from the normal working process in the moment of the accident (in 25% of the accidents); uncoordinated movements was the second cause of accidents (14%); falls of persons to a lower level was the third cause of accidents (~10%), including falls from stairs (~7%) and falls from ladders and mobile ladders (~2%); globally, body movement under or with physical stress, including lifting, carrying, putting down, bending down, twisting, turning, trading badly, twisting leg or ankle and slipping without falling, were the cause in 17% of the accidents. Lower limbs were injured in ~25% of the accidents, hand and fingers in ~14%, the eye in ~4% and the back in ~9% of the accidents. An incidence rate of 3,580 accidents/100,000 employees was found to the sector (2003 data).

Validating trends in the Danish National Injury Register

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All lost time occupational injuries in Denmark are to be reported to the Danish Occupational Injury Register (DOIR). Over the last few decades various sources of data have indicated that only about 50 pct. of all reportable injuries are actually reported. It is unknown whether trends in reported injuries over time could be attributed to true trends in the injury rate or merely to variations in the proportion of reportable injuries actually reported. The objective of this study was to develop a tool to estimate the reporting ratio (the proportion of reportable injuries reported) to DOIR on a yearly basis. Data from five major emergency departments (representative of Denmark and covering about 17 pct. of all emergency department visits) regarding occupational related injuries in the period 1997-2006 were merged with DOIR using Danish residents' unique personal identification number and the date of injury. Occupational injuries were categorised as serious (amputation, fracture, crushing, nerve lesion) or minor. All serious injuries were expected to be followed by a period of work absence, and by definition be reportable injuries. The proportion of serious injuries reported is thus a direct estimate of the reporting ratio to DOIR. The emergency department data included 9,121 serious and 124,884 minor occupational injuries. DOIR included 412,310 injuries. Of the serious injuries registered at the hospital emergency departments 46.9 pct. (n=4,276) were reported to DOIR, whereas only 17.5 pct. (n=21.888) of the minor injuries were reported. Both the reporting ratio of serious injuries and the proportion of minor injuries reported were constant over time. The method provides a simple and valid yearly estimate of the reporting ratio of reportable injuries to DOIR. Trends in the reported number of injuries in DOIR can hereby be inferred correctly, and appropriate action for the national occupational injury prevention programme can be taken.

Occupational Health and Safety in the Italian Hospitality Industry

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Accommodation and restaurant includes hotels, clubs, holiday villages, pub and restaurants. In Italy, around 900.000 people are engaged in incentives activities, a number increasing more and more. It is a dynamic industry characterized from different series of duties and working activities. So different activities require dedicated training solutions regarding health and safety at work. More then 30.000 injuries denounced for this activities, a worrying data compared to the number of injuries registered in the other european countries. The analysis of injuries frequency average data in the range 2004-2006 for activity sector confirm this worrying. Accommodations' and restaurants' frequency index is comparable with the industry average index. Very few studies in Italy have been developed on this subject. For this reason, the job analyzed in this paper has been designed. The purpose of this preliminary study is to present the updated situation regarding injuries data trend and of the main causes of happening obtained within a more complex project on the main possible preventive measures to apply so to reduce the phenomena. In the first step of the study have been analysed injuries data extract from the National Italian Institute for Worker Compensation database together with the statistic data reporting the injury way of happening recorded with European Statistic Accident at Work code (ESAW/3). Furthermore, data extract from International Labour Organization have been used to characterize some european and extra-european nations. Hospitality industry is a particular area in which necessary to apply proper health and safety solutions, to be able to develop the best strategies in the organization context and to assure the occupational injuries and diseases prevention.

Relative importance of management influences on reducing flight crew errors

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This paper reports the results of a study using paired comparison expert judgements to assess the importance of management influences on 2 preconditions which influence pilot errors in the aviation. We have developed a new method to be able to quantify the size of organizational influences on risk.

Analysis of Accidents in the Shipyard Industry

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Aim - The causative investigation of accidents that happened in shipyard industry.

Method - The archive of accidents recording was kept in the Occupational Health Department (OHD). 161 accidents were analyzed that happened during a 14 months period.

Results - From the 161 accidents that were recorded, 59 (36,7%) were concerning injuries of upper extremities with varying severity, from which 4 were fractures, 29 (18%) of lower extremities, 20 (12,4%) external injuries on eye (mainly burs of metals), 20 (12,4%) fracture of the skull, 9 (5,6%) sprains of feet, 15 (9,3%) injuries in various body sites and the 9 (5,6%) burns (chemical and thermal). The analysis of causes of accidents showed that 43 (26,7%) were owed in falls of workers themselves, 27 (16,8%) were owed in falls of objects, 26 (16,2%) in use of hand-held tools, 22 (13,7%) in airborne foreign bodies (by grinding or sandblasting), 13 (8,1%) were owed in collision in objects, 10 (6,2%) in lifting of weight, 8 (5%) in exposure to chemical substances, 7 (4,4%) in use of machines and 5 (3,1%) in road accidents. The most serious accidents were owed in falls of objects (amputation of hand column and 3 from the 4 fractures more utmost).

Conclusions - The most frequent cause of accidents was the fall of workers themselves. This was owed in disarray and lack of cleanness of working places, in abnormalities of floor and streets, in the insufficient lighting, in the absence of protective means in ladders, shafts, in carelessness and inexperience of workers, in the lack of labelling etc. The more serious accidents were owed in fall of objects with likely causes the disarray, the limited space mainly in work inside the boats, the inexperience and the lack of education. Many of the accidents could be avoided if the workers used the individual means of protection as visor or mask of person for protection from the airborne foreign bodies. The road accidents can be attributed mainly in thoughtlessness of workers, but also in weaknesses in safety policy. The analysis of accidents via detailed investigation is fundamental obligation and prerequisite for the determination of priorities with regard to their prevention. The incitement of interest of workers in health and safety constitutes perhaps the biggest challenge for the Service of Health and Safety in the industry but also condition for the achievement of her objectives.

Job title and absenteeism related injuries in heavy industry employees

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Aim: To examine the orthopedic and surgeon related absences per job title in order to target the prevention of accidents in a heavy industry.

Methods: In a three year period the total spells of absence in a shipyard and the related injuries were recorded. The absenteeism due to orthopedic or surgeon causes was classified per job title.

Results: The total spells of absence were 7026. Out of them the 25.6% were among the platters and the 1.8% among the sand (grit) blasters i.e. the highest and the lowest percentage respectively. The orthopedic and surgeon related absence represent the 31.4% of the total. However, the analysis of absenteeism within each group of workers showed that the absences related to the above two causes were ranged from 46.1% for tug boat personnel, followed by 45.2% for chipper-riveter and 41.2% for riggers/ propeller fitters to 28.9% for practical engineers.

Conclusion: Orthopedic and surgeon related injuries represent a highest percentage of the total absences. There are certain occupational groups that orthopedic and surgeon injuries are much higher than that of the average. Special preventive measures should be taken in these high risk groups of workers.

Occupational accidents in the local public sector in Finland

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A fair share of all occupational accidents in Finland occurs in the local public sector. In national statistics only sector specific information about local public sector occupational accidents is available. The national occupational accidents and diseases database was utilised to produce more detailed information about municipal workplace accidents, especially by occupational class. On the basis of the results the most hazardous occupational classes in the Finnish local public sector were, among others, agricultural work and metal and machinery work. Assuring the quality and targeting the consistency of the statistics is essential for retrieving occupational accident information according to occupational classification. For accident prevention it is recommended that even more detailed information than occupational class specific data is provided.

Major accidents involving hazardous materials: occupational safety risk assessment

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The purpose of this study is to develop a methodology for the evaluation of Safety Reports according to the directive Seveso II. Specifically, the evaluation concerns the impact on workers health and safety in the event of a major industrial accident involving hazardous materials. The industrial area is classified according to "consequence zones" for each accident scenario as described in the Safety Report. These zones are determined according to the intensity of the phenomena following accidents, such as thermal radiation, blast wave, concentration of toxic substances, etc.

Following the above classification scheme, the protective measures for each section of the plant, as described in the Safety Report, are determined (e.g. the operational centre site). Moreover, emergency procedures are examined for evacuation routes, assembly points for the personnel, personal protective equipment, etc. This methodology was applied in a pesticides storage plant and the results are presented and discussed.

Consequence zoning sensitivity for employees of a major accident hazard site: the case of refinery control room

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The scope of the present study is how the employees of a site handling dangerous substances can suffer less consequences in case of a major accident. The study examines the sensitivity analysis of critical parameters involved in the assessment of consequences of major accident scenarios in a "Seveso" industrial site. It focuses on thermal radiation levels and shock waves produced by phenomena such as, BLEVE, Pool Fire, and Vapor Cloud Explosion (VCE), that can affect employees working within structured workplaces and not in the open. The Sensitivity Analysis examines parameters such as: critical mass of dangerous substance released during a major accident (loss of containment), degree of confinement of dispersed explosive cloud, bursting pressure at the time of vessel rupture, etc. The sensitivity analysis helps to identify critical parameters at which consequence assessment is more sensitive and thus propose basic design improvements and controlling measures that can minimize the extent and severity of thermal radiation and blast overpressure to employees. The most important parameters related to common types of major accidents have been identified.

A case study examines major accidents in refinery units and their consequences to critical employees working in the central control room of the establishment. Critical parameter values are identified at which effects of worst case scenarios to employees are diminished to acceptable levels.

The outcome of this study can be helpful to the safety optimization of process design and the planning of safe location for critical workplaces. The methodological approach can also be used as a decision support tool for safer working conditions in major accident hazard sites.

Accident prediction based on historical incident reports: Could the blow-out at Snorre A have been predicted?

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This paper discusses the possibility to predict the possibility of major accidents based on (1) historical reported data, and (2) questionnaire based surveys. This discussion is based on a major gas blow-out at Snorre A oil platform in the North Sea in 2004. The investigations in the aftermath of the incident identified several underlying causes. Any how, these causes identified in retrospect were not considered as serious threats in advance of the incident. It was a dominant belief among managers and employees that the safety level was satisfactorily. This view was partly based and legitimated by the safety records. The interpretation of the safety records indicated a reasonable safety level. In addition, a questionnaire based survey that had been carried out a few months in advance of the incident was interpreted as a confirmation of the dominant view. The survey which measured attitudes and opinions, showed excellent scores regarding attitudes towards safety, and that the majority regarded the safety standard as very high.

This paper presents an analysis of the safety records and the survey in a retrospective attempt to identify potential signals that could have been interpreted as indications of in-built serious hazards of the operational processes and a lack of robustness in the safety barriers of the organisation. We claim that the questionnaire based survey and the analysis of the historical data in terms of frequencies, hardly could have been used as an indication of the upcoming incident. Any how, by analysing the qualitative information of the reports, there are some repetitive patterns that could have been interpreted as an indication of several in-built hazards in the operational processes of the organization. Further, we discuss why these potential warning signals was not brought to the surface of the public memory of the organization in advance of the blow-out.

The Regional Emergency Plan Requirement: Application of the best practices to the Brazilian case

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The objective of this study is to define new requirements for a Brazilian Regional Emergency Plan based on the best practices used in countries such as the USA, UK, Canada, Japan and Australia. Therefore, the risk analysis methodologies and emergency frameworks used in these countries will be taken into account and a critical analysis will be carried out in order to customize and apply their best practices to the Brazilian case. In addition, other issues will be looked at, such as the number of accidents and environmental impact in some areas, related to environmental sensitivity in order to define the environment reliability of the whole system in a specific area. Currently in Brazil resources are not optimized in an emergency offshore plan, rather company has to implement its own emergency plan without any kind of coordination. Despite the existence of some procedures, there are no national or regional frameworks to coordinate emergency plans in Brazil.

Modeling of organizational and management changes in work environment through a prototype Safety Management System

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The present work attempts to analyze organizational and management changes of the work environment through an integrated model of Safety Management Systems (SMSs) for the control of accident hazards involving dangerous substances. The proposed model consists of SMS elements according to legal requirements of SEVESO II Directive. Moreover, it takes into consideration 30 principal organizational and management factors related to important safety operations. All SMS elements and factors are represented in a model action-flow diagram with interrelations using the Structured Analysis and Design Technique (SADT). The action-flow diagram comprises work-flow loops that describe procedural and action sequences related to important safety operations. Safety performance is quantified by linking the probability of top events to SMS elements and safety related factors. This way specific organizational and management factors can be identified as underlying causes of system failure and system performance. A case study using a specific accident scenario and work-flow loops demonstrates how changes in the organization and management of the work environment in a company greatly affect the reliability of the safety system.

Accident investigation versus the European Machines Directive

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The author has over 30 years of experience in the investigation of major accidents in Belgium as a forensic expert.

In that practice he faced several times a cause due to an insufficient use of the fundamental requirements of the European directives, e.g. the Machines Directive.

From that experience, the author will give several exemples and propose a better prventive control system, in order to avoid such major accidents, the costs and the sorrow.

Exploring risk-awareness as a cultural approach to safety: Exposing the gap between work as imagined and work as actually performed

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Safety culture has risen to prominence over the past two decades as a means by which organisations may enhance their safety performance. One way to conceptualise safety culture is as an interpretive device that mediates between organisational rhetoric and safety programs on the one hand, and how local workplace cultures make sense of and choose to interpret the rhetoric and programs on the other. More recently, risk-awareness has emerged as a cultural approach to safety. Front line workers are encouraged to become risk-aware through programs designed to prompt them to undertake mental or informal risk assessments before commencing work. The problem is that risk-awareness programs have not been the subject of systematic research. Therefore, the purpose of this ethnographic study of two sites within a large contract maintenance organisation in Australia was to explore the impact of a risk-awareness program upon workers’ awareness of risks, their risk control practices, managers’ practices in relation to the program and the impact of the program on safety culture more generally. This study found that managers focused upon collecting the paperwork associated with the program whereas workers preferred to rely upon their common sense to keep them safe. For workers, the completion of the paperwork became a ritual that served to appease the organisational rhetoric about safety but had minimal influence upon their awareness of risk and their risk control practices. Consequently, the paperwork created an illusion of safety for managers as much as common sense did for workers. Therefore, this study found a gap between work as it was imagined by the managers and work as it was actually performed by the workers. The results of this study have implications for the design of risk-awareness programs and the role of risk-awareness programs in sculpting a culture of safety.

Safety Culture and a Safe Work Environment in the Construction Industry: A leader-based Intervention

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Background: In many countries the construction industry is one of the sectors having the highest frequency of accidents including fatal accidents. At the same time, the construction industry is characterized by a temporary work environment and temporary social compositions of management and employees. These temporary characters make interventions difficult when targeting both the work environment and the safety culture.

Purpose of the study: The aim of this study was to reduce the hazards at construction sites by a leader-based intervention. It was hypothesized that an improvement in the leaders' safety communication with their employees would lead to a safer work environment and thereby a reduction in hazards, as well as improvements in construction site safety culture.

Methods and data: The study is based on safety measurements at five construction sites, with two intervention work gangs and three control work gangs. Data were collected every week over a maximum 42 week period. Micro interviews (n=1700) uncovered the content of the gang foremens' communication with their employees, safety rounds uncovered the hazards in the work environment (n=22000 safety observations), and safety culture questionnaires (n=100) were filled out before and after the intervention. Every fortnight during the intervention phase the gang foremen on the construction sites were coached by the authors and were given feed-back from data concerning the frequency and content of their verbal communication with their employees.

