

CASE STUDY REGARDING THE RISK ASSESSMENT METHOD BASED ON MEASURES OF CONTROL OF THE RISK LEVEL

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Abstract

The case study was developed on the basis of the requirements of the OHSAS 18001:2008 standard. In this respect, hazards were identified, the risks of accidents and occupational diseases were assessed and control measures for all workplaces within the organization were established. A case study was conducted in a metal processing factory in Oradea where the work process "cold pressing of metals" was analyzed. The activities and work tasks were identified and analyzed in this case, while also determining the extent of the hazards and risks relating to occupational health and safety. In the first phase, the assessment team described and analyzed the press operator job and analyzed the work task. Risk factors were identified depending on the work task, the number of people exposed (workers employed, occasional personnel), the probability of injury. In the second phase, the potential hazard was identified, the basic risk following to be calculated by multiplying the scores of the four criteria: frequency, probability of the event, seriousness and number of persons exposed (calculated risk level 1). In the third phase, control measures are established in order to reduce the level of risk, that take into consideration the deficiencies/irregularities found in the workplace. By applying control measures, a tolerable risk level is achieved, i.e. the risk level that results after implementing control measures.

Key words: occupational health and safety, risk level, risk identification, control measures, OHSAS 18001:2008

INTRODUCTION

According to the requirements of the OHSAS 18001:2008 standard, occupational health and safety management systems, Chapter 4.3. Planning 4.3.1 Hazard Identification, Risk

Assessment and Risk Control, the organization must establish, maintain a procedure / work method for hazard identification, risk assessment, establishing the necessary controls (OHSAS, 2008)

The work methodology for hazard identification and risk assessment must take into account the following (OHSAS, 2008):

- routine and non routine activities;
- activities of the entire personnel having access to the workplace (subcontractors and visitors);
- human behaviour, capabilities and other human factors;
- hazards identified and generated outside the workplace, capable of affecting the health and safety of persons who are under the control of the organization in the workplace;
- hazards created in the vicinity of the workplace by work-related activities which are under the control of the organization;

- infrastructure, equipment and materials in the workplace, if they are provided by the organization or other parties;
- changes or proposed changes in the organization, its activities or materials;
- changes to the OH&S management system, including temporary changes and their impacts on operations, processes and activities;
- any legal obligations applicable to risk assessment and the implementation of necessary controls;
- job design of processes, facilities, equipment / machinery, of the operating procedures and work organization, including their adaptation to human capabilities (OHSAS, 2008);

ESTABLISHING THE LEVEL OF RISK

For each hazard identified, the event or concrete form/consequence of its potential occurrence due to this hazard must be determined.

Each of the events recorded as probable must be assessed in terms of the following criteria:

- The frequency of occurrence of the consequence (F);
- The seriousness (gravity) of the consequence (G);
- The number of people exposed (N).
- The probability of occurrence of the consequence(P).

The final score for each risk is obtained by multiplying the scores obtained for the four criteria as follows:

$$F \times G \times N \times P(1)$$

By applying this algorithm, the basic risk and the tolerable risk associated with each hazard are identified.

CASE STUDY

Hazard identification and risk assessment for the “cold pressing of metals” job/workplace.

Description of Phase I:

The assessment team describes the workplace and the work task subject to analysis, the risk factors identified depending on the work task, the number of people exposed (workers employed, occasional personnel and special personnel).

Description of the workplace / activity being assessed for the cold pressing of metals.

