

## CASE STUDY ON THE ANALYSIS OF RISKS OF ACCIDENTS AND OCCUPATIONAL DISEASE FOR THE PRESS OPERATOR JOB WITHIN A SMALL AND MEDIUM SIZE ENTERPRISE

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### **Abstract**

*One of the legal requirements regarding the occupational health and security is that the employer identify and evaluate the risks of accidents and occupational disease for all jobs existing within the organization. The purpose of risks evaluation is that the employer take the technical, organizational, hygienic – sanitary measures and other types of measures in order to prevent work accidents and occupational disease at the jobs organized by the employer. The evaluation method of professional risks, used in this paper, is a method implemented at INCDPM Bucharest<sup>1</sup>, starting with the year 2006, being a successful measure in respect to work accidents and professional diseases prevention. In this paper was elaborated a case study through the implementation of the methodology mentioned in a metal working factory at “Press operator” workplace, the global risk level calculated being equal to 3,666. It was identified a total number of 21 risk factors among which 10 risk factors exceed the maximum admitted limit, as partial level. For the risks which exceed the risk level, were proposed measures in order to eliminate or to reduce their effects.*

**Key words:** occupational health and security, risk factors, risk level, risk evaluation.

### **INTRODUCTION**

According to the legislation on occupational health and security, one of the obligations of employers from our country is that to identify and to evaluate the occupational accidents risks for each workplace, (Pece, St, 1994). The legal framework is the article 7 of law 319/ 2006, wherein the employer, within his obligations, shall “evaluate the risks for employers’ security and health, including at choosing the work equipment, the chemical substances or preparations used and at the development of workplaces, (Darabont, Al., Pece, St., 1996). From an array of methods used on global and national plan for the evaluation of risks, the most frequent used method in Romania is the evaluation method of accidents and occupational disease risks elaborated by I.N.C.D.P.M Bucharest, experimented till present in most industrial branches, (Pece, Șt., Dăscălescu, A., 1998). This method is part of the category of analytical and semi-quantitative methods and consists, in essence, in the identification of all risk factors from the system analysed by the help of some default control lists, followed by the quantification of the risk size for each risk factor in part, according to the combination between the graveness and the frequency of

maximum predictable consequence. The global risk level on the workplace is determined as weighted average of partial risk levels. The application of the method is finalized with two centralizing documents for each workplace: evaluation sheet of risks and proposed measures sheet, (Pece, 2010).

The evaluation of risks presupposes the identification of all risk factors from the analysed system and the quantification of their sizes according to the combination between two parameters: graveness and frequency of possible maximum consequence on the human body, (Babut, Moraru, 1999).

## MATERIAL AND METHOD

After getting the risk level for each element of the work system (executant, work task, means of production/ work equipment and work environment), is calculated the global risk level for the workplace evaluated. The calculation formula of the global risk level, according to the method elaborated by INCDPM Bucharest, is (Pece, 2010), (Moraru, Băbuț, 2010):

$$N_r = \frac{\sum_{i=1}^n r_i \cdot R_i}{\sum_{i=1}^n r_i} \quad (1)$$

Where:

$N_r$  = global risk level for workplace;

$r_i$  = rank of risk factor "i";

$R_i$  = risk level for the risk factor "i";

$n$  = number of risk factors identified at the workplace.

In order to get the global risk level, is calculated the weighted average of average security levels determined for each workplace analysed from the structure of the organization's macro-system, (Moraru, Băbuț, 2000).

## RESULTS AND DESCUSSION

The workplace analysed, where it was implemented the method INCDPM Bucharest is that of press operator within the production department, "Presses" section from S.C. METALWORKING SRL.