Results: Even though the results show heterogeneity, the study demonstrated that by improving the foremens' verbal safety communication with their employees, it was possible to significantly improve the safety of the work environment and safety culture, compared to the control work gangs.

Conclusion: By improving the construction gang foremens' communication with their employees concerning safety, it is possible to create a safer work environment and improved safety culture, which are proximal estimates for work-related accident. Furthermore, the improvements seem to last over time. However, the results must be interpreted with caution because of the heterogeneity in the results across the construction sites and the limited number of cases.

Stability and changeability of safety climate in a Norwegian hospital

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Few studies have been conducted regarding the stability and changeability of safety climate in hospitals. The aim of this study was to investigate this topic with a longitudinal study at a Norwegian hospital. Hospital Survey on Patient Safety Culture (HSOPSC) was selected after a review of available safety climate instruments because the dimensionality of HSOPSC covered general topics revealed as part of a broader patient safety project and studies have shown that HSOPSC has met more psychometric criteria compared to other instruments (Flin et al., 2006). The target group included health workers at the hospital and other personnel employed in the same working environment as the health care personnel. The response rate was 55 (N=1919) percent at the first sample (T0) and 49 (N=1703) at the second sample (T1) two years after. To measure change, MANOVA (Wilks' Lambda) was conducted to examine if there was overall changes on HSOPSC concepts and independent sample t-tests were utilized to investigate changes separately on each measurement concept between T0 and T1. Results generally demonstrate that the safety climate level is relatively stable during the period which indicates that interventions implemented have had relatively little impact on safety climate dimensions: Three safety climate dimensions were improved and two reduced. Still, changes on the safety climate dimensions were associated with small significant improvements on two out of three outcome measures: Patient safety grade and Stop working in dangerous situations. Results indicate that the level on safety climate at the hospital is relatively stable and that more comprehensive interventions are necessary to improve the climate level more extensively.

Safety culture aboard fishing vessels

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Safety at sea is a serious issue for the commercial fishing industry. Between 1976 and 1995, the risk of a fatal accident at work was 52.4 times higher in the British commercial fishing industry than in Great Britain's general workforce (Roberts, 2002). Fatality rates are between 25 to 40 times the national average in many European counties, Australia and the USA.

Using both self developed items and items from published research, a 50-item safety culture questionnaire was developed. The questionnaire was distributed to fishermen in a self-administered form. A total of 209 questionnaires were collected. Principal Component Analysis (PCA) revealed 9 factors, all with a Cronbach's Alpha higher than .68.

The factors were tested using ANOVA, t-tests, correlations and regression analysis. Significant differences were found between age groups, vessel types, occupations, and whether or not a close family member was a fisherman. The safety attitude of management had a strong influence on a company's safety policy.

Fishermen who had to seek medical attention during last year due to accidents showed a significantly less positive attitude to rules and regulations and a less positive safety attitude in general. Fishermen who had been involved in a serious accident/incident showed a significantly more positive attitude to rules and regulations.

Safety cultural assessment among management, supervisory and workers

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The rapid growth of petrochemical and refinery industry in recent ten years in Iran, has contributed to a lot of concerns, in terms of safety and health. The main purpose of the present study is a scientific assessment of safety culture perception among three work groups of workers, supervisors and senior managers. Having designed and validated a safety culture questionnaire, they were distributed among work groups and the obtained data was thoroughly analyzed.

High Interco relations were found among 10 safety culture factors which have been determined through a confirmatory factors analysis. The attitudes of three groups of respondents towards safety culture were found to be quite divergent. The findings put a great deal of emphasis on the role of managers as major establishers of safety culture

Keywords: safety culture, management, attitude

Can the Quest for Good Corporate Governance Motivate Improved HSE Management?

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"Corporate governance" refers to the system by which business corporations are directed and controlled. Most corporate governance frameworks do not include explicit requirements on HSE (Health, Safety and Environment) management, but they do include a requirement that companies comply with laws and regulations. Some frameworks pay great attention to risk management, but leave to the company board to define what risks to focus on. A few frameworks include sustainability indexes. The purpose of the reported study was to explore the potential for building synergies between corporate governance and HSE regulation in the Norwegian petroleum sector.

We studied how five major companies that are active in the Norwegian petroleum sector presented HSE management and corporate governance in their annual reports in 2004 and 2005. All companies made an effort to convince the reader that aspects of HSE were central to their values or their company culture. None of the companies made explicit links between corporate governance and HSE management in their annual reports. Several companies described how they complied with corporate governance requirements and recommendations, whereas none described how they complied with laws and regulations on HSE management. Only one company discussed HSE-related risks as risks to the investors.

We argue that quest for better corporate governance may give listed companies an additional incentive to pay attention to HSE management, beyond the incentives associated with the threat of regulatory sanctions in case of violations. This applies in particular to companies that are mainly owned by long term investors. A critical factor appears to be the extent to which companies and owners view HSE-related risks such as the potential for major accidents as a threat to the interests of investors.

Human performance technology and working reliability

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BUROVA O.O. *State Enterprise Ukrpatent* *UKRAINE*

Introduction

It is known up to date a lot of methods, techniques and units patented and published that used for human performance reliability assessment and prediction. But their efficiency can be evaluated really only from viewpoint of prediction of occupational risks related to a human safety and reliable work.

Purpose

Identification of reasons confines accuracy of a human operator performance prediction and ways to improve analysis of present and desired level of performance, identifying the drivers for the performance gap, solutions to improve performance and evaluating results. Significance of the proposed presentation lies in demonstration of reasons why traditional occupational safety ways cannot ensure the high level of prediction and control of human performance reliability.

Methods

Complex of methods and principles of computer systems synthesis for operators capacity prediction was developed. It relates to different stages of their professional biography, methodical and software tools for experimental research of operators professionally important psychophysiological qualities.

Results

Theoretical, practical results and tools concerned work of operators are discussed. Their validity was checked at the power industry for more than 500 professional operators. After results of observation they were built regression models and they were investigated in relation to number of variables included into models (8-9) as well as their stability. These results differed from traditional hypothesis that the more variables were included into model the higher is accuracy of prediction. This phenomenon is discussed.

Efficiency and effectiveness of the methodological approach proposed were demonstrated in experimental research in both laboratory and industrial sets in different groups of operators. It was carried out analysis of the computer system developed and demonstrated possibility to reach prediction accuracy for human performance 90 %.

Hellenic Petroleum Safety Performance and Safety Culture

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Hellenic Petroleum's top priority is the health and safety, both of its employees as well as that of the residents of local communities. The Company's policy considers healthy and safe conditions as a primary requirement for exercising its operations and the Management is committed to this.

Each industrial facility has a well established and comprehensive Safety Management System, for the implementation of the safety policy and for continuously measuring and reviewing their progress in meeting relevant targets using safety performance indicators.

The main safety performance indicators calculated are the well known and adopted by the majority of the world industry a) the Lost Workday Injury Frequency (LWIF) and b) the All Injury Frequency (AIF). They represent the number of relevant injuries at work per million of working man-hours and they are compared annually with the corresponding mean European oil industry indicators. It should be noted that all accidents and near misses are reported and investigated by the company facilities in order to avoid recurrence.

The ultimate proof of a good safety performance is the elimination or reduction in the number of accidents or near-misses over the years. However, simply counting accidents and near-misses does not provide sufficient information for deciding what actions should be taken to improve process safety. Therefore, alternative means to measure safety performance are needed, such as Process Safety Metrics.

Following an international effort to establish mainly process safety related performance indicators, Hellenic Petroleum have recently implemented on an experimental basis new process safety indicators. A broader use of these indicators by similar industrial facilities is expected to allow benchmarking.

Additionally, in order to be more proactive against accidents, Hellenic Petroleum is currently implementing the state of the art safety culture improvement tool, known as "Winning Hearts & Minds". The core idea of this tool is that further reduction of accidents can be achieved only by an improved safety culture, where people are intrinsically motivated and not simply obliged to act safely.

HSE Identity. The Case of Norwegian Petroleum

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KARLSEN H. *BI - Norwegian School of Management* *NORWAY*

A long range and overall ambition of Norwegian authorities pertains the idea that Norwegian petroleum (read; offshore activities) is world leading when it comes to HSE. This paper challenges the realism and self-insight of this ambition, offering a more critical view on the excellence of the Norwegian HSE regime. The paper describes and analyses the HSE identity of Norwegian petroleum seen as constituted both by its HSE image and by its HSE culture, and proposes a set of research implications/hypotheses connected to the key concepts. The paper applies a case study design, using various sources of documentary information.

The Desfa Safety Rules

LAIOS P. *Health and Safety manager* *GREECE*

The Hellenic high pressure natural gas pipe line, dispose of fire alert systems, like:

- Mobile fire-fighting systems
- Automatically fire insurance and fire-fighting systems
- Range of INERGEN and Co2
- Water fire-engine
- Water sprinkler
- Automatically fire-detention system

The SCADA system – optical fibre in attendance with the pipe line, transmitting the functional dates, like:

- Natural gas pressure
- Gas debit
- Natural gas consum

To the central control room in Patima, Elefsina, 24 hours a day.

In case of gas leak, the stuff must insolate in two points, upstream and down stream of the leak point, etc.

Risk influencing factors and“double-edged” effects of on safety barriers

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FENSTAD J. *Norwegian University of Science and Technology* *NORWAY*

Based on findings from an organizational safety assessment of a Floating Production Storage Offloading vessel (FPSO) on the Norwegian continental shelf we address the possible “double-edged” effect of some risk influencing factors in the organizational design. By using concepts from High Reliability Theory (HRT), the organizational seemed to share several hallmarks of a high reliability organization. The organizational design may be described as based on (1) redundancy, (2) decentralized authority to make decisions, (3) conceptual slack and (4) trial-and-error learning process. At first glance, based on the categories of HRT, it is easy to interpret the vessel organization as a highly reliable. In our study we claim that some aspects of the organizational design may influence several barriers, both hazard control barriers and recovery barriers. This multiple influence may have contrary effect on the different safety barriers. Some risk influencing factors may both increase and decrease the robustness of different safety barriers of the organisation. In our study of this specific organization we have identified several multiple influencing organizational factors. Based on these findings we discuss how these multiple effects. The methodological approach in the safety assessment consisted of a survey, interviews, an analysis of reported unwanted events and document studies. The survey, which included 152 respondents, aimed to measure attitudes towards safety among employees. Interviews were conducted in the offshore and onshore parts of the organization, and included a total of 186 employees.

The development of the Safety and Health mentality in the technical personnel of DEI Lignite Center of West Macedonia (L.C.W.M.) open mines.

KARAMPAKAKIS I. *Public Power Corporation S.A.* *GREECE*

The development of the Safety and Health mentality and culture in the technical personnel of DEI/Lignite Center of West Macedonia open mines, has been distinguished, progressively from the middle of the 90’ s(1994 - 95) till current days, as the main factor of improvement so much in Safety and Health level as of the productivity results.

Although in DEI open mines from the first moment of the opening works, have been Kipped rigorously, the entire valid legislation, there was always problems on the application of the rules, mainly because of the defective education and technical establishment of the personnel.

In 1994 the Safety and Health services have been reorganized and a new action began with central pivot the education aiming so much in the improvement of the dexterities of personnel as in the sensitization with regard to the Safety and Health themes. So, from that time on, has been imprinted a continual improvement so on, the development of the Safety and Health indexes as on the productivity heights.

Best practices - the application of a total «management for safety» system - the difficulties with the outsourcing and the contractors personnel and the results, (till current days) will be presented in this work.

The influence on organizational accident risk by integrated operations in the petroleum industry

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BJERKEBAEK E. *Petroleum Safety Authority Norway* *NORWAY*

Transition into IO, integrated operations, (introduction of new technology, new organization of work and increased automation) in petroleum activities in the North Sea influence the ability to accommodate failures and disturbances without producing organizational accidents. The paper describes the main expected changes in human and organizational aspects related to IO, and present both positive and negative effects from these changes on organizational accident risk.

Optimal Enforcement of Safety Regulation Aiming at the Prevention of Work-related Accidents

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TILINDYTE L. *University of Maastricht* *THE NETHERLANDS*

Recent decades have seen a considerable increase in safety regulation to address occupational health and safety risks. Whereas the need for safety regulation as such is almost not disputed, the enforcement aspect remains a crucial and contentious issue. Moreover, there seems to be a serious problem of noncompliance that every year results in thousands of work-related injuries and fatalities at work, both in Europe and worldwide.

The goal of this paper is to provide a theoretical model based on economic analysis indicating what are the cost-effective enforcement techniques (monitoring, sanctioning) to induce compliance with safety regulation. In this regard, cost-effective measures are considered as measures which achieve a high level of compliance at the lowest social cost. Such a model may further provide guidance for national authorities in designing their policies and enforcement strategies.

From an economic point of view, the enforcement of occupational health and safety (OHS) regulation aims at increasing the costs employers expect from noncompliance with the safety standards. This can be done through increasing the probability of detection – by means of reactive or proactive monitoring - and/or through sanctioning – via administrative or criminal law. Whereas proactive monitoring, targeting plants in which contraventions are most likely, requires more inspections and demands considerable resources, reactive monitoring which is conducted in response to complaints is much less costly and may still prove effective under certain conditions. This paper formulates predictions what these conditions might be.

Next to the monitoring aspect, optimal sanctioning methods, the use of administrative versus criminal law in particular, are addressed. Above all, the paper investigates the proper role and effectiveness of criminal law in OHS legislation as opposed to the less stringent 'co-operation and compliance strategy' which primarily relies on advise and persuasion. It also addresses the question whether inspectors should be given post-detection discretion.

The methodology we will use is the economic analysis of law. Although there is, to our knowledge, no economic model of the enforcement of OHS regulation, we can rely on general models concerning optimal enforcement of regulation. Moreover, quite some literature exists in the domain of enforcement of environmental legislation as well as enforcement of consumer legislation. To some extent we will use that literature and compare it with the particular situation of occupational health and safety.

Our paper is structured as follows: first we will briefly sketch the basic ideas behind the economic model of enforcement, starting from the idea that an employer should be given optimal incentives to comply with OHS regulation (2). Next, we will explain the different monitoring models which exist to detect regulatory violations (3). Then the question will be asked whether post-detection discretion in case of the establishment of a violation is indicated (4). In case it is decided that enforcement through sanctioning is necessary, some differences between private and public enforcement will be discussed (5), whereby it will be held that there are strong arguments in favour of public enforcement of OHS regulation. However, in the next section we will demonstrate that public enforcement should not necessarily imply the use of the criminal law since administrative law can provide sufficient incentives for compliance as well (6). Next, the question will be analysed what are optimal sanctions in case of a breach (7) and which role stigma and shaming could play in that respect (8). The question also arises to what extent third parties, more particularly employees and trade unions can play a useful role in the enforcement of OHS regulation (9). The last chapter formulates some concluding remarks (10).