1. Work task assessed: supervision and operation of the work equipment, press supply with semi-finished products, minor interventions on the serviced technical equipment, travel to other work sites

2. Hazard / Risk factor being assessed:

- risk factors related to the work equipment or machines used (mechanical risk, electrical risk, thermal risk, chemical risk factors);

- risk factors related to the work operations and methods (inappropriate content of the work task, under- or oversized workload as compared to the performer's capacity);
- risk factors related to the work environment (physical risk, chemical risk, biological risk factors, the special nature of the environment);
- risk factors related to the work task performer – the press operator;

3. The number of people exposed. The workers who are or may be exposed to the hazards described must be identified. Where appropriate, the following should be taken into account:

- employed workers who perform those activities on a permanent basis or occasionally (operators, heads of department, directors, managers);
- personnel working on the basis of cooperation agreements, personnel seconded or delegated for specified periods;
- special categories of personnel (e.g., pregnant women, minors, disabled persons);
- visitors (e.g., guests, customers, prospective suppliers, delegates from other locations)

For the assessed workplace, we have the following persons exposed:

- Employed workers: 1 - the press operator;
- Occasional personnel – contractors, visitors - 0
- Special personnel - 0
- Operating conditions (routine ones)

Description of Phase II

The assessment team must describe the potential hazard and calculate the basic risk by multiplying the scores for the four criteria, the frequency of occurrence of the potential hazard, the seriousness of the consequence, the number of people exposed and the probability/likelihood of occurrence of the potential hazard, as a result of which the risk level is obtained (Law, 2006).

Table 1

Potential hazard		BASIC RISK				
No. in the list	Potential hazard / injury description	Frequency of the potential hazard	Seriousness of the consequence	Number of persons exposed	Probability of occurrence of the potential hazard	Calculated risk level
4	Limb injuries caused by contact with surfaces or sharp edges (semi-finished products, metal sheets, platbands);	5	4	1	3	60
5	Bumps, bruising of the body caused by inadvertent collision with vehicles moving on the internal traffic routes in the area of the workplace;	5	4	1	3	60
7	Electrocution through indirect contact (disused earthing connections, accidentally pierced insulation);	5	4	1	3	60
8	Electrocution caused by unauthorized intervention on the electrical plant of the work equipment (the press);	5	4	1	3	60
10	Injuries caused by explosions of containers under pressure in the work area or area adjacent to that of the activity (compressors, cylinders, pressure vessels);	5	4	1	3	60
13	Respiratory diseases caused by gases, vapours, toxic aerosols resulting from the carrying out of the technological process of the department or from exhaust gases of forklifts moving through the workplace area;	5	4	1	3	60
14	Osteoarticular disorders due to the repeated handling by lifting, pulling, pushing, carrying semi-finished products or containers;	5	4	1	3	60
15	Hearing disorders due to the noise present in the workplace;	5	4	1	3	60
18	Body injuries caused by the use of technically non-compliant work equipment (defective or improvised);	5	4	1	3	60
20	Body injuries caused by failure to comply with the work instructions regarding the execution technology;	5	4	1	4	80
21	Body injuries caused by failure to use collective / personal protective equipment;	5	4	1	4	80

The 11 potential hazards described above were selected from a total of 21 risk factors for accidents and occupational diseases on the basis of the risk level criterion ≤ 51 points.

The score greater than or equal to 51 points is considered as priority number 1 because the potential hazard is imminent and indicates the fact that the activity should be stopped until the risk has been removed or reduced to a level that can be controlled accordingly, by means of implementing control measures.

Table 2

The priority grid of risks in the field of occupational health and safety

Final score	Priority
Greater than or equal to 51 points	Priority 1 –the risk is imminent and indicates the fact that the work should be stopped until the risk has been removed or reduced to a level that can be controlled properly.
Between 10 and 50 points	Priority 2 –it is necessary to act immediately in order to remove the risk or reduce it to an acceptable level
Below 10 points	Priority 3 - the risk is properly controlled or is insignificant. However, this risk level should be subject to regular updating in order to make sure that the existing control measures remain effective.

Description of Phase III

Identification of control measures implemented in order to control the hazards, determining the current risk level and the action plan for risk reduction

For each activity and work task, the personal protective equipment required, the types of medical checks, first aid facilities must be identified. Subsequently, control measures are established that may result in lowering the risk level.

