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## Defeating of Safeguards: Results of a Recent Survey

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### **ABSTRACT**

Despite the associated risk, safeguards on machines are repeatedly being dismantled, bypassed or otherwise rendered ineffective, leading to thousands of severe work accidents every year. To assess the current extent of the problem, the Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA) conducted a cross sector survey among OSH professionals. The results are presented in this paper.

### **1 INTRODUCTION**

A research project on the defeating of safeguards conducted between 2003 and 2005 by the former Institute for Occupational Safety and Health of the German Social Accident Insurance (BGIA) and the German Social Accident Insurance Institutions for the metalworking industry (which have since merged) was the first to examine background issues and causes. The study published in 2006 revealed that more than a third of all safeguards on metalworking machines are bypassed [1]. The figures represented a wake-up call to occupational health and safety professionals to take a closer look at the problem. Since then, the topic has increasingly been addressed by directives, regulations and standards, and both manufacturer and user of the machines are now obliged to prevent possible incentives for the defeating of safeguards from arising, and to take thorough measures to prevent defeating itself. Despite these advances, however, accidents caused by the defeating of safeguards occur time and again, and safety experts across all industries report a sustained incidence of defeating.

To assess the current extent of the problem, the Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA) conducted a survey between 2020 and 2022 [2]. In a total of 16 questions, survey participants were asked for their assessment of the incidence of defeating. Occupational safety experts from companies operating machinery in trade and industry were defined as the target group for the survey. It was distributed at OSH trade fairs and seminars, in trade journals and online periodicals, and through targeted advertising on social media channels such as Facebook, Twitter, LinkedIn, Xing and Instagram. In total, 839 people took part in the survey, with almost 98% of the participants working in positions related to occupational safety and health.

The findings indicate that across all industries a quarter of all machinery is being defeated. The survey also shows that bypassing safeguards is tolerated by supervisors more often than expected, which leads to a statistically significant increase of defeated safeguards and subsequent accidents. The main findings of the survey are discussed in this paper.

### **2 CURRENT INCIDENCE**

The trend in the incidence of the defeating of safeguards over the last decade is viewed predominantly optimistically by the respondents: 57.3% believe the incidence to have declined over this period, whereas only one in five respondents have observed an increase. A quarter of those surveyed have observed no change over the past decade.

To assess the current incidence of defeating, survey participants were asked to state the percentage of machines in their companies on which safeguards are permanently and temporarily defeated. As the answers show, responses concerning the proportion of machines subject to defeating vary widely. On average, safeguards are defeated temporarily or permanently on 27.2% of machines. On 17.2% of the machines, safeguards are defeated temporarily, i.e. solely for the performance of certain tasks; the original state is subsequently restored. On 10% of the machines, defeating is permanent, regardless of whether it is necessary for the activity being performed. Such machinery present a particularly high risk potential, as it especially endangers persons who are not aware that its safeguards have been defeated.

The estimated frequency of defeating varies from sector to sector. According to the survey participants, the proportion of machines that are defeated is particularly high in wood and metal-processing companies, where on 39.6% of machines safeguards are estimated to be defeated permanently or temporarily. The corresponding proportion of machines is 22.4% in companies in the chemical industry and 23.6% in companies in the energy, textile, electrical and media products sectors. For the remaining sectors, the number of survey participants (<100) is not sufficiently representative to permit conclusions for the sector as a whole.

A parallel, unpublished survey conducted among supervisors of the German social accident insurance institutions revealed an even higher frequency of defeating on machinery in the construction sector, where safeguards of around 59% of machinery is estimated to be defeated.

Safeguards that physically separate the work area from the operator, such as interlocking devices on guards, are bypassed the most, as these are most likely to be perceived as a hindrance or obstacle in the work process. Accordingly, bypassing is most likely in activities that require manual intervention in the hazardous area behind the separating guards of the machine. If this intervention occurs only irregularly and in exceptional situations, such as to eliminate malfunctions, the possibility of defeating and the associated increase in the overall risk is often underestimated by manufacturers in their risk assessment and the design of the safety concept of the machine. It is easy to overlook the fact that defeating of safeguards for an activity that is rarely carried out is often not reversed, even if this should be technically possible without further ado. According to the respondents, the first task for which safeguards are defeated is the search for and elimination of faults, followed by set-up and adjustment as well as repair and maintenance, even if these only account for a small proportion of the machine's life cycle.