Information and communication strategies in prevention

TIMM S. *German Social Accident Insurance (DGUV)* *GERMANY*

Crucial points of successful occupational safety (OSH) work are effective and efficient information and communication. When developing OSH strategies it is essential to include an integrated information and communication strategy. All relevant OSH information such as regulations, guidelines, recommendations, good practice examples etc. have to be transferred to the enterprise level. Communication and information networks should be established. Due to these information and communication needs in OSH in the first step it is indicated to take stock in order to assess the current situation on the existing communication and information systems and data. Consequentially necessary improvements can be identified and deduced. Following this systematic approach the information flow from OSH institutions to public in general and among the OSH institutions, and their functions and role in the communication and information system should be assessed in detail. In this presentation the major elements of the new Latvian OSH strategy which was developed in the framework of an EU financed PHARE assistance project are presented as an example

Epidemiology of injuries coming to a tertiary care hospital in Karachi, Pakistan

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Injuries are one of the leading causes of death and disability and are expected to rise to the third commonest cause in the world by 2020. Developing countries contribute the major part of the total burden of injuries in the world. Studies and literature from developing countries on the epidemiology of injuries are limited. Our study aims on dealing with the epidemiology of all injuries coming to the Aga Khan hospital of Karachi, Pakistan.

Materials and Methods

It is a retrospective study conducted in the department of emergency medicine at Aga Khan University hospital Karachi, Pakistan. Past medical records from June 2006 till May 2007 of all injured patients coming to Emergency room (ER) were reviewed. Data were recorded on the basic epidemiological features, hospital stay, body parts injured and the outcome.

Product testing and certification: a successful contribution to prevention activity in Germany

REITZ R. *German Social Accident Insurance (DGUV)* *GERMANY*

For decades, the testing and certification bodies of the German statutory accident insurance institutions have influenced the safe and healthy design of working equipment.

The result is that products are improved in the interests of occupational safety and health. With the relaying of findings from testing and certification activity, this influence particularly permeates the areas of standardization, consultancy, and research and development.

Influencing products at their source has proved to be an efficient method. Technical innovations in particular are supported, resulting not only in improvements to occupational safety and health, but also in enhanced competitiveness.

Overall, a feedback loop is often created which favours products which are safe and conducive to health: information on their use within companies is passed, via the labour inspectorates, to testing, certification and standardization activity; this input in turn serves as a basis for manufacturers to improve the products used in companies.

Voluntary test marks have proved to be an important element in testing and certification: they provide manufacturers with a marketing incentive, and they serve as a simple aid to selection by buyers.

The purpose of the paper is to describe the chains of action associated with testing and certification activity. Beyond that, examples are presented of how innovative activity has been successfully promoted, for instance in the area of emerging technologies. The added value of this prevention service for manufacturers, companies and occupational safety and health is to be demonstrated.

Social Dialogue on Crystalline Silica: The first European Multisector Agreement for Workers Health

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The protection of workers health in Europe will be improved in the long term by minimizing exposure to crystalline silica at workplaces in relevant industries. This is the objective of the “Agreement on Workers Health Protection through the Good Handling and Use of Crystalline Silica and Products containing it”. The agreement set in force on 26 October 2006 was negotiated by the European sectoral employer and worker organisations and is being implemented and evaluated on their own responsibility. In Germany the Berufs-genossenschaften (BG) support the companies in implementation and reporting.

Acknowledgment of Compliance (AoC) - A mix of regulatory principles in the petroleum industry

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MOEN A. *University of Stavanger* *NORWAY*

In the UK, the regulatory regime was strengthened after the Piper Alpha disaster in 1988. Moreover, the second volume of the Cullen report (1990) played a major role with its recommendation of a specific Health, Safety and Environment (HSE) regime and a Formal Safety Assessment presented as «Safety cases». The Petroleum Safety Authority (PSA) has introduced "Acknowledgment of Compliance" (AoC) for mobile facilities in order to standardise their regulatory procedures. This paper addresses AoC as a "safety case" issue in the petroleum industry with focus on the relationship among partners and their involvement in the process of regulation. Stakeholders involvement in such cases are interesting in a regulatory regime with a most stringent labour legislation, densely unionised offshore industry with extensive collective bargaining rights and empowered safety representatives. This paper explores how the stakeholders are involved in the regulatory process in the industry by looking at communicative and instrumental rationality in the process and power interests. The AoC increased the involvement of the regulated, and is thus in accordance with the PSA's philosophy of enforced self-regulation and tripartite cooperation. On the other hand, the AoC as an arrangement, diverges from the PSA's regulatory strategy, and represents a move towards the maritime sector's philosophy of pre-qualification and certification. This paper is part of an ongoing program on "Robust Regulation in the Norwegian Petroleum industry," funded by The Research Council of Norway.

Safety on the brink.National debate about the lack of balance between public policy and private needs for safety.

ROGGEVEEN V. *NVVK* *THE NETHERLANDS*

This contribution to the WOS 2008 Conference presents insight in a national debate about the lack of balance between the public (governmental) policy and the private needs for safety.

The debate has been initiated by the chairman of the Dutch National Safety Board late 2007. The Dutch Association of Safety Practitioners contributes in this debate. The presenter of this paper is Chairman of this association. The Dutch Association of Safety Practitioners is dealing has identified 5 distinct domains of safety: Occupational Safety, Transport Safety, External Safety, Consumers Safety and Patient Safety. Security is explicitly excluded; the association does not deal with topics as terrorism etc.

In The Netherlands (16 million inhabitants) are around 8000 accident related fatalities per year. However, only the sensational ones (effects of political attractive subjects) direct the formal governmental policies. By that approach a lack of balance, resulting in an ineffective preventative acxtivities, is developed.

The following topics represent the core of the national discussion:

- The way Rules and Regulations are developed, issued and enforced
- The way individual responsibility of private entities is respected and stimulated

A public discussion hosted by the association has focused on:

- Identification of the parties forming the playing field of safety
- Identification of the parties influencing the playing parties
- Different approaches to risk management in public and private entities
- Different approaches to safety cultural aspects
- Safety education and information

The first public debate has produced some interesting insights in the different views and interests by parties from the public as well as from the private sector. This presentation will address the results of this debate.

A tool for decision makers: calculation of cost-benefits of OSH

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MAURITE L. *SLI* *LATVIA*

In former East, now new EU, countries there has been a transition from state planned to a more capitalistic society. One of the issues in Latvia is the increasing role of cost-benefit calculations used in decision making. For the field of Occupational Safety & Health this field of work is highly underexposed. The State Labour Inspectorate in Latvia thrived to develop calculation tools and enhance the competencies of the inspectors to use them in the field.

TNO has a long track record on calculation of OSH in The Netherlands. Three experts specialized in different levels of calculation of OSH (calculation of interventions, on business level and on societal level) combined their forces to develop custom made tools for the State Labour Inspectorate in Latvia.

The project had three goals:

1. Monitoring & prioritizing: development of methodical instructions for the analyses of working environment in the country;
2. Economic effects of the prevention of occupational accidents: development of methodical instructions for the calculation of costs accidents at work;
3. Economic effects of the prevention of occupational diseases: development of methodical instructions for the calculation of costs of occupational diseases.

In the paper these tools and instructions how to use them will be described and presented. Some information about the specific situation of Latvia will be given to illustrate the use of these tools.

Risk assessment in the construction industry, the case of crane safety

SWUSTE P. *DELFT University of Technology* *THE NETHERLANDS*

Vertical transport by mobile cranes will be used a an example of risk assessment in the construction industry. With a presentation of accident causality, the bowtie model, accident scenario's are classified, based upon major crane accidents recorded by the Dutch Factory Inspectorate. Beside dominant accident scenario's, managerial influence on these scenario's are discussed, as well as the quality of the data provided.

Keywords: Crane safety, construction, accident scenario's, safety management

How to measure safety in construction industry?

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Too many accidents happen in the construction industry globally. Retrospective methods are used to understand the causes and to reduce the number of accidents. However, the results are limited by imperfections in accident recording, and in research and analysis of accident causes. Therefore there is need for a prospective method to detect potential causes of accidents and to reduce the risks by the introduction of safety interventions. When (un)safe conditions of apparently normal situations are quantified, improvements can be made before accidents actually happen.

Five methods to identify unsafe conditions are compared, regarding their usefulness in the construction industry; the 'TR safety obser-vation method on building construction' (Finland), the 'Injury Exposure Assessment' (USA), the 'benchmark method' (Australia), the 'checklist safety indicator' (Australia) and the 'Disturbance Assessment method' (The Netherlands). The 'TR safety observation method on building construction' is considered to be the most suitable method. The method is validated and easy to use in the operational phase of the building process. It is based upon a scenario approach. Comparing various work-places is easy with this method and the results will inspire the introduction of safety inter-ventions.

This paper describes the results of a comparative research into methods and a limited field test, using the Dutch version of the TR Method. A more extended field test is being carried out to assess the suitability of the method for the entire construction industry in the Netherlands.

Keywords: Construction industry, TR Method, measure safety

The secret of successful safety interventions

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A three year evaluation study was conducted in seventeen companies running a total of 298 interventions subsidised by the Dutch Ministry of Social Affairs. Although a decrease in the accident frequency rate was the Ministry's main concern, various other variables were col-lected to come to a careful definition of success within this project. Organisational and cultural interventions are found to be more successful than technical ones; Hale et al. (submitted) discusses this full process in more detail. A standard questionnaire was distributed in the companies at the beginning, in the middle and at the end of the study.

This paper focuses on the results of the most complete first survey. Factor analysis and multilevel analysis are conducted to develop a model that combines the questionnaire results with the rating of success.

Various hypotheses are tested and discussed within the context of the current evaluation literature. It appears that the relationship between compliance and desirable safety actions in successful companies is more straightforward than in unsuccessful companies, in that successful companies appear 'to walk the talk' more clearly. The role of the coordinator of the interventions within the company along with an unremitting support (s)he gets from upper management will remain crucial ingredients of success, alongside to the extent the intervention is matched to the current development level of the company.

Effectiveness of safety programmes: development of method and instruments

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HOLLANDER *TNO Quality of Life* *THE NETHERLANDS*
DE JONG T. *TNO Quality of Life.* *THE NETHERLANDS*
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The aim of our research programme is to find key factors of successful behaviour-based programmes. In this paper we describe the first step; developing instruments to measure the effectiveness, based on a model of theory based intervention. By collecting information on means, activities and effects of the programme itself we intent to find out why a programme is effective or not and which are the indicators within as well as outside the programme that make it successful. Collecting this information occurs using observation, interviews, document studies and a questionnaire on attitudes towards nine different safety processes. The developed instruments are now being tested in three pilot studies.

Workforce risk awareness

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ZACHARIS S. *HERACLES General Cement Company, Lafarge* *GREECE*

Field research was done by questionnaires in order to analyze risk perception, awareness level and responsiveness of employees to new H&S standards in all work sites (cement plants, terminals, quarries) of Heracles GCC. Aiming to identify safety culture maturity level and effectiveness of previous safety campaigns, the size of population and variety of work sites provided ground for clear and solid conclusions. Timing, duration and necessary efforts for successful safety projects depends upon employees risk awareness and willingness for adherence to simple standards like PPE use or complex like Work at Height protection.

Competency (behaviour) Based Safety as part of a Safety Management System

PHEIFFER S. *Safemap Africa Ltd* *SOUTH AFRICA*

Many companies have embarked on the road to establish safe working cultures in order to improve their safety performance. The so-called Behaviour Based Safety programs are the vehicles to achieve this desired outcome. Indeed some companies have experienced huge improvements in their safety performance while others however utterly failed.

The questions then to ask are: Why are some companies successful, and what are the success drivers that need to be incorporated in this effort to establish safe working cultures?

Since the late 1980's the emphasis in safety has shifted towards the behaviours and attitudes of employees at all levels of the organization so-called behaviour-based safety. This document describes a very unique angle on behaviour – Competency Based Safety, namely the concept of SMARTsafe.

SMART stands for Safety, Mindset, Awareness, Risk competence and Team safety.

SMART is a revolutionary approach to behaviour. It accepts that risk-taking is essential and fundamental to doing work and that no work workplace can ever be made risk-free. Therefore, the focus should be that employees become competent to identify and assess risks and act appropriately. This approach specifically targets the complacency factor, which is a natural result if people perceive their work environments and procedures to be safe.

SMARTsafe targets an employee mindset, attitudes and behaviours the human factor. It supplements and contributes to the safety management system in a company. If we are to be effective in safety we need to focus on both behaviours and attitudes of employees.

The aim is to change employees' mindsets and attitudes (at all levels) towards safety, so that they understand the role and impact of their own behaviours on safety. This implies that the leaders will have to apply leadership practices that will grow safety from a changing priority into an imbedded value. In order then to encourage the employees to achieve high standards the leaders must lead by example they must be the models of the behaviour they would like.

SMART by implication emphasizes SMARTleaders that employ various SMARTtools to ensure that the behaviours of employees are changed. These tools include Risk Awareness Tools, Motivational Tools and Behaviour Observations.

In order to establish whether the culture is changing in a company some kind of behaviour measurement needs to be installed. This will not only identify the hot spots or at-risk behaviours but also the areas where participation in the program is not satisfactory. What can be measured can be changed and as such allows for interventions that in turn ensure continuous improvement.

The purpose of this presentation is to focus on human factors and risk-taking behaviour and how to equip employees to take good risks in a non risk-free environment in order to act competently.

Antecedents of safety behaviour in the oil and gas industry

DIDLA S. *University of Aberdeen* *UNITED KINGDOM*
MEARNS K. *University of Aberdeen* *UNITED KINGDOM*

The quest for safety will persist as long as there is value for human life. High-risk organizations like the oil and gas have been promoting safe behaviour due to the dangers associated with the work involved. Risks associated with hazardous tasks are usually minimized by supplying good technology, setting high standards, and establishing an effective management system. However, safety management still presents a major problem, the core of which is human behaviour. In order to understand the behavioural aspect of safety, we focussed on two kinds of safe behaviours: safety compliance and safety citizenship behaviour (SCB). Previous research has established that leadership plays a major role in influencing employee behaviour (Neal and Griffin, 2002). In this study, we tested how leaders (with transformational and transactional leadership style) with their fair practices can encourage their subordinates to engage in safe behaviours. From an organizational point of view, the prioritization of safety by management (safety climate) has also shown to motivate employees to engage in safety-related practices (Zohar, 1980). In order to test for these relationships, data from an oil and gas service organization (n=196), was analysed using structural equation modelling. We found support for leader fairness as a mediating factor i.e. it explains the effect that transformational and transactional leaders have on employee SCB. However, in the relationship between leadership and subordinates’ safety compliance, leader fairness did not make any contribution; instead safety climate emerged as a strong mediator explaining a significant amount of variance in the mediation model. It also added significant amount of variance in the mediation model with SCB as an outcome variable. Therefore, although leader fairness enhances employee SCB, there is stronger evidence for safety climate as it influences both compliance and citizenship behaviour. This study adds further credibility to the role of management in occupational safety.

Changing behaviours in work sites

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MALAMI Ch. *HERACLES General Cement Company, Lafarge* *GREECE*
VOMVORIDIS G. *HERACLES General Cement Company, Lafarge* *GREECE*

Efficiency of modern safety management systems in industrial work sites is strongly dependent on behaviours exhibited by workforce. Positive reinforcement and persuasion techniques while team leaders conduct safety talks help their teams develop and sustain proper behaviours. Experience and relevant analysis from such a project run in HERACLES Plants, Quarries and Terminals is presented in this paper.

