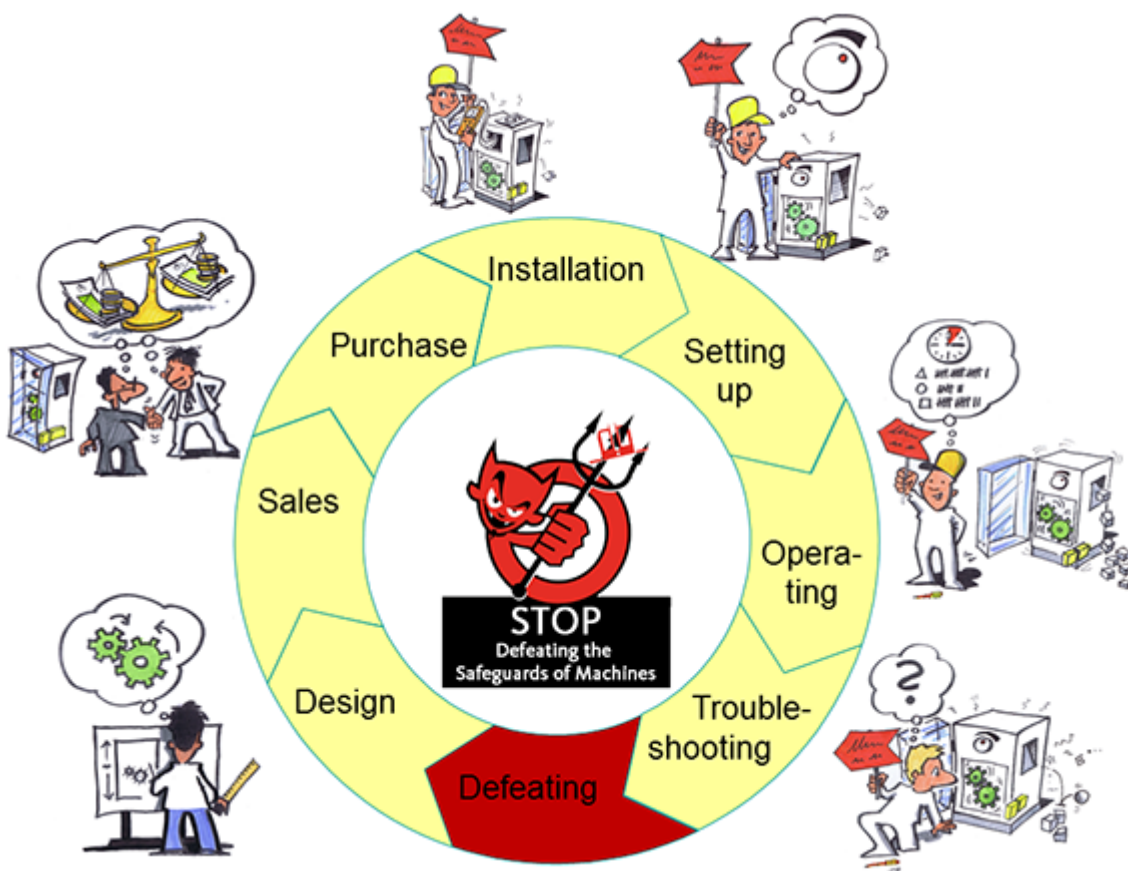


Vicious circle

Defeating of safeguards on machines causes to serious accidents, high costs and restrict the availability of machines. Taking a look inside the enterprises shows: one-third of safeguards are defeated (from [Report of defeating of protective devices of machinery](#) -only available in german-). This results in thousands of accidents every year – also deadly accidents.

The aim must be to prevent these accidents.



There are many ways of getting caught in a vicious circle: Look at the life cycle of a machine from design to use at the end customer and you will see clearly that the aspect of “Defeating protective devices” plays an important role in many places. However, this is rarely noticed in practice. Quite apart from financial risks and hazards arising for the machine operator, legal provisions are violated also. This refers to all parts of the vicious circle with all persons involved bearing responsibility.

Break the vicious circle!

Click on the corresponding logo in the navigation bar above. Of course, you are also free to have a look on what “the others” have to respect.

In this context, the “classical example” surely is the actuator plugged into the position switch of a guard gate. However, it is very often rather difficult to detect a manipulation. Here, colleagues tend to judge such a situation quite differently if an “expert” – e.g. the plant electrician – bridges a protective device, as they think, “he’s allowed to do so”.

Have a look at the life cycle of a machine, and it becomes clear that the aspect “defeating of protective devices” plays a role on many places. However, this is rather ignored in practice. Apart from the risks arising for the machine operators, legal provisions such as the European Machinery Directive or the European Directive on the safe use of work equipment are violated also.