Examples of control measures that lower the risk level: ensuring security signalling, providing personal protective equipment, training workers with regard to the use of the protective equipment, existence of work permits, etc.

The control measures identified must be analyzed in terms of their effectiveness. Low effectiveness of control measures is caused by the inappropriate behaviour of the performing personnel or of the personnel that have access to the work area, poor training and awareness of the personnel as regards the use of protective equipment or compliance/noncompliance with occupational health and safety requirements.

After the implementation of the control measures, the risks of accidents and occupational diseases are re-assessed, the level of risk associated with each hazard being determined, by taking into account the existing control over the identified risk. In assessing the tolerable risk level, the same criteria are used as for determining the basic risk.

Depending on the result/score obtained as regards the risk level, subsequent opportunities and actions are determined, as well as the priority of taking such actions, considering the “Quotation and Priority Grid of Risks in the Field of Occupational Health and Safety”.

For the priority 1 and 2 risk levels, respectively, the possibilities for removing or reducing the risk level to an acceptable level, for which the control measures already implemented should suffice, must be analyzed. Risk removal or reduction is required in order to prevent work accidents or

occupational diseases. For this purpose, action plans are developed in order to reduce the risk level, with the specification of the necessary measures, deadlines and persons in charge.

Table 3

Control measures and tolerable risk							
No	CONTROL MEASURES		TOLERABLE RISK				Calculated risk level [2]
	Deficiencies / deviations from the control measures	Control measures implemented in order to reduce the risk level	Frequency of potential hazard	Seriousness of consequence	Number of persons	Probability of occurrence of potential hazard	
4	Failure to follow work instructions regarding the handling of semi-finished products. Failure to use the protective gloves provided by the employer	Compliance with the requirements in the instructions drawn up for handling materials (metal sheets, strips with cutting edges). Use of appropriate protective equipment –protective gloves.	5	4	1	1	20
5	No walkways are established for workers on the internal traffic routes. Workers do not comply with the safety rules for internal movement. Lack of safety signs regarding the movement of internal transport means.	Establishing walkways for pedestrians, for workers on the internal traffic routes. Compliance with the internal traffic rules within the territory of the company.	5	4	1	2	40
7	Failure to replace defective electrical wiring (with old or pierced insulation)	Compliance with the rules of electrical safety, electrical intervention to be performed by authorized personnel, preventive maintenance of electrical equipment	4	4	1	2	32
8	Unauthorized interventions on the electrical plant of the work equipment	Compliance with the rules of electrical safety, electrical intervention to be performed by authorized personnel, preventive maintenance of electrical equipment	5	4	1	2	40
10	Failure to follow safety rules in the area of containers under pressure. Failure to perform the planned inspections in due time	Compliance with safety rules for containers under pressure, Periodical ISCIR and metrological checks of the pressure valves. Preventive maintenance programme	5	4	1	1	20
13	The production area works without a ventilation system. Failure to perform the periodic medical examination	Existence and operation of the ventilation system. Preventive maintenance of ventilation systems. Periodic medical examination of workers	3	3	1	2	18

14	Failure to train the worker with regard to the manual handling of loads. Failure to use the safety equipment provided.	Operator training with regard to the manual handling of loads. Use by workers of appropriate protective equipment, lumbar belt, safety shoes with metallic toecap, etc.	5	4	1	2	40
15	Failure to determine the noise level in the work area of the press operator. Lack of use by operators of noise protection equipment provided by the employer.	Determining the noise level in the workplace. Use by workers of personal noise protection equipment, regular medical checks– audiometry	5	4	1	2	40
18	Use of faulty or improvised work equipment	Preventive maintenance plan. Use of work equipment only if it meets the technical requirements	5	4	1	2	40
20	Failure to comply with the requirements of the press benchmark-manufacturing technology	Training and testing knowledge of the manufacturing technology used in pressing metals	5	4	1	2	40
21	Failure to use the protective equipment provided	Use of the protective equipment provided, by taking into account the existing risks in the workplace, as well as of the protective devices fitted to machines	5	4	1	2	40

By analyzing the data presented in the table above, it is found that out of the 11 deficiencies / deviations from the control measures, three have a risk level ≤ 20 , which means a share of 27.3%, while the remaining deficiencies / deviations (72.7%) have a risk level ≤ 40 .