The stairs of well-being at work - health and safety as a basis of well-being

RAURAMO P. *University of Kuopio* *FINLAND*

In Finland, a model for activities to maintain work ability (known as workplace health promotion in the European Union) was developed in the early 1990s. Optimally, the activities of the model cover a wide range of measures related to the working environment, the working community and individual workers, varying from health and safety promotion to competence development. Research has shown that this type of comprehensive activity – which is increasingly referred to as ‚activities to promote well-being at work' – can actually promote and enhance the health, work ability and competence of workers at all ages.

As the society and working life change, it is essential to realize that the human being, as a psycho-physiological entity, has changed very little over the centuries. The basic human needs remain constant. When considering such issues as why workers suffer from stress, burn-out and musculoskeletal diseases, or are accident-prone, or incapable of developing personally or being innovative, the answer may lie in deficiencies concerning the various levels of the hierarchy of human needs.

The aim of this study was to examine The Theory of Basic Human Needs presented by Abraham Maslow in relation to work and life as a whole, and to find new methods and focal points to support the activities for maintaining work ability and promoting health and well-being. The new WHP- model "The Stairs of Well-Being at Work" (Rauramo 2004, Rauramo & Louhevaara 2005) was developed by comparing and combining the most well-known Finnish WHP- models to the Maslow motivation theory. The idea was to create a model, which is intelligible, deep, practical and easy to understand and perceive.

The Steps of Well-being at Work model is based on the hierarchical theory of human needs. According to the theory attaining the highest hierarchical level is impossible unless the lower level needs are satisfied. In the model, each step contains a number of factors affecting well-being at work both from the organizational and individual point of view as well as measures for assessing the issues in question. According to this Well-being at Work –model it is very clear that well-being is built on the solid foundation of the first two stairs. These stairs are "made of" health and safety.

Keywords: change, well-being at work, workplace health promotion, hierarchy of needs

Study on workers' evacuation in an industrial company

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SILVA J.M. *University of Porto* *PORTUGAL*

The purpose of this study was to evaluate the influence of a training period on the worker's behaviour, and consequently on their evacuation time, in case of emergency.

Three fire drills were undertaken, being the first one preceded by a warning signal.

The following variables were considered:

§ Initial time, i.e. time taken by the first worker to reach the respective section meeting point;

§ Final time, i.e. time taken by the last worker to reach the respective meeting point;

§ Average age of the workers in each section;

§ Number of workers in each section;

§ Average distance of each section relatively to the corresponding meeting point.

The plant's fire risk was evaluated by the Gretener method and evacuation times were compared with calculated values through theoretical expressions.

A factorial method of data analysis, named Principal Component Analysis, was considered.

In spite of data scarceness, it could be observed in the last fire drill a better attitude towards fire risk and an increased awareness of safety issues.

The workers' age as well the number of workers seems to have no influence in the evacuation time.

Accident prevention in TITAN SA

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TITAN is well known for its early start in accident prevention since 1974, 11 years before the framework law on Health and Safety was applied in Greece. Because of this successful endeavor TITAN has better accident rates than most European cement-producing companies and aims to be in the first quartile among European cement companies.

But this record still leaves us unsatisfied. Our only acceptable target is zero accidents both for direct as well as indirect personnel.

A top management team consisting of the CEO, the 3 general managers (for each geographic area in which TITAN is present), the technical director and the Group H&S director leads and coordinates the efforts on 4 main axes. An established H&S organization comprising of Group Safety Director, National Safety Manager, and 6 Safety Engineers work on achieving our goals, in Titan Greece namely:

1. Safety awareness / training
2. High risk tasks' accident prevention
3. Contractors' management
4. Dissemination of knowledge / Best practices/ Incidents investigations

The actions on these categories cascade as follows:

1a. Induction of newcomers
1b. Being "conscious" of H&S
1c. High caliber training for HS professionals
2a. Working at heights
2b.Hot work (emphasis on preheater / kiln)
2c.Working in cement port facilities
3a. Brick layering in kilns. Share expertise with other cement companies
3b. Crane management
3c. Constructing and working on scaffolds
3d. Safety plan, i.e. specialized Job Hazard Analysis for non- routine and/ or high- risk jobs.
4a. Safety DVDs from TITAN America translated and adopted to local languages and mentality.
4b. Check list from Balkan subsidiaries applied on Greek operations.
4c. Lessons learnt from incidents.
4d.Application of HS Management system (OHSAS 18001) on Greek affiliated companies
4e.Establishment of common methodology for "Safety plans" between Greek operations.
4.f. Interest for the society

The framework for all the above actions are incorporated in the H&S vision signed from the CEO, showing the management commitment on Safety. Our efforts have significantly raised the awareness and interest of direct, as well as, indirect personnel on HS. The results in terms of Lost Time Injury Frequency and Severity are encouraging.

Practices and methodologies for an integrated management of health and safety issues in ports

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Health and Safety (H&S), as an issue that defines ways of both working and behaving, is kept today high in the agenda of the most ports' corporate policy, and specific organizational structures have been put in place to ensure a safe and healthy workplace in both day-to-day operation and long-term development. Although this acknowledgement, over the last years many accidents keep occurring in ports. The recent revised ILO's (International Labour Organization) code of practice "Safety and health in ports" seems to act as an umbrella for the ports worldwide concerning the raise of the profile of safety and health issues in ports. In parallel, European Union (EU), through its occupational health directives, seek to ensure the well-being of all workers and make more and more obligatory the duties of employers to perform a healthy and safe work environment. The enforcement of existing rules, the improvement and intensification of inspections, the enhancement and extension of training to all workers and the creation of a culture of prevention are essential elements to improve the H&S issues in ports. In this paper, the importance of an integrated management of H&S issues in port operations is analyzed and the basic steps of applying an integrated H&S management system in ports are outlined. Some relevant practices and data coming from the port of Thessaloniki in Greece act as a case study, as the main aim of the paper is to be concerned by other port authorities, in terms of information exchange and experience diffusion.

Interventions for Preventing Injuries in Agriculture: A Cochrane Review

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OBJECTIVES: Occupational injury rates among farmers are still high. Many prevention programmes and laws have been introduced, but the effectiveness of these strategies is still unknown. This study aimed to determine the effectiveness of interventions to prevent occupational injuries among workers in the agricultural industry.

METHODS: A Cochrane Collaboration systematic literature review was conducted to find studies on interventions to reduce occupational injuries among farmers. Eight studies were found from over 8600 references. The quality of the relevant studies was assessed and their results were extracted. Randomized controlled trial data were combined across studies in a meta-analysis. Interrupted time series studies were reanalyzed to assess if there was a change in the level or trend of injuries associated with the intervention.

RESULTS: Five randomized controlled trials with 11,565 farmers and one interrupted time series with 14 measurements used combinations of various educational interventions and financial incentives. Two of these studies concentrated on injury prevention among children or adolescents and the rest dealt with injury prevention among adults. The effect of legislation was evaluated in two interrupted series with on average 32.5 measurement points. One study evaluated regulations to prevent poisonings in Sri Lanka. The studies provided no evidence that educational interventions had an injury reducing effect. However, insurance premium discounts as a financial incentive decreased injury claims in one study. Specific legislation expanding the use of Rollover Protective Structures (ROPS) on tractors was not associated with the reduction of injuries in one study. Legislation to ban Endosulfan pesticides was associated with a reduction in fatal poisonings in the long term in another study.

Safe Handling of Dangerous Cargoes in Ports

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Many cargoes transported by sea or land have dangerous properties that could cause fire and explosion, injuries and environmental damage in every step of transportation chain. The ports constitute the main transhipment centres and import-export gates of dangerous cargoes all around the world. Every year are transported safely, through the ports, million of tonnes of dangerous cargoes in a framework of internationally recognized rules and practices. An integral UN Classification System is implemented in transport procedure and the dangerous cargoes are classified accordingly in nine classes associated with the primary hazard. In addition, every dangerous substance or material is identified by a UN Number that indicates specific physical and chemical properties.

The implementation of a dangerous cargoes management system in port areas consists of a broad range of parameters and all the involved parts have to undertake specific roles in transport procedure in order to be reached an optimum level of occupational safety and environmental protection. Ports have to designate and activate procedures for sufficient notification, information exchange, classification, identification, storage, segregation, monitoring, training and emergency arrangements for the transported dangerous goods in port areas. More concretely, the Port Authority adjusts and enforces appropriate rules and standards to achieve adequate control over the entry, presence and handling of all types of dangerous goods for the safety of portworkers, the “shippers” provide to the port authority all the necessary information before dangerous cargoes entry into the port area by land or sea and the Port State Control supervises the implementation of the entire procedure.

Biological Monitoring of 24 aromatic amino and nitro compounds in coke oven workers

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Coke oven emissions are complex mixtures of coal and coke particles, various vapours, gases, and tars containing metals, PAH, and aromatic amino and nitro compounds. Some epidemiologic literature suggests that coke oven workers may bear an elevated bladder cancer risk. Occupational exposure to aromatic amino and nitro compounds, and PAH is discussed being responsible for that observation. Within this study we examined 47 workers from a European coke oven plant regarding their external (personal air monitoring) and internal exposure (biological monitoring) to 24 different aromatic amino and nitro compounds, including the known human bladder carcinogens o-toluidine, 2-naphthylamine, benzidine and 4-aminobiphenyl. Internal exposure was assessed by measuring arylamines in urine (pre and post shift) and their corresponding Hb adducts. Individual smoking behaviour was assessed by questionnaire and determination of urinary cotinine. Neither urinary aromatic amines nor Hb adducts correlated with the individual external exposure. Except for 4-amino-2-nitrotoluene, no significant increases in exposures during shifts could be observed. Oven-charging operations and leakage around poorly sealed coke oven doors are expected the major sources of gaseous emissions from coke ovens. However, workers engaged in working tasks near these sources did not show higher internal exposure to aromatic amines than others, e.g. electricians. All results for occupational exposures were within the range of those environmental exposures observed in smokers and non-smokers of the general population. As most of the working tasks in a coke oven plant are regularly done outdoors biological monitoring was most suitable for exposure assessment. The results of biological monitoring reveal that internal exposure to aromatic amines is primarily influenced by individual smoking habits rather than exposure to coke oven emissions. If coke oven workers bear an elevated bladder cancer risk it could hardly be explained by exposure to those aromatic amino compounds known to be bladder carcinogens in humans.

Certification of safety professionals at the European level

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As industry becomes more global and as professionals working in it move more widely and rapidly between countries to work, the issues about the comparability of professional qualifications in different countries are becoming more pressing. The European Network of Safety and Health Professional Organisations (ENSHPO) was set up in 2001 to further the exchange of information and experience between the national associations, particularly of safety professionals. It has built on the work done by an earlier group under the auspices of the International Social Security Association Section on Safety Training, to study the way in which these professionals are trained and assessed across Europe. This work has culminated in the development of a standard for the qualifications of a European Occupational Safety and Health Manager (EurOSHM) which was published in 2007. The process of qualification for this title is being launched in 2008. The standard covers the recognition of national qualification schemes and the registration of individuals for the title. A scheme for a second level qualification is also in preparation.

This paper describes the issues and studies leading up to the certification standards and explains their structure and content, and the process of registration.

European Standard for the Quality of Trainers in Occupational Safety and Health

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On 24 October 2007, the European Parliament adopted the European Qualifications Framework for lifelong learning (EQF). For the first time, a common European reference system exists for vocational education and training in Europe. In the light of this, the discussion of competence requirements in the area of occupational safety and health acquires a new importance.

Related to the EQF a standard of competence for instructors and trainers in occupational safety and health was developed by the European Network Education and Training in Occupational Safety and Health (ENETOSH) in order to improve the quality of tuition in the area of health and safety. The development of this standard was based on a study carried out by Germany’s “Berufsgenossenschaft” institutions for statutory accident insurance. The ENETOSH standard covers the following fields of competence: education and training, safety and health at work, workplace health promotion and OSH management. It describes in precise detail the maximum expectations regarding the skills, knowledge and personal competence of instructors and trainers in safety and health. There is a detailed checklist and a summary checklist for each field of competence. The checklists can be used by instructors and trainers to evaluate their own competences themselves and by educational institutions as an aid in recruiting staff. A matrix shows the EQF levels to which the fields of competence correspond.

Since November 2007 the standard can be now downloaded in 11 languages from the ENETOSH website: www.enetosh.net.

The ENETOSH standard will be implemented, assessed and developed further e.g. by transferring the standard to the Balkan countries, – supported by WHO and by transferring it to the area of continuing education for teachers, - in co-operation with ISSA.

The ENETOSH standard of competence provides the first ever basis for improving the qualifications of teaching staff in the field of safety and health in Europe and leads to a process of joint reflection on the professional conduct expected of teaching staff in the field of safety and health in Europe.

What research brings to the health and safety professional?

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The role of health and safety professionals has grown in recent years to meet the changing demands of the current working environment. In particular there is recognition of their increasing contribution to the strategic decision making of organisations. A wide range of health and safety courses and qualifications are available to address these requirements. And there is wide variation in the subjects taught and the competences addressed.

This paper presents the results of a questionnaire evaluation administered to 40 past students of the research element of the MSc in Occupational Health and Safety Management, Loughborough University. The evaluation addressed the motivation of the student in applying for the MSc and the perceived benefits for the individual in achieving it, including the development of core competences.

The motivation for applying to study focused around improving qualifications to enhance career opportunities and personal development. Several core competences had been developed or improved by carrying out empirical research. These competences included better written English and grammar, information gathering, data collection and interpretation and reflection.

The results are discussed in relation to credential inflation, increased job mobility and the overall value of acquiring research based competences for both the individual and the organisation.

Prevention Training at occupational schools

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Our global communication society with its fast technological and economic changes shows, that education and training are of high economic value and the start-up capital for personal development. It is also one of the basics for lifelong learning and for the ability to face the challenges of the continuously changing labour market successfully.

High quality vocational and technical education and training oriented towards practical and economic requirements is therefore of major importance. The better this training is, the higher is the chance of employment. The fact that today more than 80% of the Austrian youth want initial vocational training at secondary level schools shows its high acceptance among the population.

Development of an evaluation instrument to predict effectiveness from training in Occupational Health and Safety

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Continuing vocational education in the field of health and safety aims to influence the attitude towards, the knowledge about as well as the health and safety behaviour of trainees. To reach this high educational quality of training an enormous effort is expended. To prove if this effort is expended in the most effective way, more and more educational institutions are engaged in evaluating this ratio of costs and benefit.

A lot of research was carried out by the Institute Work and Health (BGAG) the last years to prove the quality of training and to prove the transfer of training that takes place.

Quality of training implies more than the participant's satisfaction with the training. There should also have taken place learning, knowledge and skill enhancement. The learner should be enabled to perform the transfer of training into workplace.

To prove this quality of training an evaluation instrument has been developed.

A search regarding questionnaires for the evaluation of seminars and training was carried out. On the basis of 37 questionnaires from private and public educational institutions an item pool was compiled. This pool of 1024 items was structured by the content character of the item such as belonging to a certain scale, quality criteria and heritage from a certain questionnaire.