Construction

Of course, a machine has to product as fast as possible, it has to be good and it has to be cheap. Oh yes, of course, it has to be safe, too! This is why, at the end of the design stage, the protective device is grafted on the completed machine. Unfortunately, such grafted solutions tend to disturb the machine operator during operation. Maybe he is no longer able to fulfil the desired cycle time as it takes too much time to open and close guard gates time and again. Or he has no longer an adequate view on the production process. In such cases, one can foresee that the machine will be manipulated in later operation. The designer should have taken this into account already when designing his machine, for this is a “reasonably foreseeable misuse of the machine” (European Machinery Directive, Annex 1, 1.1.2. a). This machine bears the CE mark wrongly. It would have been necessary here to develop a protection concept early in the planning stage, and to detect and avoid possible disturbances of the operator.

An example:

Today’s machine tools, machining centres and production lines involve

a considerable risk of injury due to high spindle speeds and torques and extensive automatization, respectively. Human reactions don't stand a chance against the often quick and unforeseeable movements. Particularly, where factors, as e.g. inattentiveness due to time pressure, e.g. during setting-up or maintenance, or monotony of repetitive jobs, e.g. piecework, are added to the equation, severe accidents are unavoidable. This is why where such high risks are involved the protective measures must work inevitably and mostly automatically. It is never sufficient to trust solely in human experience or the "fortune that favours the bold".

Sale

As a rule, sales assistants are judged by their sales. However, sales assistants are also the connecting link between manufacturer and user. This is why the sales assistant has to try to select a machine that fulfils the requirements of the user – including an appropriate protection concept. It may happen that machinery is sold that, actually, is inappropriate for the intended use. In the wake of that, it may happen that protective devices are manipulated as the operator is forced to intervene in the manufacturing process time and again and thus may be unable to fulfil the expected cycle time. Possible causes may be processing/machining of products of too large a size or consisting of the wrong material, or causing disturbances/interruptions for other reasons. However, sales assistants tend to leave protective devices and functions aside as they believe to get competitive advantages in doing so. Sometimes, sales assistants are ignorant about the whole purpose of protective devices. They are then "discussed off" hastily.

Purchase

A performance specification exactly specifying the requirements to be fulfilled by the machine serves as a basis for solicitation of quotations. The potential manufacturer needs this information to offer or develop, respectively, a protection concept restricting operation not more than necessary. On the basis of the performance specification, the purchasing department will try to obtain a machine that is as cheap as possible. It is very useful to involve both the

competent labour protection experts and the operators when selecting from the quotations received. They will then decide also whether the machine will fulfil the technical and economic requirements without manipulation. Failure to do so may have the consequence that a decision is taken at purchasing stage already that leads to the machine being manipulated over its whole life cycle.

Commissioning

At commissioning stage, the machine might not yet be completely installed. It may not yet be possible to put the protective devices into service; they will be defeated for the purpose of working in the danger zone. Danger points are exposed as machine parts are not yet installed. From the safety point of view, this is a very critical stage. Depending on the machine designer's creativity, appropriate features of the machines support this stage. Partial movements, e.g., might be possible without unnecessary movements accompanying them. For commissioning, special measures are to be specified which, in principle, are not applicable to later operation.

Setting-up

Many machines need to be set up for later production routines. This means optimizing programmes, approaching a covered workpiece with a tool, pulling in material sheets and a lot of other things. Machinery failing to provide special modes of operation for this will inevitably be operated with manipulated protective devices. This is a case of inappropriate design with the manufacturer bearing the responsibility. Therefore, modes of operation are required allowing safe machine movements with set-up personnel being present in the danger zone. As a rule, selection is made by mode selector switch and actuation/operation is performed by using a manual actuation device.

Operation

This is about operational capacity, high piece numbers, high number of working cycles. Where protective devices disturb the manufacturing cycle, they will be disabled sooner or later. Position switches with separate actuator on guard gates are particularly prone to this. It is easy to obtain an additional actuator as a spare part from the

manufacturer, or to screw it off from the door. This is done quickly as, to begin with, the machine manufacturer has not used the one-way screws supplied by the switch manufacturer. Henceforth, the machine is operated with defeated protective devices: a clear violation of legal provisions for which at first the user is responsible. However, also the manufacturer can be called to account for an inappropriate protective concept; this is particularly the case where the foreseeable misuse has not been sufficiently taken into account.

Fault finding

During fault finding, it is often necessary to analyse disturbances in the movement sequence. Where this is not possible with the protective devices active, a special mode of operation is required. Where this is not provided, faults often can be found only with the protective devices being manipulated. This also constitutes a violation of legal provisions for which both the user and the manufacturer, where appropriate, are responsible.

Positive feedback

The described cycle shows that faults are made at many points, that even laws are violated. Amazingly enough, little or nothing is done to change this. Obviously, people have grown accustomed to protective devices being manipulated and nobody reproaches the machine designer for having constructed something unsafe. Insofar, the designer wrongly gets a mainly positive feedback from his customers and thus does not see any necessity to change something. At least as long as no accident occurs...

Unsafe situations and states, just the same way as provisional solutions, tend to persist for quite a long time. As long as the actual cause has not been remedied, they sneak back in even after severe incidents (accident), as the following illustration shows.

Reinforcement of dangerous behavior