### **3 ACCIDENTS RELATED TO DEFEATED SAFEGUARDS**

Whereas accidents are always accompanied by harm to health and often by financial loss, near accidents usually have no consequences and generally attract correspondingly little attention. However, near accidents offer a means of identifying as-yet undetected hazards before a harmful incident occurs. Rigorous reporting and analysis of near accidents and elimination of their causes, as is consistent with a positive error culture, is therefore an effective means of preventing occupational accidents in the long term.

As part of the survey, respondents were questioned concerning their experience with accidents and near accidents caused by defeating. 25.7% of those surveyed state that an accident caused by defeating has already occurred in their companies. 27.1% of those surveyed state that defeating a safeguard has already resulted in at least a near accident. Overall, half of those surveyed state that in their company or the companies they supervise, their work has already involved accidents or near accidents caused by defeating.

### **4 SUPERIORS PLAY A KEY ROLE**

Superiors are responsible for the safety of employees under their authority. Besides making safe behaviour in the workplace possible in the first instance and taking measures to promote it, this also includes identifying unsafe behaviour by means of regular checks, and preventing it. Finally, it entails being thorough in preventing safeguards from being defeated. In practice, however, it is found that where a conflict exists with the desired production target, safety and productivity may prove to be incompatible, and productivity is often prioritized.

To determine the prevalence of such negligent behaviour among those in leading positions, those surveyed were asked whether, to their knowledge, a case had already arisen in their company in which a superior knew of a safeguard being defeated. Over half of the respondents (50.7%) stated that defeating has already occurred in their company with a superior's knowledge. Only 16.9% of respondents were able to answer the question with an unequivocal "no".

A comparison of the responses of the two groups reveals a significant correlation with the incidence of defeated safeguards. In companies in which the defeating of a safeguard has already been tolerated by a superior in at least one case, safeguards on 33 percent of machines are defeated, which is one and a half times as high as in companies where this is not the case (22.9 percent). At 10.9 percent, the average proportion of machines with permanently defeated safeguards is almost twice as high (for comparison: 5.7 percent) as in other companies; where superiors are indifferent to the topic, there is no reason for the operators to restore the original state of the safeguard.

The impact of the behaviour of superiors on the number of accidents caused by the defeating of safeguards is even bigger: the proportion of respondents who can report that accidents caused by defeating actually occurred is twice as high (35.9 percent) in companies where defeating is tolerated as in companies where this is not the case (17.9 percent).

The correlation between the incidence of defeating and the indifference of those in leading positions towards the associated risks indicates the following: A lack of or inconsistent preventive behaviour on the part of superiors has fatal consequences for the safety of employees. However, if the superior in charge fails to comply with his or her obligations under occupational health and safety law to protect his or her subordinate employees and an accident occurs, this will also have legal consequences. In the case of accidents caused by defeated safeguards, this can mean a criminal conviction for negligent bodily injury or homicide if it can be proven that the defeating of the safeguard was tolerated – as in all the cases reported by more than 50 percent of the respondents to the IFA survey.

## **5 INFLUENCE OF COMPANY SIZE**

As the survey shows, there also exists a significant correlation between the size of the company and the incidence of defeating. This becomes particularly apparent when small and micro-enterprises (1 to 49 employees) are compared with large companies (over 250 employees).

Defeating is much more likely to be tolerated by managers in small and micro-enterprises than in larger companies. For example, 59.1% of respondents from small and micro-enterprises confirmed that a manager was aware of defeating (large companies: 45%). This also reflects in the general attitude towards defeating. Without exception, all respondents who, according to the survey, consider defeating of safeguards completely acceptable or at least tolerable under exceptional circumstances (18.6%) were from small and micro-enterprises. Ultimately, this yields a significantly higher proportion of machines being defeated permanently or temporarily in small and micro-enterprises compared to in large companies (37.1% vs. 23.1%).

## **6 MEASURES TO PREVENT DEFEATING**

Preventing safeguards being defeated is the responsibility of both the manufacturer and the operator. While for manufacturers, technical measures predominate, organizational and personal measures and the company's general safety climate are the primary means by which the operator is able to prevent the defeating of safeguards.

The survey participants were asked what measures, in their opinion and in consideration of their experience, they believe contribute in particular to prevent defeating. Their responses show that they regard measures on the part of manufacturers and operators as complementary and having equal value. Intelligent safeguards (72.4%) rank first among the measures stated. These, for example, include intelligent camera systems capable of distinguishing between human beings and machinery, safety light curtains with blanking function, or control systems with plausibility or functional checks to detect when a safeguard has been defeated.

Second among measures to be taken by manufacturers are safeguards that are less conducive to defeating (53.5%), for example measures for this purpose on interlocking devices as listed in ISO 14119 [3], and ergonomic safeguards that are easier to operate (41.5%). Reducing the reasons for defeating (troubleshooting, fault clearance and repair) by use of machinery with a lower maintenance overhead is also acknowledged as an effective measure specifically for preventing defeating (29.3%).