A criteria based reduction process of several rounds was carried out to eliminate items that were not fitting by content or were identical.

This reduction process leads to a questionnaire of 9 scales with all over 59 items. A following statistical testing including factor and item analysis enables further reduction of items for a revised questionnaire.

The questionnaire was developed to measure the quality of training and to predict transfer from training and herewith the long-term effect of training. Studies to prove this predictable validity will be realised in the near future.

Research for the awareness level and training needs of engineers in East Crete, concerning Health and Safety issues.

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In most of the cases, engineers are responsible for developing Health and Safety measures and supervising their implementation among working places. However lack of experience, insufficient education and inadequate training of engineers, is -most of the times- the reason for not fulfilling Health and Safety standards. On the other hand, working with case studies and studying best practices can improve the effectiveness of education and improve engineering skills regarding Health and Safety aspects.In this research, knowledge, experience, awareness and training needs regarding Health and Safety issues is tried to be identified. The research is focused in all engineers -members of Technical Chamber / Department of East Crete- and it is the first ever implemented in the region of Crete. Appropriate questionnaires are prepared and sent by e-mail to all participants. Additionally, on-line submission is available through Technical Chamber / Department of East Crete web site. According to the research objectives, engineers awareness regarding Health and Safety issues are determined, setting as parameters sex, age, training and working experience. Additionally, training needs for engineers are detected in order to propose further specific actions to Local Society and Technical Chamber of Greece.

Safe work practices conforming to the reach regulation in cases of exposure to carcinogenic substances

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The number of substances rated as carcinogenic has been rising continually. Most of these substances have no scientifically established effect threshold. Where carcinogenic substances without effect threshold are indispensable and will inevitably be detected in workplaces, it is necessary, especially against the backdrop of the Reach Regulation, to possess scientifically derived information about the risk potential of these substances on the hand, as well as socially agreed standards on the associated tolerable and acceptable risks on the other. Based on the risk limits discussed in a number of countries (including Germany), the BGIA has begun to develop descriptions of best available procedures, including protective measures, for use in operations involving an exposure to carcinogens.

The range of substances currently comprises, inter alia, asbestos (in building remediation), bitumen, trichloroethene, welding fumes, engine exhaust gases, and solvents in adhesive and coating materials.

Help! Reach is coming soon!

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The aim of this contribution is to explain how companies can be supported to overcome the administrative obligations the new European Reach regulation imposes on them.

In Belgium, we have since more then 25 years a non profit organization, called BIG, standing for a computer based multilingual information system on hazardous products, introduced primarily as a help for the Fire Brigades during intervention, but very soon expanded to a real prevention instrument for industry in reaching their prevention goals on accidents with chemical substances.

Now this instrument seems to be extremely important in helping the European industry and more specifically the SME branch in fulfilling their obligations towards the new Reach regulation.

Hazardous chemicals, small firms and the impact of REACH

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Controlling the risks of working with hazardous chemical substances is widely recognized as one of the major elements in ensuring a healthy workplace. Control strategies for chemicals used in the workplace feature prominently in both regulatory and voluntary approaches to improving the work environment. But their impact on small firms the vast majority of workplaces in which chemicals are used & remains problematic across the whole range of economic sectors and work activity, in which there is demonstrably poor understanding among owner managers concerning their responsibilities for chemical risk management. Why this has been so, how it is being addressed, and with what results are the subjects of this paper, which is based on a recently completed study of strategies, tools and support for chemical risk management in small firms in several EU countries.

The regulatory profile governing the management of chemical risks at work is in the process of major restructuring in Europe, with the implementation of the REACH (Registration, Evaluation and Authorisation of Chemicals) reforms in European legislation. It is claimed that the impact of these provisions will be substantial and significant, especially in relation to downstream use of chemicals in smaller enterprises, because the new regulations aim to improve risk communication within the supply chain & identified as a particular weakness of previous approaches. The paper therefore also examines the evidence for this weakness and the extent to which it is likely to be addressed by the new regulatory framework.

Methodical procedures for the development of exposure scenarios in the context of REACH with reference to screen printing

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The European chemicals regulation on the registration, evaluation and authorization of chemicals (REACH) has the aim of providing better protection for humans and the environ-ment from the potential risks from interaction with chemicals. The regulation came into effect on June 1, 2007. From this date on, chemicals produced in the EU in quantities of more than 1 t per year and sold on the market have to be evaluated and registered in accordance with REACH. The duty to register applies both to manufacturers of substances as well as to importers of the substances into the EU. Registration requires an exposure scenario that describes how the substance can be safely used throughout the supply chain. The German institution for statutory accident insurance and prevention in the printing and paper-process-sing industry has conducted a project on "Exposure scenarios in screen printing" within the framework of the REACH Implementation Project (RIP 3.2-2) on behalf of the German Federal Ministry of Economics and Techno-logy. This article reports on the experience and findings from the project.

4 step Program for respiratory protection

ZORBALAS G. *3M HELLAS LTD* *GREECE*

End users face many hazards in the everyday working environment. The challenge is to raise awareness to end users and Safety engineers as to what these hazards are and which are the consequenses on the human body and our health. The challenge is extended to the right choice of respirator and the training of the end users on proper fitting of the respirators on their faces. Finally, examples of best practices and situations to avoid are also covered

Short presentation of 3M solutions will follow

Individual differences and serum cortisol changes in shift workers

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In modern societies, shift work is an essential component of daily life. Since the beginning of research in shift work, researchers have been engaged in the identification of factors predicting adjustment and adaptation to shift work. The concept of adaptation and tolerance refers mainly to the biological responses in terms of circadian rhythm and performance efficiency as well as sleep duration and quality. Since some of the shift workers show higher level of adaptation in comparison with the others, the individual sensitivity may be a good predictor. The present study was undertaken to specify whether changes in cortisol fluctuation are associated with chronotype, quality of sleep and adaptation to shift work?

This research was a cross-sectional study. Blood samples were removed from 57 shift workers. Three samples removed from each subject (at the beginning of their night shift, at the end of their night shift and at the beginning of their morning shift). The samples immediately centrifuged and the plasma was removed and stored at -25 ^{0}c until assay. Cortisol was measured by radioimmunoassay using LKV Mili gama counter and Immunotech-IM1841 kit. Also all subjects completed questionnaires for the detection of chronotype, quality of sleep and adaptation to shift work.

The mean age, background and BMI of the sample was 33.5±6.2years, 6.2±2.5 years, 24.1±2.8, respectively.91.1 percent of subjects were married. The mean cortisol level at the beginning of night shift, the end of night shift and the beginning of morning shift was 6.95 Mg/dl, 18.31Mg/dl and 19.1Mg/dl respectively. 83.9 percent of subjects had morning chronotype and 16.1 percent had evening chronotype. The mean cortisol level at the beginning of morning shift and at the beginning and end of night shift for morning and evening subjects were (19.5, 16.5), (6.5, 7.7) and (17.1, 18.4) Mg/dl. 46 percent of subjects reported good sleep at the morning shift and the others reported moderate and weak sleep. Also at the night shift; only 21.4 percent showed good sleep.

Although there was a difference between the mean cortisol levels of morning and evening active subjects, but because of small sample size of evening active subjects, statistical analysis showed no significant difference between them. The mean cortisol level at the beginning of morning shift was related to the quality of sleep directly. There was a significant difference between the mean cortisol level at the end of night shift and morning shift sleep score (p- value =0.035). Also spearman analysis revealed a significant correlation between morning shift sleep score and value of beginning night shift cortisol reduction per end of night shift. There was a correlation between mean cortisol level at the end of night shift and adaptation score. Results showed that as the adaptation score increased, the differences between mean cortisol level at the beginning and the end of their night shift decreased.

Key words: Shift work – cortisol – circadian rhythm – sleep – individual differences - chronotype

Urine-based tumor marker tests among workers with high bladder cancer risk – interim data of the prospective study UroScreen

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In Germany, workers with former occupational or accidental exposure to aromatic amines have been enrolled in a national surveillance program for detecting bladder cancer. This high-risk population has been established as a prospective cohort for the project UroScreen to evaluate the predictive values of molecular tumor markers for bladder-cancer screening. In this interim analysis we present results focused on potential confounders of the marker concentrations.

For 1,543 subjects 4,634 urine samples were collected repeatedly over the time. Several influencing factors on the concentrations of the three studied tumor markers, NMP22, UroVysion®, and survivin were identified.

This analysis demonstrated the feasibility of the evaluation of tumor markers for bladder-cancer screening with the prospective study UroScreen. A successful screening can only be accomplished if factors that might confound the marker results can be controlled

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Occupational risk in flexible forms of employment in Greece

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"Flexible" forms of employment, such as part-time, temporary, short-term or self- employment (either virtual or true) are increasing during last decades in the context of deregulation policies in labour market both in Greece and in other member states of the European Union. However, despite these increasing trends, limited statistical data and research do not allow for safe conclusions on occupational risk in these forms of employment.

Estimating occupational risk in flexible employment in Greece is a product of two uncertainties: a) poor accident data (under-reporting) and b) poor labour data (informal employment). Still, it is a scientific challenge to identify these forms of employment and occupational accidents and occupational diseases in sectors where these flexible forms are increasing; these sectors also happen to be among the most dangerous for occupational health and safety (OHS).

In this paper it is attempted to analyse the phenomenon of flexible employment, (focusing on the case of Greece) so as to indicate its implications for OHS, especially in the context of the deregulated labour environment.

The most important features of flexible employment in Greece are presented, along with estimates for its magnitude. On the other hand, the implications of these forms of employment on occupational risk are explored, aiming to build a holistic picture of this phenomenon.

Finally, a short analysis of occupational risk in the key sectors where flexible employment is dominant follows, with respect to these features and implications.

Healthy Workplaces: Good for you. Good for business. A European Campaign on Risk Assessment.

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Under the Slogan "Healthy Workplaces: Good for you. Good for Business. A European Campaign on Risk Assessment", the European Agency for Safety and Health at Work has developed a European-wide information campaign focusing on risk assessment. This article presents and provides an overview of the campaign.

Keywords: risk assessment, risk management, Healthy Workplaces, European Campaign, European Agency for Safety and Healh at Work

Measures taken by Cyprus to meet its obligations arising from the Framework Directive 89/391/EEC

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Cyprus, with a population of about 780.000 out of whom 380.000 are employed and a per capita income of 19.077 Euro, 2,4% inflation, 4,4% development rate and 3,9% unemployment rate has favorable conditions to employ a suitable strategy on safety and health at work in order to improve the working environment at all workplaces.

40% of all occupational accidents happen in the tertiary sector, which dominates the GDP with a contribution of a 78,6% rate.

A study on the cost of accidents at work, which showed that 40% of the cost is allocated to the victim, 29% to the state, 24% to the employer and 7% to others, formed the basis to increase the Government Budget and to use economic incentives, in order to promote the placing on the market of equipment for work at height which conforms to the relevant EU standard.

The Government of the Republic of Cyprus in its effort to meets its obligations arising from the EU Acquis in the field of safety and health at work but also trying to meet the aspirations of the society and the challenges arising from its geographical position and the good educational level of its workforce, designed a strategy with main components an enabling institutional and legal framework, adequate Labour Inspection Services, promotion of prevention through education, training, dissemination, mainstreaming and promotion of research.

The results, as can be concluded from the descending trend in the accidents rate (14% reduction between 2004 and 2007), the increase in the number of seminars organized and of persons trained, the number of articles published in the press, the set up of units of OSH within the social partners organizations are promising.

Occupational Risk of tunneling construction

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This paper presents the quantification of occupational risk of the construction of a highway tunnel, located in Northern Greece. Risk assessment is based on the Workgroup Occupational Risk Model (WORM) project, developed in the Netherlands. This model can assess occupational risk at hazard level, activity level, job level and overall company risk. Fifteen job positions have been identified for this construction project, such as operators of a drilling machine, a loader, an excavator, a spraying machine, a crane operator, a blaster, a welder, the supervisor of the project, truck drivers and various other workers participating in the major construction phases. All risk profiles of workers have been quantified and jobs have been ranked according to their risk. Occupational risk has been assessed for two major tunnel construction phases which are a) the excavation and primary support and b) the final lining and support of the tunnel.

Functional Modeling for Risk Assessment of Automation in a Changing Air Traffic Management Environment

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Envisioning and analyzing the potential effects of automation is an essential part of the system development process in air traffic management (ATM). Moreover, ATM automation is a currently active development area considering the expected further increase in air traffic for the coming decades. The ERASMUS project proposes to decrease the occurrences of conflicting aircraft through automated minor adjustments of their horizontal or vertical speed. However, the literature demonstrates that the introduction of automation is typically not unproblematic. This modeling effort provides a means to evaluate the effects on controller and pilot work resulting from ERASMUS automation.

Modeling the tasks and functions that people and machines perform facilitates a systematic evaluation. Although many models of the (cognitive) tasks of controllers have been published, functional models of controller(s)-pilot(s)-aircraft-automation systems are rare. This study aimsto apply functional modeling concepts and methods from the Cognitive Systems and Resilience Engineering and specifically the Functional Resonance Accident Model (FRAM; Hollnagel, 2004) perspectives to ERASMUS.

The Functional Resonance Accident Model (FRAM; Hollnagel, 2004) characterizes socio-technical systems by the functions they perform rather than by how they are structured. It captures the dynamics by modeling non-linear dependencies and performance variability of system functions. FRAM proposes that normal performance (success) and failure both are emergent phenomena that cannot be attributed to features of specific system components, such as failure probability.

A set of functions in en-route air traffic control and cruise flight is identified from published task analysis efforts, interviews with (former) controllers, and observations of controllers on position in ACCs and in experimental settings, and taken as an input to the FRAM model. The functions of the envisioned ERASMUS applications are included, resulting in a model of the functions of the joint controllers-pilots-aircraft-ERASMUS system, which may be used for systematic evaluation and assessment of human factors issues.

External Services of Protection and Prevention Problems and Constraints in Cyprus.

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Risk Assessments in Cyprus are primarily carried out by a group of about 60 registered specialists in Safety & Health (officially called External Services of Protection and Prevention).

Risk Assessment is a relatively new institution to Cyprus. Since its introduction some positive results have undoubtedly been produced such as upgrading the level of safety, increasing people's awareness, better employee participation, better use of personal protective equipment etc.

However, a number of problems have also been encountered, particularly with the way ExSPP function. Some of these problems are:

-Market forces are forcing down the quality of Risk Assessments. Employers do not retain the best ExSPP but the cheapest. At the same time some ExSPP do not spend enough time or exercise enough attention on their work

-Instead of offering practical advice for the control of risks, some Risk Assessments tend to be bulky documents. This makes Risk Assessments difficult to read and implement

-TheRiskAssessmentspreparedbysomeExSPPtendtobeverysimilarincontentandtheuseof"copy-paste"iscommon

-Risk Assessments are not checked by anyone at present and ExSPP have little feedback on their work. Consequently they are not sure if they are working along the right lines.

-Although Cyprus has its own criteria for people to register as ExSPP, it would be very positive if these criteria are harmonised with those of other EU countries. The efforts of ENSHPO in this direction are vitally important

-ExSPP deserve a decent name for their profession. The official title "External Services of Protection and Prevention" may be legally correct but it is not practical and does not contribute to the recognition of the profession.

