Risk management

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Ing. Šárka Zapletalová, Ph.D.
Katedra Podnikové ekonomiky a managementu
KRIZOVÝ MANAGEMENT

Risk Management Process

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Risk assessment methods:

- Simple method of HSE risk assessment
- Simple OSHA risk assessment
- Point method
- Security inspection
- Checklist
- "What-If" method
- FMEA and FMECA method

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Simple method of HSE risk assessment

- It is usually used for small organizations with up to 10 employees and where hazardous chemicals are not handled, hazardous technical equipment, etc. are not operated.

The method has 5 steps:

- **Step 1** go through the workplace and find out what can cause damage, focus on important dangers that can endanger people, ignore pettiness, ask employees what they see as a threat, how they would imagine improvement, take into account events that have happened or could have happened.
- **Step 2** reassess whether anyone other than the employee is at risk, check that the safety regulations are observed. If not, troubleshoot.
- **Step 3** assess the probability of the adverse event and what the consequences may be, in the event of a serious threat, take measures to eliminate the risk.

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

- **Step 4** make sure that the residual risk after the adoption of the measure is acceptable, to acquaint employees with the residual risk.
- **Step 5** document an overview of significant hazards and residual risks, process the results of the evaluation in writing into working procedures, instructions, internal regulations, reassess risks when introducing new substances, machines and work procedures.

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Simple OSHA risk assessment

- The first step gathers all information about workplaces, employees, production equipment and technologies and materials used, known hazards, protective measures used, accidents at work, regulations.
- Hazards are identified using checklists.

Probability of threat:

- Highly unlikely - will not appear during the employee's working career;
- Probable - will appear several times during the employee's working career;
- Highly likely - may occur repeatedly during the employee's career.

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Severity of consequences:

- Mild damage - injuries and diseases that do not cause long-term pain (abrasions, eye irritation, headache, etc.);
- Moderate damage - injuries and diseases causing mild but long-lasting or periodically recurring pain (wounds, simple fractures, skin allergies, 2nd degree burns, etc.);
- High damage - injuries and illness as well as not causing deep and constant pain or death (amputations, complicated fractures, cancer, etc.)

Risk tolerability

- A high level of risk is unacceptable, small and medium acceptable.
- Failure to comply with the law is an unacceptable risk.

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Point method

- This is one of the most widely used methods for risk assessment. The degree (size) of the risk is a combination of the probabilities of the occurrence of the risk and the possible severity of the consequence of the risk. Risks are always related to the job position and the job. The protected value is human life and health.
- ***The resulting level of risk*** is determined as the product of the probability of risk and the severity of possible consequences. R - degree of risk, P - probability of occurrence, Z - severity of consequences. R = P x Z
- ***Acceptability of risk (safety)*** must have at least 2 levels (acceptable, unacceptable), but can be multi-level. The more acceptable the degree of risk, the finer the gradation.
- **Resulting safety - risk assessment**

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Security inspection

- It is performed by experienced workers and identifies possible dangers.
- For existing facilities, it is practically a physical inspection of the facility.
- In the case of new equipment, it is already a question of assessing the technical documentation before the actual construction and implementation of the equipment.
- The purpose of the safety inspection is to identify the conditions and circumstances that may lead to an accident, as long as its consequences are a threat to human health, damage to the environment or property.

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Checklist

- Hazards are identified according to a pre-established checklist (eg by a specialist company) listing typical hazardous substances and / or potential sources of accidents.
- To create a checklist, it is necessary to define the requirements of regulations and standards, on the basis of which a set of questions is created. In most cases, the checklists are very detailed and are designed so that they can be used to assess the system's compliance with regulations and standards.
- It is important that checklists are regularly reviewed and updated.
- The complete checklist includes yes - no options for each question.
- The disadvantage of the checklist is that it leads to a mechanical approach without considering other possible alternatives and contexts. Checklists are also limited by the authors' experience. It is therefore important that they are created by workers with experience, professional experience and knowledge from related fields.
- Hazard identification using checklists is quick and easy and can be used at any stage of a system's life.
- The advantage of using a checklist to identify hazards is that it is easy to use even for less experienced workers.

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

"What-If" method

- The "What-if" method is based on brainstorming, in which a qualified work team (well acquainted with the researched process) examines in the form of questions and answers unexpected events that may occur in the process. Formulated questions begin with the characteristic "What-if" (What happens when…?)
- The identification of possible failures and their consequences takes the form of creative workshops. The meeting will be attended by a selected group of experts well acquainted with the research process. Anyone on the team can formulate a question like "What happens when…" that interests them. The work team then seeks answers to the questions formulated in this way. The consequences of the situation or situation are estimated, measures and recommendations are proposed.