The most highly ranked measure to be taken by operators is a clear commitment by management to preventing defeating (66.9%). As shown, the correlation of the responses concerning superiors' tolerance of defeating with other results of the survey clearly indicates that the attitude of superiors has an immense influence on the incidence of defeating. At the same time, respondents would like management to take tougher action in response to defeating incidents (48.8%) and address the topic more regularly in safety instruction (43.8%) in general and machine briefings (36.8%) in particular. Underestimation of risks and ignorance of hazards are a major factor, in fact,

among reasons for unsafe behaviour. This can be rectified only by measures for increasing safety awareness, such as dedicated instruction, training in safety, and in general by a company atmosphere that promotes safety.

The free-text responses also addressed technical and organizational aspects in equal measure. With regard to measures taken by manufacturers, the list is topped by those for reducing the reasons for defeating, in the form of trouble-free or inherently safe processes and an ergonomic protection concept for the machine. Several respondents call for better communication between manufacturers and operators during the procurement process. Some respondents would like to see tougher action, and a stronger legal basis for it on the part of the labour inspectorate and accident insurance institutions.

## 7 RESOURCES

The website <https://stop-defeating.org> offers cross sector information and tools both for manufacturers and users of machinery to prevent the defeating of safeguards. The content of the webpage is developed by the working group “defeating of safeguards” which consists of representatives of German social accident insurance institutions and is chaired by the institute for occupational safety and health. The content is made available in German and English alike.

The website, that has first been published in 2010, has recently been completely revised, and further material has been added. The presentation of information is now aligned with the life cycle of machinery, clarifying which measures to prevent defeating need to be applied by manufacturers or users at which step of the machine’s life. For users, the information is divided into three main sections:

- Procurement of machinery, leading through the steps of procurement from the requirement specification to commissioning of the final machine
- Operation of machinery
- Dealing with defeated safeguards

Further practical help both for manufacturers and users is available in form of downloadable informational sheets and presentations:

- Cross sector best practice design examples
- Cross sector examples of accidents caused by defeated safeguards
- Tuition modules
- Educational films
- A download section for further informational material and publications

Besides the update of the website, the procedure incorporated in Annex H of ISO 14119 to determine the incentive for defeating safeguards has recently been implemented into a web application. The tool is available in both German and English at <https://masem.ifa.dguv.de>. It offers the possibility of evaluating multiple safeguards for one machine and automatically generating a machine specific report file for documentation.

## 8 OUTLOOK

The survey revealed that a lack of or inconsistent preventive behaviour on the part of superiors leads to a significant increase in the defeating of safeguards and subsequent accidents. Future efforts towards minimizing the defeating of safeguards must therefore increasingly focus on management behaviour. Managers must insistently be made aware of the effects of their acts or omissions. Best practice examples available at [stop-defeating.org](https://stop-defeating.org) must not only contain technical examples but also examples of good corporate culture and describe measures that help tackle the issue on an organisational and individual level.

The website [stop-defeating.org](https://stop-defeating.org) is under continuous development. This applies in particular to the offered examples for good machine design and work accidents caused by the defeating of safeguards, as these are naturally derived from specific sectors. It would be worthwhile to provide examples for as many sectors as possible. To help extending the website and filling the gaps, everybody is invited to participate, e.g. by preparing short descriptions of good machine designs or good methods, sending feedback to the website or describing their experience regarding the issue. Persons interested are welcome to contact [info@stop-defeating.org](mailto:info@stop-defeating.org) or the author of this paper.

## 8 REFERENCES

[1] Apfeld, R.; Huelke, M.; Lüken, et al., *Manipulation von Schutzeinrichtungen an Maschinen*, published by: Hauptverband der gewerblichen Berufsgenossenschaften (HVBG), Sankt Augustin 2006.

[2] Otto, S., *Current figures on the defeating of safeguards. Results of a recent survey*, published by: Deutsche Gesetzliche Unfallversicherung, Sankt Augustin 2024

[3] DIN EN ISO 14119:2014-03, *Safety of machinery - Interlocking devices associated with guards - Principles for design and selection* (ISO 14119:2013)

## 9 Websites

Prevent the defeating of safeguards

<https://stop-defeating.org>

Web App for determining the incentive to defeat safeguards

<https://masem.ifa.dguv.de>

Website of the institute for occupational safety and health

<https://www.dguv.de/ifa/stopp-manipulation/index-2.jsp>