-ExSPP need Continuous Professional Education at a higher level. However, due to the small size of Cyprus, this is not always possible.

- Although Cyprus has its own criteria for people to register as ExSPP, it would be desirable if these criteria were harmonised with those of other EU countries. The efforts of ENSHPO in this direction are vitally important

FRAM as a risk assessment method for nuclear fuel transportation

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This paper gives an overview and evaluation of the predictive use of the Functional Resonance Accident Model, FRAM (Hollnagel, 2004), a method that is under development and in line with the theoretical framework of Resilience Engineering (Hollnagel et al. 2006). FRAM is based on the premise that both negative and positive events can result from (expected and unexpected) combinations of the variability in the normal performance of complex socio-technical systems. FRAM was used as a qualitative risk assessment method in a nuclear power plant.

The process assessed was the transportation of an 80 ton heavy metal cylinder for transportation of used fuel. The study focused on the transportation of the cylinder inside the power plant and in particular the 40 meter lift that is needed to get the cylinder up into the reactor hall. The FRAM analysis was used to propose recommendations at different levels, such as how to improve human-machine interface issues, procedures, information dissemination within the organization, and government guidelines.

The paper evaluates the suitability of the current rendering of FRAM for this type of analysis and describes how the four steps of the method were applied, thereby contributing to the development of the method. The evaluation was performed by using a form of introspection, inspired by the descriptive experience sampling method. FRAM is judged to be a promising method for creating resilient systems although some areas are in need of further development. Amongst these are the visualization of models, modeling of variability with positive outcome, and identification of countermeasures. Some suggestions on how to improve these are also presented. The authors believe that once these areas have been addressed FRAM can be said to fully embrace the concepts of Resilience Engineering.

Keywords: Functional resonance accident model (FRAM), Human reliability assessment/analysis (HRA), Resilience engineering.

Prevention of muscle-skeletal-disorders by ergonomic workplace design

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The study evaluates the lumbar load while handling airport luggage from two different band conveyors.

The body postures and the handled weights are captured with the biomechanical motion analyzing system CUELA. The data are analyzed with the OWAS and the lumbar load dose is calculated by using the MDD approach.

The frequency of stressful body postures is higher when working at band conveyor B than working at band conveyor A by factor 2.5. In the same way the frequency of hazardous OWAS categories increases by factor 1.4. Working at band conveyor B leads to an increase of 8.4 % more lumbar load dose.

Risk assessment in health-care workers: an ergonomic approach

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Risk assessment while handling patients requires a multi-level analysis of the operative needs and a wide range of interventions including the evaluation of their efficacy by means of a participative design. A comprehensive risk analysis and prevention program, based on the Royal College of Nursing methodology and the Sobane method is here discussed. Its application require a participative approach and multi-dimensional analysis of the real and operative needs of the Unit.

Lumbar overload prevention for health-care workers during patient-transfer activities

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Diseases of the muscular and skeletal systems are one of the most frequent causes for health-related absenteeism in the workplace. In particular in occupational fields associated with handling heavy loads – like care-activities with patient transfer – the risk of spine diseases in the lumbar region is increased.

Hence, laboratory investigations were conducted regarding the mechanical load on the lumbar spine of health-care workers. The examinations of patient-transfer activities mainly refer to such tasks, which presumably result in high lumbar loads. The aim of the study was to describe quantitatively subject's spinal load by several indicators, to support the assessment of work-related prerequisites in occupational-disease evaluations, to examine various measures for work design, and to derive potentialities for a biomechanically substantiated prevention.

Lumbar-load indicators – such as compressive and shear forces at the lumbosacral disc – were determined for several patient-transfer activities within the bed, between the bed and a chair, on the floor, and at the bathtub by applying a previously developed validated three-dimensional multi-segmental dynamic biomechanical model, The Dortmunder. The forces acting between nurse and patient were recorded indirectly with the help of newly developed force detection devices like "measuring bed" or "measuring chair". Postures of nurse and patient were captured via an optoelectronic "position sensor system" in combination with several video cameras.

In summary, the analyzed patient-transfer activities, if performed in a "conventional" execution mode, cause intensive lumbar load for the healthcare workers, which frequently exceeds recommended limits for the assessment of manual materials handling activities (e.g. Dortmund Recommendations). A considerably lower lumbar load can be achieved using an "optimized" execution of the activities in many cases. The testing of "small aids" (e.g. "sliding mat" or "handle belt") shows that lumbar load can furthermore be lowered in order to support health prevention in nurses' everyday working life, especially for elderly persons.

OSH intervention challenges; A case study

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Occupational safety and health (OSH) management has a great impact on safety and ergonomics at work. Many interventions have been used and it has been observed that it is often unclear whether the intervention really works. The Finnish postal service company realised the importance of improving the ergonomics and safety at work in order to improve workers' health and safety as well as the physical and mental impact of their work load. Many intervention methods were adopted and a number of improvements were made. Process evaluation revealed many positive results, as well as some challenges. Instead of describing detailed results of OSH risks at a postal service company, the aim of this paper is to describe the process of an OSH intervention study both from the company's point of view and from that of the researcher.

Ergonomic improvements for the reduction of operator fatigue at transformer assembly lines

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The assembly lines of transformers include work posts which are known for their monotony and increased operator fatigue, due to:

1. Continuous handling of loads
2. Prolonged standing position
3. Repetitive movements of the hands and wrists.

In order to reduce the risk of accidents, as well as the operator's fatigue and risk of MSD's, an integrated programme was introduced for the improvement of work conditions at the plant. Initially, the occupational safety and health (OSH) issues were examined through a detailed occupational risk assessment covering all activities at plant in order to phase out any risks which might lead to a serious accident. Subsequently, an ergonomic study was carried out in order to document the detailed improvements to be made at specific work posts, like the coil winding machines for transformers. This case was submitted at the 2007 European Good Practice Awards in Safety and Health at Work devoted to the prevention of MSDs and won a Good Practice Commendation.

Organizational factors in accidental causation in a building project in Brazil

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Construction industry is responsible for one of the highest incidences of work-related accidents in Brazil. Accidental falls account for the majority of these, and therefore an analysis of their causes is pertinent. Whilst some studies recognise the relevance of organizational factors on accidental falls, they do not describe their influence and impact in detail. The difficulty in describing their influence and mechanisms is due to the design of studies of accidents that, for the most part are based on statistics from accident reports or from analyses of accounts from these reports. In order to try to understand the influence of organizational factors on accidental falls, a field study was undertaken, which looked at the phase of concreting the floors of a residential block. The methodological approach was based on the analysis of carpenters' work practices and of workers' accounts of minor falls. Observations were noted on work practices over this stage, and interviews were conducted with the workers hired by the subcontractors and with professionals working for the construction company itself. The results showed that falls were related to the introduction of new building technology and its use by the workforce. The production planning and organization of activities by the subcontracted firms also led to temporary demands that were additional determining factors for falls on site.

Prevention of occupational farm accidents in Denmark from 1998 to 2006

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Aim: The aim of the present study was to study and follow trends and developments in the number of farm accidents, including patterns and severity of injuries in the years 1998 – 2006 in order to evaluate preventive efforts being carried out in the same period.

Material and Method: Numbers of accidental deaths were collected from the registry of work related accidents for the whole country. Other data were obtained from the Danish EHLASS project (European Home and Leisure Accident Surveillance System). This emergency room registration project covers about 17 % of the Danish population and contains data about the place of an accident, types of injuries sustained, consequences of injuries, the activity (work, leisure, sport, traffic) and details about work accidents, including type of occupation and materials involved in the accident.

Results: The incidence of farm-work related deaths fell from 1.9 pr. 10.000 employees to 0.2 during the period 1998 to 2004, but during the last 3 years the incidence of work-related deaths has risen to the same level as in 1998. The numbers of emergency room treated accidents registered in the EHLASS project during the same period shows an unchanged injury rate. The severity of accidents has fluctuated over time, reflected in death rates. Accident severity measured by hospitalisation rates, fell at the start of the period, but appears to be rising again. In the years 1998 to 2002, following several studies highlighting the causes of farm work-related accidents, there was an intense focus on accident risk and accident prevention. Preventive efforts targeted groups from farm labours and farmers to farming students, farmers wives etc. These efforts were seen as responsible for the decline in the accident rate, and likewise, increasing rates during the last three years could be explained by a decline in awareness as well as by an influx of migrant workers in the field.

Conclusion: The results of a number of preventive efforts targeting accidents in Danish Agriculture seem previously to have reduced accident rates. Current rises in accident rates can have several explanations.

The role of the Occupational Health Physician (OHP) in the investigation of the causes of the Work Accidents (WAs) – Experience from the Public Power Corporation (PPC) in North Greece

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Introduction: By the investigation of the causes of the WAs, the PPC records also the opinion of the OHP, responsible for the Operational Unit of the victim. The Greek legislation charges with the duties of the investigation of the WAs exclusively the Safety Engineer (SE) of the enterprises. In the years 1993 – 2007 (14,5 years) we investigated totally 220 WAs of employees of the PPC in North Greece, 12 WAs of third persons, most after a direct contact to active power lines and 4 WAs of subcontractors staff. Fifteen WAs were sent back on grounds of unauthorization. With our presentation we wish to transfer our experience for the importance of the involvement of the OHP in the investigation of the WAs.

Methodology: We reviewed all the data and the reports of the WAs of the reference period. We surveyed our written reports and statements with our aspects one by one.

Results: 205 of the 220 WAs occurred to men and 15 to women. 85% of the victims were workers and technicians. The rest were employed in several duties. 20 road and traffic WAs with two deaths, were excluded. In 48,2% of the WAs were involved electricians for the power lines, who are frequently working under voltage. Specific findings by the WAs of the staff of the PPC, were following:

- 3 electric WAs had a lethal outcome
- 18/55 (32,7%) of the WAs by electricians, working in Current Distribution Units in the city of Thessaloniki, occurred after an electric arc and an explosion resulted to burns of the face and/or the hands of the victims.
- 6 WAs were heart attacks after a heart infarct, two lethal, which occurred during the implementation of the work duties
- 2 WAs were strokes, during the employment
- 7 of 10 electric accidents in third persons (not employed by the PPC or by subcontractors) occurred through a contact to active current lines and had a lethal outcome.

Separate specific reports with our aspects and statements for the causes of the WAs were sent for more than 75 cases. More than 30% our approach for the grounds of the WAs was partially or totally different, compared to such of the Operational Unit of the PPC.

Conclusions: By the investigation of the causes of the WAs have to be involved the statement of the OHP, especially by:

- The lethal and serious WAs
- The WAs after an internal disorder or disease
- The issues of recruitment after the rehabilitation
- Any case asked for by the enterprise or by the representation of the employees

Accident events among self-employed private forest owners

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Half of the Swedish forest is owned by private persons and at least 215 000 persons conduct work themselves on their forest holding. However, only lethal accidents are systematically monitored for this kind of self-employed forestry. Therefore, data from the registers of the Swedish Work Environment Authority, the Labour Market Insurances and the regional University hospital in Umeå were gathered.

Large differences in accident types and numerals between registers were found. Difficulties in defining self-employed forest workers were manifested, as well as the work's leisure time characteristic. Consequently, conducted estimations varied from 32 to at least 4400 injured persons per year in Sweden, depending on the choice of population definition, register and accident severity. Nevertheless, accident events were consistent over registers. Severe accidents were common, with casualties corresponding to 7% of all lethal accidents in the authority register. The falling tree was associated with many and severe injuries. Thus, unsafe work methods appeared more related to the accident event than the equipment used (chainsaw). Improvement of the workers' skills is therefore considered to be an important prevention measure.

Challenges in improving safety in the smallest of companies, between occupational and consumer safety, are exemplified and discussed.

Key words: Accident statistics, SME, forestry, firewood, chainsaw.

Safe work plan for tank truss installation

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On sunday, october 9, 2005 one contractor worker was assigned to work on the top of tank (x) "c" to refit the end of the steel rafters where they meet the top of the tank in a petrochemical construction plant. Prior to the incident worker had been wearing his fully-body harness with a single lanyard that had been attached to 2 cran rigging slings.These crane rigging slinging had been placed in the "choke" position (one end woven through the eye of the others end) and fastened around the structural steel cross bracing located between each truss .The worker had placed these rigging slings in place to extend the reach of his work area. Upon completion of his work day, he was standing on the 600 mm horizental steel truss/wall plate, when he chose to unhook the layard from his full-body harness and de-rig the cran rigging slings. The worker dropped the crane rigging slings to the floor (roof) of the tank top.At this time, he choose to descend from the 600 mm horizental steel truss/wall plate and climb down to the scaffolad planking located approximately 1 meter below. His route of travel was on the west side of the roof truss he had been working on which was under load/pressure. The steel roof truss that he had been preparing to weld had been cut and altered from its original condition .The end of the truss located over the 600 mm horizental steel truss wall plate had been pulled down onto the plate by the use of a 3-ton come-a-long (hadnd operated) attached to two welded metal brakets , the one bracket was welded to the under portion of the roof truss , while the second braket was welded to the inside sidewall of the tank . As the worker was climbing down onto the scaffolding ,the metal bracket located on the under portion of the roof truss broke,causing the steel roof truss to spring up and outward, strinking he under his chin causing the vertebrate in his neck to break.Upon being struck by the structure steel truss which had been under pressure , the worker was thrown over the tank wall where he fell 24 m to the ground below.

Occupational Health and Safety in EASA PART-145 Approved Maintenance Organizations

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The objective of this paper is the Safety in EASA PART-145 Approved Maintenance Organizations of Europe, a field of financial activity with very particular characteristics. The study aims to present the National and European occupational health and safety conditions which exist in the Base and Line Aircraft Maintenance as well as in the supporting Workshops (e.g. Engineering facilities shops, Plate shops, Electrical shops, NDI facilities shops, Avionics shops etc.). After a thorough research in both National and European level, statistical figures are presented as far as the number of labor accidents in the maintenance units is concerned. These include the cause of the accidents, the seriousness, the material factor, the part of the body injured, the victims sex, the victims previous experience in the job, the consequences (financial and others) to both the maintenance organization and the employees plus other interesting features like index, etc. Furthermore, tables presenting the labor accidents that occurred per month of the year, per day of the week, per hour in a day, concerning the maintenance organizations participated in this research are included. Information is also presented concerning the safety measures taken by the administration of the companies to prevent labor accidents. Particular attention is paid to the checking to whether or not the measures are adopted by the employees plus the difficulties in their adoption. The influence of the human factors in the cause of labor accidents is also examined. The final target of this research is to come to as far as possible safe conclusions and propose useful suggestions for the improvement of the safety conditions in the aircraft maintenance organizations.

A multi-level model predicting safe behaviour and compliance

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This paper presents an investigation of the influence of individual perceptions of safety issues, and group level shared evaluations, on safe behaviours. Current literature stresses the importance of, not only employee perceptions of safety, but also the level of shared work group evaluations, of, for example, safety climate, in the explanation of safe behaviour. Workers from different work groups do not necessarily provide independent evaluations of the work situation; many of the safety outcomes have an individual component which is difficult to separate form the collective structure and social context.

