

Bypassing and defeating protective devices of machines: A multidimensional problem

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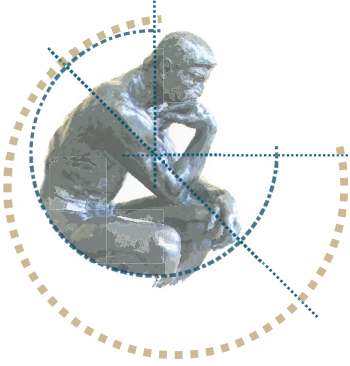
The article gives an overview about an interdisciplinary research project which identified the reasons for tampering protective devices of machinery. An empirical study consisting of two surveys, in which more than 1000 occupational safety and health experts were involved, shows the status quo of the research tasks: the dimension of tampering is extensive. The results show that the issue of tampering protective devices is not adequately present in the field of occupational safety and health.

Nous donnerons les grandes lignes d'un projet de recherche interdisciplinaire qui a permis d'identifier les causes de fraude des dispositifs de protection sur les machines. Une étude empirique comportant deux questionnaires destinés aux experts en santé et sécurité au travail (n = 1000), fait un état des lieux de la recherche en la matière : le nombre de fraudes des dispositifs de protection est très élevé. Les résultats soulignent les lacunes de la prévention dans ce domaine.

Der Beitrag gibt einen Überblick über ein interdisziplinäres Forschungsprojekt, das die Gründe für die Manipulation von Schutzeinrichtungen von Maschinen identifizierte. Eine empirische Studie, bestehend aus zwei verschiedenen Erhebungen, in die mehr als 1000 Arbeitsschutzexperten involviert waren, zeigt den Status Quo der Forschungsfragen: das Ausmaß an Manipulationen ist sehr hoch. Die Ergebnisse zeigen, dass das Thema Manipulation von Schutzeinrichtungen noch nicht adäquat im Bereich des Arbeitsschutzes repräsentiert ist.

Context

The examination of accidents at work by the Gewerbliche Berufsgenossenschaften evince that there are many targeted manipulative actions at protective devices of machines. They are disabled for example by bypassing or disassembling. Up to now the reasons for these manipulative actions remain non-specific. Furthermore there are no reliable numerical values concerning the dimensions of the problem of manipulations in companies. The presented explorations, made by the Berufsgenossenschaftliches Institut für Arbeitsschutz (BGIA) and the Berufsgenossenschaftliches Institut Arbeit und Gesundheit (BGAG), aim at getting an approximate estimation of the numerical values concerning the dimensions of the problem; the second aim was to analyse the reasons for manipulations in greater detail by integrating the users' point of view. So, the basis is laid for successful prevention of accidents at work related to manipulations.



Methods

Two different surveys were developed to explore the reasons and to get the estimations of numerical values concerning manipulations: a general questionnaire with a scope of two DIN A4-pages served for the elicitation of general estimations concerning manipulations (e. g. how many per cent of all protective device are manipulated). The questionnaire was applied in training centres of the VMBG, the BGFE and the BGAG. The target group of this instrument were occupational health and safety experts especially technical advisory staff and safety engineers. Completing the questionnaire needed just a few minutes.

The questionnaire consisted of five parts: estimations, how often manipulations occur in the companies, occurrence of manipulations depending on the kind of safety guard, operation mode, in which manipulations occur, and personal data. The return run of 940 questionnaires allows valid estimations concerning the amount of manipulations in metal-working companies. It indicates first emphases of upcoming strategies.

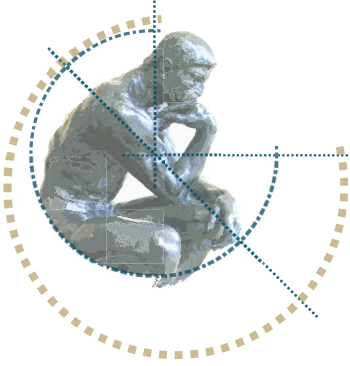
A second instrument, called a special questionnaire, served for the detailed analysis of concrete manipulations detected in the field. This instrument served for the description of all aspects referring to manipulation actions by the technical advisory staff of the VMBG. It could be completed when a manipulated machine or safety guard was detected during routine inspection or when there was a hint given by the staff members. A total of 202 manipulations were analysed. The research focussed on the following aspects: description of the machine type, the safety guard, the kind of manipulation, hazard appraisal (by technical advisory staff vs. the employee), the mode of operation, specific manufacturer attributes, ergonomic aspects of the man-machine-interface, aspects at operational level, and aspects related to the operators' personality. A highlight is the direct involvement of the operator who can be seen as a potential manipulator. The operator was thus able to indicate his suggestions for improvement und advise operational prevention actions. A first analysis of the usability of the interfaces between man, machine and safety guard was possible by this special kind of data collection.

An interdisciplinary project team analysed the raw data und discussed methods of solution based on a psychological, an ergonomic, an organisational, and a technical view. These specific strategies of prevention served for the development of interdisciplinary action recommendations. These recommendations aim at a systemic procedure against manipulations: on an individual, a technical and an organizational level (compare [1]).

Results

The analyses of the empirical data already show the timeliness and the brisance of the explorations. The following is a small cut-out of the results which are explained in detail in an HVBG-Report [2]:

- The dimension of the problem of manipulations in the companies is extensive – as the estimations of more than 1000 occupational safety and health experts show. On average one third of all protective devices are temporarily or constantly manipulated.
- Operators show a significant underestimation of the heightened hazard caused by manipulation
- In many cases negative consequences for the manipulator are missing (toleration). In combination with behaviour-strengthening aspects (higher pace of work) this supports manipulation actions.
- In many cases the interfaces between man, machine and protective device are not created in a very user-friendly or ergonomic way. So the application of several protective devices reduces the space of work perspicuously and forwards manipulation intentions.
- Manipulations are often detected in the following modes of operation: setup, trouble shooting, reconstruction, and automation mode.



- The observability of the working process is an eminent reason for manipulation actions
- Manipulations can also be detected at current and modern machines which obviously do not yet show user-friendly safety solutions.
- In some cases manipulations are necessary, e.g. to perform maintenance actions.

Discussion

The issue of manipulation is not adequately present in the field of occupational safety and health as this explorative study imposingly shows. The analysis of the amount of manipulations in the examined sample (metal-working companies) shows a vast potential to improve the man-machine-interfaces and further on the acceptance of protective devices.

But not just the interfaces are not adequately fitted to human demands; the integration of safety measures in the construction phase of machines is not yet realised either.

Furthermore the companies are only marginally sensitized for the issue in many cases. Methods which show the hazards of manipulated machines can make for more realistic hazard cognition. Further analyses and concrete practical suggestions how to counteract manipulations can be found in an HVBG-Report (download free of charge).

Literature

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Further Literature

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