The work process – consists in the execution of pressing operations (stamping, die forging), filling of the press with plate unfinished goods, checking and storekeeping of pressed parts. Component elements of the work system evaluated:

- a) **Means of production/work equipment:**
  - Technical equipment (hydraulic presses);
  - Appliances, pallet trucks;
  - Manual tools (catches of stamped benches, tweezers);
  - Utensils for cleaning the work area.
- b) **Work task:**
- c) To perform specific pressing operations (stamping, die forging) on the work equipment from the production department, according to the requirements from the instruction book and to the work instructions;
- d) To manipulate machinery (hydraulic presses) and auxiliary devices (filling devices with unfinished goods, pallet trucks), according to the work instructions;
- e) To label the containers and the products (unfinished goods from the working position) according to the internal specifications;
- f) To participate to the adjustment of machinery and to the change of stamps;
- g) To use the individual protection equipment adequate to the risks of the working position.
- h) **Work environment:**
  - The “Press operator” develops his activity within the production department, presses section endowed with metallic plates pressing machinery;
  - The work place is connected to the electric power installation, drinking water network, sewerage and it is endowed with air conditioning installation.

**Hazards determined:**

- Noiselevel: 86.7 dB, weighted average value at 8 hours;
- Presses micro-climate:WBGIndexCelsius degrees 24,2.

After the identification of component elements of the work system evaluated, we passed to the elaboration of the Evaluation sheet of the work place (Table 1).

This includes the risk factors identified and the specific form for the manifestation of the risk factors (description, parameters). For each risk factor was previsioned the maximum consequence, the graveness and probability classes and the risk level.

Table 1

## Evaluation sheet of the workplace

Unit:S.C. METALWORKING SRL Department: Production Section:Presses Number of persons exposed: 15 Exposure duration:8 ore						
Component of the work system	Risk factors identified	Specific form of manifestation of risk factors (description, parameters)	Maximum predictable consequence	Gravens class	Probability class	Risk level
Means of production	Mechanic risk factors	Catching of superior members in the technical equipment in operation (machine elements in movement)	INV <sup>1)</sup> 3rd degree	4	2	3
		Diseases of osteoarthritic system because of wrong positioning of the working position	ITM <sup>2)</sup> 3-45 days	2	2	2
		Bodily injuries, deaths because of turnover/ dropping of objects from the working area	DEATH	7	1	3
		Injuries of members caused by the contact with cutting or stinging surfaces – cutting (unfinished goods)	ITM 45 -180 days	3	6	4
		Beating, bruising of the body caused by the beating by means of transportation riding on the internal circulation roads from the region of the working position	DEATH	7	2	4
	Electric risk factors	Electrocution by direct touch (accidentally deteriorated switches) or by indirect touch (accidental deterioration of isolations, uncovered cables, defects)	DEATH	7	1	3
		Electrocution through indirect touch (disaffected grounding connection, isolations accidentally punctured)	DEATH	7	2	4
		Electrocution caused by unauthorized interventions to the electrical installation	DEATH	7	2	4
	Thermal risk factors	Burning lesions caused by fires generated by the presence of inflammable materials (aluminum dust from the vicinity of the working position)	ITM 45-180days	3	2	2
		Burning lesions caused by explosions because of recipients under pressure in the working position or in the vicinity of the development place of the activity (compressors, bottles, recipients under pressure)	DEATH	7	1	3
		Skin irritations because of chemical substances, oils, emulsions used for the lubrication of unfinished goods for pressing	ITM 3-45 days	2	4	2
	Physical risk factors	Respiratory diseases because of air currents in cold season (bronchitis, pneumonias, freezing)	ITM 3-45 days	2	5	3
		Respiratory diseases caused by toxic gases, vapors, toxic aerosols resulting from the functioning of the technological process of the section or from the exhaust emissions from forklifts which circulate in the production area	ITM 45-180 days	3	5	4
		Osteoarthritic diseases because of – repeated manipulation by picking up, drawing, pulling unfinished goods or containers	ITM 45-180 days	3	5	4
		Hearing diseases because of the noise from the area of the work position	INV 3 <sup>rd</sup> degree	4	4	4
	Work task	Physical overload	Orthostatic working positions, diseases of inferior members	ITM 3-45 days	2	5
Psychic overload		Attention overload to complex operations	ITM 3-45 days	2	5	3
Executant	Wrong actions	Bodily injuries caused by the use of work equipment which don't correspond from the technical point of view, with malfunctions or makeshifts	DEATH	7	2	4
		Burning lesions cause by fires because of the use of open fire or of smoking in the working areas with inflammable substances, dangerous materials	ITM 45-80 days	3	1	2
		Bodily injuries caused by the inobservance of working instructions regarding the execution technology	INV 1 <sup>st</sup> degree	6	3	5
	Omissions	Bodily injuries caused by the non-use of collective/ individual protection equipment	DEATH	7	3	5