Multilevel methodology facilitates the analysis of data from both the personal and aggregate levels simultaneously, and the effects of the hierarchical structure of this sample were examined using multilevel Structural Equation Modelling. Data were collected form 1189 individual employees in a large transportation company over a period of two months during 2007. These respondents came from 78 separate work groups across the company. Evaluations of safety climate, working environment and worker involvement, as well as safe behaviours, were collected using a self report questionnaire.

The multilevel analysis showed that both levels of evaluation were significant in explaining participation in safe behaviours. All variables were associated with *risk taking* and *active safety behaviour* at the individual level, while further variance in *risk taking* could be explained at the group level. The results suggest that, while individual evaluations of safety issues are important, there is a role for the fostering of collective safety climates in encouraging safe behaviours and reducing accidents.

Session 29: Risk Perception

Managers' attitudes of safety measures in the commercial transport sector

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Safety measures and related costs and benefits have been widely discussed and analyzed in the academia, authorities and industrial sectors. The study reported in this paper addresses these aspects from a cognitive and behavioural based perspective. Risk management is about dealing with the conflict between production and safety. Enterprises that spend too much on safety will meet bankruptcy, and those not concerned with safety measures would meet severe accidents and related damages to the enterprise. Inspired by James Reason's theoretical framework, managers (n=106) of commercial transport enterprises were asked about their attitudes towards safety management, which factors that have contributed and their belief that further effort and investments in health, environment and safety (HES) measures will pay off. One half of the managers perceive HES work as too expensive, and approximately 25 % of the managers assess HES work as compromising their competitiveness. One third of the managers do not find further safety measures than already implemented necessary or remunerative. They claim that there are no other alternatives of doing their activities and that there are no technical measures available that could improve the safety challenges. Managers do acknowledge HES work as important for the reputation. The factor analysis gave five HES-attitude factors; I) concerned about formalities, II) HES work improves health, environment and safety, III) HES focus reduces motivation, IV) HES regulation is appropriate, and V) HES work can be improved.

Explaining safe behaviour across different work groups

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This study examines the relationships between employee attitudes to organisational safety issues; perceptions of the physical working environment, and evaluations of worker involvement; and relates these to self-reported levels of safety behaviour. It explores the relationships between these variables in three work groups in a large transportation organisation, examining the similarities and differences in the architecture of safety attitudes in those groups. Over 1100 workers from a large transportation company based in UK were assessed using self report questionnaire measures. These workers were involved in three types of tasks: delivery, warehousing and administration.

Multisample structural equation modelling was used to estimate different nested models, in order to explore the moderation effects of membership of different work groups on the promotion of safe behaviours. These data showed the same basic structure of attitudes to safety issues, and their relationships to safety behaviour, across the three occupational groups. This suggests that climate and attitudes to safety play an important role in the explanation of employee safe behaviours. However the differences between groups suggest that occupational role can act as a moderator in several of these relationships. Comparisons are made between the three groups, and mean scores on each of the model components show that there are differences in the relative assessments of the dimensions. The results are discussed in terms of generating general models of attitudes to safety, which in turn may facilitate climate change and result in the promotion of safe behaviours.

Pilot error: even skilled experts make mistakes

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Between 1987 and 2001, 27 major airline accidents occurred in the United States in which crew error was found to be a causal or contributing factor. In five of these, inadvertent omission of a normal procedural step by pilots played a central role. Professionals in other work settings involving high risk have been shown to be vulnerable to similar errors. Why do highly skilled, highly motivated pilots make errors that cause accidents? The answer to this question is complex. Attributing errors to “carelessness” or “complacency” is trivializing and misleading. Finding meaningful answers requires careful analysis of the nature of cockpit tasks, of the demands those tasks place on human cognitive processes, and of the inherent vulnerability of those processes to characteristic forms of error in particular situations. Our analysis based on a detailed examination of flight manuals and observations from the cockpit jumpseat shows that omissions during task performance stem from the same underlying and contextual factors. Crews accomplish many tasks, most of which involve multiple procedural steps. The high degree of familiarity with these tasks and the standardization of operating procedures usually keep the workload within human capabilities. During even the most routine of flights, the difficulty arises not so much out of the total.

Professional drivers & road accidents

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AIM: Road accidents in our country occupy public opinion and the experts, as the dimensions of the problem are enormous. The present study aims at recording the elements of road accidents, their coding and the investigation of the professional driver's role.

MATERIAL-method: The elements emanated from the recordings of the Traffic Police, the General Hospital of Lamia and the Fire Brigade, for the period 2004-2005-2006 and for the National Road Athens-Lamia between 119 and 253 km.

RESULTS: The Prefecture of Fthiotida was until 2004 in first place nationwide regarding road accidents. Totally, in the 3 years of recording, 136 road accidents were reported. 37,5% involved professional vehicles. The people, who died, were seriously wounded and light wounded for the above mentioned time period was 84, 44 and 211 respectively.

Statistically important relation was found between the indicator of the seriously injured persons/per accident and light injured/persons accident and the season and the daily distribution.

A statistically significant difference between the professional and non- professional driver's was found regarding the indicator of the light wounded (p=0, 0017). The involvement of professional drivers does not seem to be connected with road accidents involving deaths and/or seriously injured (p=0,309). It is interesting that most of the accidents occurred in August and September, mostly on Sunday (day with most accidents), Saturday (day with most deaths) and Monday (day with most seriously and light injured). As far as the kilometric distribution is concerned, most accidents occurred in the route from Kamena Vourla to Lamia (170-211 km), in the heart of Maliakos gulf. Among the seriously injured, the most frequent lesions concerned rupture of internal organs while among the light injured, craniocerebral and thoracic injuries.

GTI: Vehicles and more - striking new paths in traffic education

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"GTI: Vehicles and more" is a project for road safety work with apprentices. The "GTI" training system combines seminars, computer-based training and project work to form a curriculum that covers a period of two and a half to three years. It offers companies the opportunity to incorporate road safety as an important subject of health and safety at work and as a continuous element of training.

Explaining road accidents in road transport and logistic companies: the role of organizational factors

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Safety is a critical issue in transport and logistic sector. Specifically, compared to all modes of passengers and goods transport, transport by road accounts for the highest rates of human deaths (including coaches and lorries drivers). European Union have pointed out an integrated action is needed in order to make the trans-European road network safer. Nonetheless, up to know, preventive actions have mainly focused on human and technical factors not considering organizational ones. Thus, a socio-technical approach is needed in order to better understand the antecedents of safety in road passenger and goods transport. Standing in Rasmussens socio-technical model, this study examines the relationship between a number of organizational processes and elements and likelihood of road transport accidents. Sample was composed of 107 road transport and logistic companies. Preliminary analysis showed tasks formalizations and organizational learning were negatively related to road accidents. In contrast, years of transport vehicles was positively related to road accidents. Furthermore, hierarchical regression analyses showed organizational learning is key predicting road accidents.

Risk apportionment for railway safety

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The creation of a single European rail transport market it is important to increase confidence between the actors on the market and between member states who shall ensure that railway safety is generally maintained and, where reasonably practicable, continuously improved.

For this purpose the EU Safety Directive introduces a mechanism to adopt a minimum CST expressed in risk acceptance criteria for individuals and for society. This paper focuses on the apportionment of safety targets for European railway system. We develop a generic approach based on the Functional Hazard Analysis (FHA), to analyse the safety of railway systems for a unified European network and to comply with the Common Safety Targets (CSTs) required by the European railway Safety Directive. We suggest to combine the FHA technique with the functional railway architecture, developed by the AEIF, to allocate the safety targets to the railway functions.

Keywords: Risk Management, Safety Targets, Railway, Interoperability

Six reasons why hours of service regulations for truck drivers are violated

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Two decades of research has established a correlation between tiredness and fatigue, and traffic accident involving truck drivers. Regulations limiting the driving hours of truck drivers thus are necessary precautions. But compliance is a problem. The answer from authorities tend to be disciplinary measures, leading to protests or strikes among the drivers, and an uncooperative climate.

This paper offers an insight into 16 truck drivers´ daily practices and strategies towards the European regulation 651, based on a longish ethnographical field study in a Danish haulage company.

The results points to six reasons why the regulations might be violated. The first is that driving time is respected, but resting time is not, which in effect means that the drivers experience the restraining part of the regulation, but not the protection from exploration that it also contains. The second reason is that the regulation seems to be designed to long distance driving, and has some short-comings when applied to short distance drivers. The third reason is that the regulation deprives the drivers of means to control their tiredness. The fourth reason is that the regulation limits room for planning ahead generally, because a truck driver's work is unpredictable and independent, but the regulation is action-defining and inflexible. Thus the regulations provoke violations because they counteract with the reality of truck drivers´ work conditions. The fifth reason is that the regulation counteracts with a general independency ideal among truck drivers. The last reason is that the drivers and their employers share an interest in long work hours.

POSTERS

Benchmarking Safety Through the Safety Perception Survey

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Description

Safety practitioners know only too well that simply implementing appropriate procedures and training is not enough to ensure a successful safety program. But why is it that some programs are not effectively executed or simply not followed by employees? Is there a way to identify the hidden pitfalls in a safety process? How does a company establish a benchmark by which to measure future safety performance? Conclusions

Eight years ago DuPont safety and consulting professionals set out to find a way to answer these questions, and the result was the Safety Culture Improvement Process (SCIP) Survey. The goal of the survey is to evaluate organizations' perceptions of their safety process and identify behaviors, attitudes and other factors that can derail a safety program. Since its inception, the SCIP survey has been given to more than 200,000 employees in 61 countries across a range of industries. The resulting insights get right to the heart of what employees think about safety and help companies understand the hidden issues that can negatively impact the implementation of a safety culture program. DuPont has also developed an analysis on how perception results can also serve as an indicator of future safety performance. Significance of the Subject Matter

One of the unique aspects of the survey is that it queries all levels of an organization, collecting responses not only from company leaders but also from the workers who will eventually adopt the new behaviors and attitudes. Once the information is gathered, the results are benchmarked against world class safety programs. This session will share insights, trends and analysis on safety perceptions and safety culture gained from more than 200,000 survey responses on the topic.

What does the German public have to say on the subject of skin?

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The associations and institutions responsible for statutory health and accident insurance and prevention in Germany, together with other co-partners such as the federal states, are conducting a joint healthy skin campaign from 2007/2008. It is aimed at insurants of health and accident insurance institutions and its message is "healthy skin, fewer skin diseases". The campaign consists of both a common, predominantly media-based umbrella campaign involving all the institutions and dialogue-based, target group-specific campaigns by individual health and accident insurance institutions and their co-partners. Based on a representative telephone survey at three different monitoring times (pre-post monitoring) the effectiveness of the umbrella campaign will be evaluated. This article focuses on the pre-monitoring results.

Safety of Machinery - Perpetuating the systemic approach and the integration of human factors into machinery

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Over the past few years the BGIA has been continuously integrating human factors into its work and establishing a systemic and multidisciplinary approach. As the BGIA supports the German institutions for statutory accident insurance and prevention through research, development and testing of products the interdisciplinary approach affects its full scope of duties. The testing of safety-related industrial products and the advising to developers in particular give the BGIA the capability to influence the degree of priority of safe and usable design of machinery and safety devices and thereby initiate a systemic and holistic approach by the developers themselves.

The present paper presents recent minor and major projects in the field of human-machine interaction. These projects combine organizational safety and health (OSH) relevant aspects with new technologies (e.g. computer technology) and social sciences (e.g. psychology). The presented projects show the wide spectrum of tasks and the holistic approach which exerts influence on the whole life cycle of industrial products. The tasks result e. g. in guidelines for the design of safety-related development environments or accident analysis by consideration of human error.

Legal foundation of the integration of safety and health in education and training

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- The International Labour Organisation wants mainstreaming of OSH in education and training (e.a. article 14 of Convention 155)
- The obligation of safety education can also be based on Convention on the Rights of the Child of 20 November 1989.
- Schools have to apply the national regulations transposing the European OSH directives. This means a safe and healthy school and safety eduction of pupils ans students.
- There is a general obligation of prudence and of taking precautions. This obligation is present in civil law (torts) and penal law (punishment of imprudent or reckless people). Principals, headmasters and teachers can be punished if not behaving properly regarding safety and health. In Belgium some pupils and students are assimilated to workers, which means that teachers have to give those pupils and students appropriate instructions and have to control the equipment and the machinery.
-In the higher vocational education (post-secondary) institutions have after the Bologna Decree to define the competencies taught and trained. OSH and Environment are of course part of it.
-In Flanders the programs of schools are made in accordance with existing professional profiles fixed in dialogue with the social partners. Since those professional profiles include OSH, it is mandatory that it is included in school and training programs.
-In Belgium OSH is included in the teacher training.

Safety climate in the Nordic construction industries

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Introduction: Accident and injury rates in the construction industry vary greatly between the Nordic countries, and have even been shown to vary significantly when workers from different Nordic countries work together on joint construction projects. Recent international research has established a positive relationship between occupational safety climate and safety performance and outcomes at work, e.g. low accident or injury rates. The objective of this study was to compare Nordic construction industry scores on safety climate dimensions and facets. Methods: A pilot version of the Nordic Occupational Safety Climate Questionnaire (NOSACQ) was used, in which safety climate was defined as workers' joint safety perceptions and attitudes within a social unit at a given time. The seven main safety climate dimensions dealt with safety leadership including management's priority and commitment to safety, safety systems, as well as worker involvement, priority, commitment and compliance to safety. Native language versions of NOSACQ were tested in a convenience sample of construction workers in Denmark (N=153), Finland (N=147), Iceland, (N=99), Norway (N=153) and Sweden (N=201). Results: Significantly ($p=0.05$) higher scale scores on the seven dimensions were found for Norway (n=6 of 7), Island (n=2) and Sweden (n=1), whereas significantly lower scores were seen for Finland (n=5), Denmark (n=2) and Iceland (n=3). The lowest scores across all countries were for the dimension regarding workers' priority of safety, whereas the highest scores were in regards to safety systems, e.g. workers' perceptions of formalised safety such as safety training, safety committees and safety inspections. Conclusions: Data showing national (Nordic) differences in occupational accident and injury rates are now supplemented with data showing significant national differences in safety climate in the Nordic construction industries. The identified dimensions can pinpoint not only areas (dimensions) where individual countries can focus their interventions, but also areas where countries can share knowledge and practice.

Occupational risk assessment of workers employed in uncontrolled burning processes

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Occupational risk assessment related to the occurrence of chemical agents is a process of identifying agents, which can cause potential risk to human's health. It also covers studies of work conditions in connection with these factors' activity. Its fundamental aim is an accurate recognition of hazardous properties of chemical compounds capable of causing harm, and taking preventive measures directed to their reduction. Harmful chemical agents include all of the factors classified as hazardous, except for those which are hazardous exclusively for the environment. Thus, every chemical agent and dust that has an established value of the highest acceptable concentration level belongs to this group. In practice, all of chemical compounds identified during uncontrolled burning processes within this study satisfy these requirements. Chemical compounds absorbed through the respiratory tract can induce hazardous effects to the health condition of people carrying out an open burning processes, people working in incineration plants or firefighters who participate in fire fighting actions. Quantitative occupational risk assessment related to exposure to chemical factors is possible only for agents, that have established values of the Maximum Admissible Concentrations (MACs) in the national law regulations. It concerns the assessment of inhalation exposure to harmful compounds, therefore the assessment of dose absorbed through the respiratory tract into human's body during his occupational activities. The purpose of this study was to identify and quantitatively determine chemical substances released to environment during uncontrolled combustion processes and occupational risk assessment. Results of the study have indicated that the most dangerous for human health are open air burning processes where wastes mixed with plastic products are burnt. Concentrations of polycyclic aromatic hydrocarbons were established at the level 0,7 MAC, which means occupational risk related to exposure to chemical factors was large and unacceptable. Moreover, presence of dioxins and furans in air influences increase of hazards for workers health mainly considering their carcinogenic and mutagenic activity.