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

- The examination during the safety study may cover, for example, buildings, the energy system, raw materials, products, warehouses, operational practices, work procedures, the operating environment, operational safety, etc.
- In practice, the "What - if" method is relatively popular because it does not require high time. However, it must be taken into account that the lower time intensity of the study has its roots in an intuitive, less systematic procedure.
- The aim of the meeting is to identify dangerous conditions and operational situations. Furthermore, the work team estimates the possible consequences and proposes measures to reduce the risk.

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Method procedure:

- Preparation - preparation consists in collecting all available documents. These are usually process descriptions, drawing documentation and operating instructions. It is necessary that the materials are available especially for their own teamwork during the study. If it is an existing facility, a physical inspection of the facility is appropriate.
- It is appropriate to prepare some questions for the study in advance. The source of the questions may be a previous study or a similar study.
- Meeting - the meeting itself begins with a professionally based description and explanation of the purpose of the process. During the description, the team will become familiar with ensuring process safety, safety equipment, and procedures used to ensure operator safety.

Risk Assessment

Method procedure:

- Formulation of queries - the time required for the formulation of queries cannot be defined in advance. The duration of the meeting should not exceed 4 hours, especially if the meeting continues the next day. However, it is not appropriate to end the meeting at the moment of creative thinking. If it is a larger process, it is advisable to divide it into smaller parts, which are examined gradually. This avoids the tedious formulation of a large number of questions that will only be considered later. The questions may be related to any abnormal conditions, not just component failures or process deviations. All questions are recorded. However, during the consultation, any objection regarding the safety of the process may be raised, even if it is not expressed directly. The questions formulated gradually by the individual participants of the meeting extend to various professional areas. It is therefore appropriate to classify the questions into several thematic groups, such as the safety of electrical equipment, fire protection or the safety and health of the operator. Each area can be covered by a team of one or more experts. If such or similar equipment is already in operation somewhere, it is possible to use consultations with the operation staff.

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

FMEA and FMECA method

- The FMEA (Failure Modes and Effects Analysis) method - analysis of failure modes and consequences, as well as the FMECA (Failure Modes, Effects and Criticality Analysis) method - analysis of failure modes, consequences and criticality, are methods developed for the study of system failures. They are applicable to various systems (mechanical, electrical, hydraulic, etc.) and their combinations.
- The FMEA sets out the procedure for the occurrence, course and consequence of the failure. FMECA then allows to consider the severity of failures and the criticality of its occurrence.
- FMEA is especially suitable for evaluating individual elements of the system, which can lead to the failure of the entire system. The method is not very suitable for complex systems with many elements. In addition, FMECA allows you to determine the criticality of a system failure. Using this method, the risk can be quantified.

The goal of both methods is: evaluation of consequences and sequence of phenomena leading to failure, determining the severity of the consequences of the failure with regard to the correct performance of the function, classification of detected disorders according to the conditions under which they can be diagnosed, determination of indicators of severity and probability of failure.

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Both methods use the following steps:

- description of the system and its basic functions, definition of minimum functions with regard to selected criteria (safety, reliability, etc.),
- elaboration of functional and reliability block diagrams, and other diagrams and mathematical models,
- determination of basic principles and appropriate documentation needed to perform the analysis,
- identification (modes) of failures, their causes and consequences, their relative importance and their sequence,
- choice of methods and measures for fault detection and isolation,
- proposal of design and operational measures for serious failures,
- FMECA continues,
- determination of the criticality of the phenomenon, quantification of the consequences of failures (FMECA only),
- determination of the probability of failure (FMECA only).

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Both methods are completed:

- examination of certain combinations of multiple disorders,
- recommendations to reduce the likelihood of failures and their consequences.

When using FMECA, faults (accidents) are classified according to the probability of occurrence into categories:

- very low - unlikely but possible occurrence of the fault,
- low - unlikely occurrence of the disorder,
- moderate - occasional occurrence of the disorder,
- high - probable occurrence of the failure,
- very high - frequent occurrence of the disorder.

Risk Assessment

SLEZSKÁ UNIVERZITA
OBCHODNĚ PODNIKATELSKÁ FAKULTA V KARVINÉ

Similarly, the severity of the consequences of a failure (accident) is divided into categories: negligible damage, human life or health would not be endangered,

- minor damage but negligibly endangers human life or health,
- significant damage but negligibly endangers human life or health,
- very serious damage, endangers human life or health,
- catastrophic damage, death or personal injury.

Another way of expressing the risk of failure (accident) is to use the comparative risk value (PHR), which is a functional expression of risk. PHR also takes into account safety measures to reduce risks. A verbal expression of the probability of failure, consequences and measures is used to determine PHR. The following relation is used for the calculation: PHR = A x B x C