<sup>1)</sup> INV - Invalidity

<sup>2)</sup> ITM –Temporary Work Invalidity

In figure 1 are illustrated, in the graphical form, the risk levels for the 21 risk factors identified at the workplace analysed. It can be noticed that the 10 risk factors exceed, as partial level, the maximum admitted limit, being situated in the category of risk factors for which shall be taken measures in order to eliminate or reduce their effects.

Considering the risk level quantified in the Table 1, for each element of the work system, by replacement in the relation (1) by calculating the global risk level is obtained:

$$N_{rg} = \frac{\sum_{i=1}^{21} R_i \cdot r_i}{\sum_{i=1}^{21} r_i} = \frac{0 \cdot (7 \times 7) + 0 \cdot (6 \times 6) + 2 \cdot (5 \times 5) + 8 \cdot (4 \times 4) + 7 \cdot (3 \times 3) + 3 \cdot (2 \times 2) + 0 \cdot (1 \times 1)}{0 \times 7 + 0 \times 6 + 2 \times 5 + 8 \times 4 + 7 \times 3 + 3 \times 2 + 0 \times 1} \quad (2)$$

which leads to a global risk level:

$$N_{rg} = 3,666 \quad (3)$$

value which exceeds the maximum acceptable limit of 3,5. This means that the workplace evaluated “Press operator” fits in the category of work places with average – increased level of risk for accidents and occupational disease.

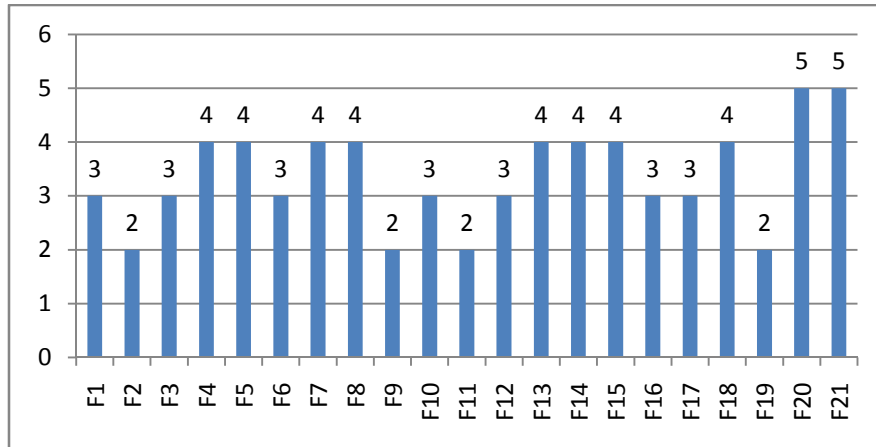


Fig. 1. Graphic representation of risk factors for press operator job

After a careful and detailed analysis of the workplace and of causes which can lead to the apparition and the encouragement of the 10 risk factors whose partial level exceeds the maximum admitted limit, it was elaborated the “Sheet of proposed measured for the workplace “press operator” (Table 2). This presents synthetically the major risk factors/ the

workplace, together with the risk level and with the proposed measures for avoidance/ decrease.