Safety and prevention measures of employees in microbiological - research laboratories

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In recent years with the advance of technology, new methods of typing and identifying micro-organisms have been adopted in the majority of microbiological-research laboratories. The handling of micro-organisms in a laboratory requires working conditions according to the methodological protocols in order to ensure the protection of the employees. This study focuses on the safety and protection principles which the employees should apply in microbiological-research laboratories, in accordance with the guidelines of the European Council of European Union 90/679/EEC emphasizing to the primary and secondary containment of biological risk.

Epidemiological approach of biological risk in the hospital environment

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In the present study the evaluation of biological risk in the hospital environment is attempted with the presentation of a methodology using hospital data that concern past events or situations (number of accidents related to the exposure to biological agents, personnel's groups at risk etc) and data that the employees provide by filling specific questionnaires, in terms of the working conditions. The aim of this study is the qualitative and quantitative assessment of biological occupational risk that represent a possible framework on which potential safety measures will be developed.

Workplace risk assessment as the main tool for prevention of accidents

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This paper focuses on the workplace risk assessment as one of the main tools for prevention of accidents. An overview of current situation in the field of occupational health and safety in Estonian enterprises based on statistical data is presented. It shows, that the main aim of risk assessment - to prevent accidents – is not fulfilled its assignments entirely. The study suggests that a more comprehensive approach to risk assessment should be promoted by authorities offering practical methods and guidelines which are currently lacking in Estonia. It is possible to reduce occupational accidents by effective risk assessment, which is proved by analysing the safety level in a company of the clothing industry as an illustration during the years from 2001 to 2007. The overall purpose of the paper is to draw the attention to effectiveness of the risk assessment, or perhaps to act as a reminder of number of issues of particular relevance to effective workplace risk assessment in order to alter its report to a practical document from which employees, employers, occupational hygienists and physicians as well as authorities can benefit today and in the future.

Pedestrian - motor vehicle accidents in rural population of Crete

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INTRODUCTION- AIM- Pedestrian-motor vehicle trauma is a common injury especially in rural populations. Most of the times are associated with substantial morbidity and mortality .

The aim of our study was to describe epidemiological and medical aspects of 80 pedestrian motor vehicle accidents from rural areas of Crete with total population of 800.000 inhabitants.

MATERIAL AND METHODS- We performed a retrospective review of 80 victims (54 men-67,5% and 26 women-32,5%) seen at our departments over a four year period(2003-2007).

Patients were analyzed by age and grouped as children (< 16 years), adults (age 16 to 64 years), or elderly (> 65 years). The main outcome measures included mortality, hospital stay, ICU stay, Injury Severity Score, Glasgow Coma Scale and Revised Trauma Score

RESULTS- 1. Children constituted 15 % (12) of the patients, adults 55 % (44), and elderly 30 %(24). 2. Elderly patients were more frequently admitted to the intensive care unit (ICU) and had significantly longer ICU and hospital stays. 3. Extremity trauma was most common in all three groups, followed by head and spine injuries. 4Among all patients, injuries included musculoskeletal (35%), head and neck (30%), abdomen and pelvis (10%), chest (8%), spine (12%), and other (5%).

CONCLUSIONS- 1. Hospital stay, Injury Severity Score, Revised Trauma Score, Glasgow Coma Scale, and the mortality rate worsen with age. 2.The high mortality rate among the elderly indicates the need for more aggressive and effective prevention efforts.

Maxillofacial injuries related to occupational accidents

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INTRODUCTION-The probability of sustaining maxillofacial trauma at work is correlated to the nature of the occupation. Individuals using tools or machines at work are exposed to a much higher risk of work-related maxillofacial trauma.

AIM-The purpose of this study was to reveal the significance of maxillofacial injuries related to accidents occurring at work by evaluating 36 patients with maxillofacial injuries over a 3 year period (2005-2007).

MATERIAL-METHODS-All 36 cases -100%-were reviewed and analyzed according to 1.age, 2.gender,3. cause of accident, 4.occupation, 5.type of injury,6. location and 7.frequency of fractures. The highest incidence of maxillofacial injury was found among construction workers , followed by craftsmen and office employees. The sex distribution showed an overall male-to-female ratio and those in the age group most affected were between 30 and 39 years of age. Of all trauma, 50% (18 persons) sustained maxillofacial fractures, 38.8% (14 patients) suffered dento-alveolar injuries, and (17 people-47,2%) showed soft-tissue injuries. 19.4% of all patients displayed concomitant injuries with cerebral and cranial trauma being the most common.

CONCLUSION-This paper demonstrates the power of databases to identify specific occurrences that may provide the basis for prevention in the future.

Occupational back pain in nursing personnel

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AIM-The aim of this study was to identify the prevalence and risk factors for low back pain (LBP) in nursing personnel and to analyze how individual and occupational characteristics contribute to the risk of LBP.

MATERIAL-METHODS- Female nursing personnel (n = 76) were followed for 3 years(2005-2007). Data on constitutional and behavioral factors, occupational exposures, and back-related symptoms and disability were collected. Back pain was grouped into 1.sciatic,2.sudden," or " 3.other" and related disability. Different questionnaires were designed to cover personal and professional data, the prevalence, and associations of risk factors with LBP.

RESULTS-Results indicated that prevalence of LBP in nurses was over 50%(40-52,6%). Lifting was the most common mechanism for LBP. Prolonged standing and rest were found to be the significant aggravating and relieving factors. Absence from work because of LBP in the month before the questionnaire was completed was reported by 43,4% of the sample.

CONCLUSION-The results demonstrate that the magnitude of LBP among nursing personnel appears to be high and therefore more resources should be allocated to prevent such an injury occurring in the nursing profession.

Systems engineering approach for the railway worksites' safety modelling

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The research presented in this paper focusses on the development of a model using a systems engineering approach, and more specifically the notation with the Unified Modelling Language (UML). The question is to evaluate if this language and the associated tools are suitable for the construction of complex, interdisciplinary and hierarchical models. The railway worksites and the safety rules to protect track workers are used as a case study of this approach.

Firstly, we will describe the static view of the railway worksites with the class diagrams of UML. These diagrams allow to represent conceptual objects and relations or actions between them. Secondly, the dynamic point of view will be described with the activity diagrams, sequence diagrams and state machine diagrams.

The diagrams we present here includes also abstract concepts not specific to the worksite protection in order to be extended to other safety studies.

Prevention of Biological Risks in the Construction of a New Department of Microbiology : from plan to installation, twelve years of experience (1996 – 2008).

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The construction of a new department of microbiology is a very enriching experience especially because in the last twenty years the fields of biology have grown, lab techniques have developed and numerous new pathogens have emerged.

It was a real challenge in 1993 to impose measures for the prevention of biological risks when the relevant legislation was poor. It is a great satisfaction today to have built a department of microbiology in accordance with the most recent French legislation. However it represents enormous work and dedication, impossible to reduce in few words and only the most important aspects will be presented here.

Professionally important qualities of train drivers and risk prevention of their unreliable work

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Introduction

Safety and security are growing concerns for businesses, governments and the traveling public. Train accidents continue to occur across West and East Europe despite major improvements in active safety systems and a major refocus on passenger train safety. Policies aimed at reducing transport-related risks depend on state-of-the-art research and technological development, among which human factors issues play increasingly bigger role.
Purpose

To reveal reasons of train drivers (operators) psychophysiological professionally important qualities gap to occupation requirements, their impact on operators professional level and reliability.

Results

It was developed and implemented the technique for investigation of psychophysiological important qualities (PPIQ) of rail drivers in conditions of locomotive depots. That technique was realized as a software tool to measure psychophysiological indices that were compared with normative ones.

Measure and analysis of rail drivers PPIQs have revealed reliable differences between drivers and engine-driver's mates on each traction types (diesel and electric locomotives), as well as between drivers of the same traction at different depots. This can be result of too sensitive indices used or significant influence of social-economic conditions of living in different regions of Ukraine that correspond the phenomenon occurred in power industry earlier (Gerasimov and Burov, 1993). Such a result should be taking into account when designing and use initial professional selection of rail drivers, because could lead to higher risk of unreliable drivers work who do not meet requirements of occupation. At the same time, use of not only medical, but psychophysiological indices for prediction of rail drivers professional ability can be fruitful way to achieve a high accuracy of prognosis, as well as a tool of risk prevention to leave for work of operators with not adequate psychophysiological status.

New hygienic standard values for chemicals in workplace atmosphere in Poland in 2007

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In 2007 The Expert Group of Chemical Agents, worked in Nofer Institute of Occupational Medicine in Poland proposed Maximum Admissible Concentrations values for 10 new harmful chemical agents in the working environment in Poland. There are following substances and their CAS Number: zinc oxide fumes and respirable fraction (1314-13-2); sulfur dioxide (7446-09-5); formaldehyde (50-00-0); diisocyanate hexane 1,6 diyle (822 06 0); toluenediisocyanate (26471-62-5); diisocyante methylenediphenyle (26447 40 5); buta-1,3-dien (106-99-0); ethyleneimine (151-56-4); formamide (75-12-7); cobalt and its inorganic compounds as cobalt (7440 48 4). According to the type of biological effects, the following categories of MAC values are used: NDS – MAC(TWA): maximum admissible concentration; NDSCh – MAC(STEL): maximum admissible short-term concentration; NDS – MAC(C): maximum admissible ceiling concentration. To 2007 there are 495 MAC values for chemical substances in Poland (The Ordinance of the Minister of Labour and Social Policy: J. of Law 217, item 1833, 2002 with amendments). Interdepartmental Commission for Maximum Admissible Concentrations and Intensities for Agents Harmful to Health in the Working Environment has appointed the Group of Experts for Chemical Agents, consisting of independent experts in the fields of toxicology, occupational medicine and occupational hygiene. The experts prepare health-base documentation for recommended exposure limits along with analytical procedures, recommendations with respect to pre-employment and periodical medical examinations and contraindications to exposure. The proposed MAC values are then the subject for evaluation by the Interdepartmental Commission and acceptance by the Minister of Labour and Social Policy. The MAC's list is published in the Law Gazette. In the Polish system, the MAC values documentation are published quarterly in the publication of the Interdepartmental Commission. The authors show the MAC values with their critical effects, bases and endpoints of MAC values for 10 substances.

The impact of Health and Safety training in employees? Accidents related absenteeism.

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Introduction

Training and education in occupational health and safety issues is considered as one of the most effective measures for the reduction of accidents and their consequences (absences, compensations etc). The aim of this study is to investigate the impact of training and education of employees with regard to incidence and duration of absences due to accidents.

Methods

Medical certifications of social insurance body kept in occupational health department and the archive of education department concerning theoretical and practical training on health and safety issues have been used during a 3-year time (2002-2003) in a shipyard of 1500 employees.

Results

During 2002-2003, 52-57% of the workers took a sick leave at least once. Per employee, a mean of 1.4-2.1 sick leave with a mean duration of 6.4-7 days was monitored. Most absences were due to upper respiratory diseases (16.8%), low back pain (7%), gastrointestinal diseases (6.4%), lower respiratory disorders (4.9%), other muskuloskeletal diseases (4%), cardiovascular diseases (1.5%), and injuries (1.5%). Fractures (0.5%) and cardiovascular diseases exhibited the longer duration of absences (mean of 44.4 and 22.3 days, respectively). Table 1 shows the occurrence and duration of accidents leaves in workers who had or not undergone Health and Safety training.

Table 1: Absences due to accidents in shipyard industry during 2002-2003.

Trained employees Non trained employees

Cause % Mean duration (days) % Mean duration (days)

Injuries 0.4 11.50 2.4 18.91

Conclusions

It is very likely that HS programs had considerable impact on accidents frequency and severity, eventhough it seems very optimistic that the huge reduction recorded to be explained only by training. This study also undelines the need of evaluation of educational programs by using indexes related to accidents.

Detecting "well-being" and "occupational health and safety", through the secondary vocational education in Greece. The contribution of gender into the perception for these notions.

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The aim of this preliminary study was to detect the contribution of sex into student's perception for well being and occupational health and safety.

Do Greek vocational schools promote health and safety at work?

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The European Agency for Safety and Health at Work recommends to member countries the implementation of programmes for occupational health and safety into national educational strategies, including all levels of education.

In order to investigate whether OSH matters had been included in initiatives/ projects undertaken by vocational schools which focused on health promotion, a preliminary survey has been designed. The results of this preliminary study demonstrate limited initiatives related to health and safety at work promotion undertaken by the secondary vocational education.

Knowledge and life skills among Greek students at the secondary education towards occupational accidents and diseases

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According to European statistics, the work injury rate for young people aged 18-24 years is 50% higher than for any other age group of workers. According to the European Occupational Diseases Statistics (EODS), the top five occupational diseases among workers aged 15-35 years are allergic reactions, skin irritation, pulmonary disorders, infectious diseases and musculoskeletal disorders. In 1999, 86.5% of all self-reported health problems that were due to pulmonary disorders, and caused more than two weeks' absence, were reported by young workers under 25.

In order to survey the knowledge and the perception of the students of vocational Greek schools, who represent the future workers, regarding occupational risk, a preliminary survey was designed. The results of this preliminary study show inadequate knowledge and skills of students at the secondary vocational education towards OSH matters.

Occupational Exposure to Diborane

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Diborane is a colourless gas that mixes well with air and may easily form explosive mixtures. Diborane is highly toxic irritant to the pulmonary system comparable with phosgene. Its toxic properties pose serious problem, although diborane is considered as appropriate substance for hydrogen storage in automobiles. Therefore, it is extremely important to estimate occupational exposure to this compound, and existing determination methods are not selective to diborane.

Analysis of safety conditions of tower cranes at construction sites

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Tower cranes are a common fixture at any major construction site. Most research work related to the health and safety aspects of tower cranes is based on the analysis of information from work accident reports, rather than the monitoring of actual working conditions at construction sites. This research is innovative since it provides information regarding the on-site safety conditions of tower cranes, in other words, during the execution phase of the building project. This is an excellent way to detect defects in elements or variables and their frequency of occurrence (e.g. maintenance contract documentation, crane operation and repair, crane operator qualifications, etc.). Our objective was to establish control measures for improving crane operation and maintenance, provide useful information for project designers, and specify qualifications for crane operators. We inspected 110 portable tower cranes at various construction sites. The data was collected and recorded with an *ad hoc* checklist. Examples of elements or variables where deficiencies were detected were the following: (i) documents certifying the existence of a maintenance contract; (ii) crane operator qualifications; (iii) electrical control cabinets; (iv) ground connection; (v) load control; (vi) anemometer.

Key Words: industrial safety, tower cranes, construction safety, work hazard prevention