CONCLUSIONS

In order to establish the measures to be included in the action plan, the use of the following risk prevention techniques is envisaged:

- removal—consists in removing the risk factor (hazard) and is the most effective measure in order to eliminate the risk, the action is directed towards the source of inherent risk factors;
- reduction –aims to identify and take action in order to reduce the identified risk factors;
- control - aims to identify and take the necessary measures in order to maintain the risk level deemed tolerable by the organization.

The actions required in order to implement the risk level are based on methods that involve collective and individual protection measures, such as:

- Insulation of the area where the risk source is, in order to prevent accidents and incidents (restricting the work area, prohibiting access to certain areas, soundproofing, etc.);
- Reducing the contact of the personnel with the risk source (personnel working in soundproof booths);

➤ Personnel protection by collective / individual protective equipment.

The updating of information regarding hazard identification and risk assessment takes place when changes occur, such as:

➤ technology changes, upgrades or introductions of new technologies or the use of raw materials with enhanced characteristics;

➤ changes in the structure of the organization;

➤ emergence of demanding requirements and regulations of the stakeholders;

➤ occurrence of work accidents or dangerous incidents.

REFERENCES

1. Law No. 319/2006, Law on Occupational Safety and Health
2. Mihaila N., Borzan M., 2016, Case Study on the analysis of injury and occupational disease risks for the press operator job/workplace within small and medium enterprises. Annals of University of Oradea, Fascicle, Faculty of Environmental Protection vol XVI
3. ***OHSAS 18001:2008 "Occupational Health and Safety Management Systems Specification" 4.3.1 Planning Hazard Identification, Risk Assessment and Risk Control
4. ***OHSAS 18001 Toolbox; Section 3.1 – Risk Assessment and Safe System of Work
5. ***The Romanian Government, 2006, Government Decision no. 1425/2006 approving the Methodological Norms for the enforcement of the Law on Occupational Safety and Health No. 319/2006, Official Journal of Romania, Part I, no. 882/30.10.2006
6. ***<http://edge.rit.edu/edge/P09310/public/Risk%20Assessment>
7. ***http://www.hsa.ie/eng/Publications_and_Forms/Publications/Safety_and_Health_Management/Guidelines_on_Risk_Assessments_and_Safety_Statements.pdf
8. *** http://www.cqm.ro/cqm-ro_doc_14_certificare-ohsas-18001-sistemul-de-management-al-sanatatii-si-securitatii-ocupationale_pg_0.htm
9. *** <http://www.bsigroup.com/en-GB/ohsas-18001-occupational-health-and-safety/>
10. *** <http://www.praxiom.com/ohsas-18001-intro.htm>
11. *** <http://www.hse.gov.uk/risk/controlling-risks.htm>
12. *** <http://www.hse.gov.uk/risk/identify-the-hazards.htm>
13. *** <http://www.hse.gov.uk/risk/decide-who-might-be-harmed.htm>
14. *** <http://www.hse.gov.uk/risk/evaluate-the-risks.htm>
15. *** <http://www.hse.gov.uk/risk/record-your-findings-and-implement-them.htm>
16. *** <http://www.hse.gov.uk/risk/review-your-assessment.htm>
17. *** <http://www.hse.gov.uk/risk/news.htm>
18. *** https://en.wikipedia.org/wiki/Risk_assessment
19. *** https://en.wikipedia.org/wiki/Risk_assessment
20. *** https://www.ccohs.ca/oshanswers/hsprograms/risk_assessment.html