

Tampering, a hot topic of machine safety

In 2005, the BGIA (today IFA) conducted a representative survey, which revealed that the safety equipment on more than one third of machinery and plants is permanently or temporarily tampered. Although the necessary conclusions have been drawn from this survey, it can be assumed that tampering still exists today. This article demonstrates that tampering however can be prevented.

Even though the BGIA (today IFA) survey regarding the "tampering of safety equipment" dates back from five years ago, it is still worth reading as well as pretty much up-to-date. This survey revealed that more than one third of machines are permanently (14%) or at least temporarily (23%) tampered or bypassed¹.

Plausible reasons for tampering

The crucial question that arises from this survey is: why are operators actually tampering "their" machine, thus exposing themselves to danger? And why is tampering tolerated by so many bosses? The answers to these questions are also included in the survey results: tampering is made easy to the operator and it subjectively "facilitates" the operation of the machine.

From the point of view of the user and the owner of the machine, tampering in fact is a completely rational thing to do: if a safety device is bypassed, no inconvenient waiting times have to be observed before the safety guard can be opened, which eliminates adverse effects on the efficiency pay. Often, the maintenance, putting into operation or servicing of the machine is impossible or difficult to realize without tampering. In other cases, a clear overview of the process is required, to avoid difficulties during the machine set-up or the monitoring of operating cycles. And apparently, tampering is not that hard to do either: according to the BGIA survey, approximately 75% of the operators of tampered machines stated that the safety equipment could be effortlessly deactivated.

Tampering is often tolerated

A special cause for concern is the fact that the operators are not aware of the risks involved when tampering a machine. It is not surprisingly that according to experts approximately 25% of all accidents occurring with machines are due to tampering. Particularly alarming is the fact that the employer of the safety engineer

does not prevent this safety risk: in 34% of the cases, the tampering is tolerated or even expected. A survey conducted in Switzerland in 2008 by the Swiss Accident Prevention Association SUVA came to similar conclusions² and so did an investigation conducted by the Austrian AUVA.

Evaluation diagram helps identifying weak spots

Both the IFA and the SUVA formulate specific proposals to prevent the safety risk associated to tampering. The IFA has developed an evaluation diagram, by means of which the advantages of a tampering operation can be determined, so that possible tampering attempts can be identified³. A tampering attempt is rated higher if particular activities such as set-up, tool/equipment change or cleaning activities are conducted at the machine in unauthorized operating modes or if this activity cannot be conducted without bypassing the safety equipment. Such machinery requires improvements, as it is unsafe.

This diagram is rather destined to machine builders, who want to design tamper-proof machinery in accordance with the requirements of the Machinery Directive. The checklist developed by the SUVA under the scope of the "Stop tampering safety equipment" is rather useful to safety engineers in production plants. This list provides an overview if and how a machine can be tampered⁴.

Protection against tampering

It is evident that the safety engineer in a production plant is well informed and intensively deals with the theme of safety equipment tampering. He always should try to consider things from the point of view of the machine operator and examine whether the safety equipment are not interfering with a smooth and quick operation of the machine, both when it is running normally and during set-up activities or troubleshooting. If they do, the operators will be attempted to tamper or bypass the safety equipment.

It is also a good idea to involve the future machine operators in the purchasing process of new machinery and plants. They often have a very good idea if the safety equipment and protective measures provided by the machine builder can be smoothly integrated in the production process or will rather build an obstacle.

Checklist for purchasing machinery

When investing in new machinery, it could be helpful to draw up a "wish list" of features that could minimize the tampering attempts, for instance:

- Large vision panels in the safety guards for a clear view of the process
- The operator is informed about the operating condition of the safety equipment (e.g. interlock of the safety guard closed)
- A fail-safe standstill or speed monitoring enables the opening of the safety guard, as soon as the hazardous movement is stopped or has reached a certain safe speed.

Operating modes such as set-up, adjustment and repair should be analyzed in particular as the ergonomics aspect is regarded; compared to automatic mode, there operating modes are disproportionally subject to more frequent deficiencies and accidents.

Prevent bypassing and tampering by simple means

When purchasing (or converting) safe machinery and plants, it must be ensured that the user at least is given a hard time when trying to tamper the machine. Similar instructions already have been implemented in the standardization at European level as well. According to the EN 1088 ("interlocking devices in combination with separating safety guards"), safety components must be designed and constructed so that "tampering by simple means" is prevented. Simple means are smoothly accessible tools and work equipment such as screwdrivers and knives. This can be realized by using safety switches with coded actuator (image 1) and by fixing the actuator of the switchgear by means of tamper-proof screws.



Image 1: Safety switch with coded actuator

Another possibility is the use of hinged safety switches, which also offer a high degree of protection against tampering, as the active mechanism is "hidden" in-side of the switch (image 2).



Image 2: Hinged safety switch

Useful: special operating modes

The application of special operating modes such as "process observation" as well as the use of enabling switches in set-up mode can also avoid tampering attempts (image 3). Originally, these operating modes were only mentioned in a few C-standards. Meanwhile, they have been implemented in the revised Machinery

Directive and therefore can be generally applied to enable the operation of the machine with the safety guard open under defined conditions.

Furthermore, numerous innovative safety switchgear have been introduced on the market, whose different constructive features contribute to preventing the tampering of safety equipment. This includes for instance the concealed mounting of safety switches or safety sensors or the use of safety sensors with an innovative operating principle, offering many "intelligent" additional functions (image 4).

These switchgear are for instance capable of prematurely detecting misalignments of the safety guard; if this situation occurs, they emit a warning message so that the user can timely adjust the safety guard. These solutions are particularly useful tools to avoid tampering.



Image 4: Safety Sensor



Image 3: Enabling Device

Last but not least, the operators should be involved in the technical solutions as well, by providing them with clear operating instructions, which prohibit any tampering of safety equipment and by organizing adequate trainings,

which sensitize them to the risks involved in working on and with tampered machinery.

Notes

(1) Report: Tampering of safety equipment on machinery; Hrsg.: Deutsche Gesetzliche Unfallversicherung DGUV, German Accident Insurance Association), St. Augustin 2006; PDF-Download (only German version) at www.hvbg.de/bgia, web code: 1855742

(2) Cf. www.suva.ch-> SuvaPro

(3) Available for download at: www.suva.ch/home/suvapro/branchenfachthemen/schutzeinrichtungen.htm

(4) Information: Tampering attempts to safety equipment on machinery - Source: www.hvbg.de/d/bia/pr/manipulation/manipulationsanreiz_p.xls

Images

Image 1: AZ16ZI

Safety switches with coded actuator, which are fitted by means of tamper-proof screws, are a simple yet efficient solution to prevent tampering.

Image 2: Hinged safety switch TVS410/TESE

Hinged safety switches can be smoothly integrated in the surrounding construction and are a good choice as the protection against tampering is regarded.

Image 3: Enabling switch - ZSD6

With the latest safety controls and enabling switches, special operating modes can be realized, which facilitates the set-up activities

Image 4: Solenoid interlock with guard locking MZM 100

The new generations of safety switchgear offer many additional functions, thus creating the optimal conditions for safe and simultaneously productive working.

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