Table 2

Sheet of proposed measures for the workplace, „press operator”

No. crt.	Risk factors / workplace	Risk level	Proposed measured (measure nomination)
1	F4.-Injuries of members caused by the contact with cutting or stinging surfaces - cutting (unfinished goods)	4	<ol style="list-style-type: none"> <li>1. Use of individual protection equipment granted (protection gloves, combination suit, etc) by the press operator;</li> <li>2. Assurance of instructed personnel regarding the grant of the first medical aid.</li> </ol>
2	F5.- Beating, bruising of the body caused by the beating by means of transportation riding on the internal circulation roads from the region of the working position	4	<ol style="list-style-type: none"> <li>1. Marking the internal circulation roads according to the provisions on security and health signalizing at the work place stipulated by the Government Ordinance 971/2006;</li> <li>2. Instruction of press operator regarding the avoidance of his stopping in the areas where the internal transportation means are travelling.</li> </ol>
3	F7.-Electrocution through indirect touch (disaffected grounding connection, isolations accidentally punctured)	4	<ol style="list-style-type: none"> <li>1. Periodical checking of electric press equipment by authorized and instructed personnel in this respect (electrician);</li> <li>2. Realization of mass connection according to the technical and security provisions in force;</li> <li>3. Visual checking of integrity of ground connection of cases of machinery – press by the press operator and immediate communication of defects to the manager from the work place.</li> </ol>
4	F8. - Electrocution caused by unauthorized interventions to the electrical installation	4	<ol style="list-style-type: none"> <li>1. Instruction of press operator regarding the fact that the intervention to press electric equipment will be realized only by authorized and instructed personnel in this respect (electrician);</li> <li>2. Observance of security rules by the authorized personnel regarding the intervention in electric installations;</li> <li>3. Use, as the case may be, of tools with electroinsulating handle by the authorized personnel (electrician).</li> </ol>
5	F13. Respiratory diseases caused by toxic gases, vapours, toxic aerosols resulting from the functioning of the technological process of the section or from the exhaust emissions from forklifts which circulate in the production area	4	<ol style="list-style-type: none"> <li>1. Determination of noxious agents in the working area;</li> <li>2. Periodical medical checking;</li> <li>3. Use of adequate protection equipment.</li> </ol>
6	F14. Osteoarthritic diseases because of – repeated manipulation by picking up, drawing, pulling unfinished goods or containers	4	<ol style="list-style-type: none"> <li>1. Instruction of the worker regarding the manual manipulation of masses;</li> <li>2. Use of protection equipment from endowment.</li> </ol>
7	F15. Hearing diseases because of the noise from the area of the work position	4	<ol style="list-style-type: none"> <li>1. Determination of the noise level in the working area;</li> <li>2. Periodical medical checking.</li> <li>3. Use of antiphones.</li> </ol>
8	F18. Bodily injuries caused by the use of work equipment which don't correspond from the technical point of view, with malfunctions or makeshifts	4	<ol style="list-style-type: none"> <li>1. Preventive maintenance schedule for technical equipments used.</li> </ol>
9	F20. Bodily injuries caused by the inobservance of working instructions regarding the execution technology	5	<ol style="list-style-type: none"> <li>1. Instruction of the worker with work instruction for the equipment used;</li> <li>2. Periodical checking of knowledge regarding the execution technology.</li> </ol>

10	Bodily injuries caused by the non-use of collective/ individual protection equipment	5	1. The manager of the workplace will check, at the beginning of the shift, the use of protection equipment by workers.
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## CONCLUSIONS

As a result of the analyses and studies realized at the work place “press operator” was identified a total number of 21 risk factors, among which 10 risk factors exceed, as partial level, the maximum admitted limit, being located in the category of risk factors for which we shall take measures in order to eliminate or reduce their effects.

The global risk level  $N_{rg}$  calculated had the value of 3,666 (value which exceeds the maximum acceptable limit of 3,5), fact which fits the workplace evaluated in the category of workplaces with average – increased risk level of accidents and occupational disease.

It was elaborated and proposed a Sheet of measures for the work place « press operator », wherein are nominated the 10 major risk factors/ work place, together with the risk level and the measures needed to be taken for avoidance/ reduction.

In order to reduce the risk level, both the management and the entire staff will act so that the determined measures be realized, kept and observed. In this way, it will be substantially reduced the probability of occurrence of accidents and occupational disease danger for the evaluated workplace.

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