

Risk assessment

When placing a machine onto the market, you want to be sure that no accidents happen with this machine.

Therefore you have to do a proper risk assessment and reduce the risks adequately.

Hazard: Potential source of harm

Risk: combination of the probability of occurrence of harm and the severity of that harm

Defining scope

A clear scope should be defined, to determine the limits of the machine.

This scope should consist of all lifecycles of the machine, from production of the separate parts of the machine to the disposal at the end of the machine life.

These limits should describe:

- Space limits, e.g. available space in and around the machine
- Environmental limits, e.g. temperature, sound, light
- Time limits, e.g. how often used, how long used, time to end of life
- Use limits, e.g. prescribed use, reasonably foreseeable misuse
- User limits, e.g. competence, amount of users
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Hazard identification

In the hazard identification phase of the risk assessment, hazards are identified in all lifecycles of the machine.

Hazards should be identified resulting from prescribed use (as described in the user manual) and reasonably foreseeable misuse.

Reasonably foreseeable misuse is most of the time a result of hurry or convenience:

1. Skipping steps in the sequence
2. Doing steps parallel
3. Doing steps in a different order

When identifying hazards in each lifecycle of the machine, distinction should be made between operator actions, e.g:

1. Hazards during a step, which is present immediately
2. Hazards resulting from doing steps incorrectly or performing actions in a step incorrectly.
These hazards will manifest later in the machine life.

And failure of parts, e.g.:

1. Hazards resulting from incorrect strength of parts
2. Hazards resulting from deterioration of parts over time (wear, pollution, ageing)

Risk estimation

When the hazards have been identified, these hazards should be evaluated to estimate the risks. A common method to do this is making use of a risk matrix (NPR-ISO/TR 14121-2:2012).

		Risk index calculation					
		O1		O2		O3	
		A1	A2	A1	A2	A1	A2
S1	F1	1				2	
	F2	1				2	
S2	F1	2		3		4	
	F2	3	4	5		6	

In this risk matrix, the next parameters should be determined:

S: Severity of the harm

S1: minor injury; bruises, emergency kit injuries

S2: serious injury; doctor visit, emergency room

F: Frequency of exposure of persons to the hazard

F1: seldom and/or short duration of exposure

F2: frequent to continuous exposure

O: Probability of occurrence of a hazardous event

O1: occurrence may not be experienced at all

O2: occurrence may be experienced sometimes

O3: occurrence will be experienced (frequently)

A: Possibility to avoid or reduce the harm

A1: possible; slow movements and possibility to escape

A2: impossible; instant events and/or impossibility to escape (even with slow movements)

Risk evaluation

During risk evaluation it is determined whether risks need reduction or has adequate risk reduction been achieved.

The risk estimation can be seen as a measure of the amount of effort that needs to be put into further risk reduction.

So If the risk estimation is "1", this doesn't mean that adequate risk reduction has been achieved, because when the risk can be reduced without much effort, this needs to be done.

If the risk estimation is "6", the risk has to be reduced further, even when requiring a lot of effort.

Determining whether risk reduction is required should incorporate (in order of priority):

1. The safety of the machine
2. The possibility of the machine to perform its function
3. The usability (user friendliness) of the machine
4. The costs of production, maintenance etc...

Risk reduction

Risks should be reduced in the following sequence:

1. Inherently safe design measures: The hazard is gone, or the risk is reduced by the design
2. Safeguarding and/or complementary protective measures: The hazard is still present, but you cannot reach the hazard zone
3. Information for use: The hazard is still present, you can probably reach the hazard zone, but you are aware of the hazard

Iterative process

After risk reduction is applied you should always determine whether existing risks have increased, or other hazards have been introduced by the applied risk reductions measures.

BKL

BKL has a lot of experience and can assist you in risk assessment and reduction process with:

1. Explaining the risk assessment and reduction process in your own specific application
2. Facilitating the risk assessment and reduction process in your organization
3. Defining pragmatic solutions for risk reduction problems
4. Determining whether adequate risk reduction has been achieved
5. Documenting the entire risk assessment and reduction process