

Evaluation of Safe and Hygienic Work Conditions in the COVID-19 Era: A Case Study in a Production Company

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Keywords: COVID 19, Occupational Risk

Abstract. In recent times, the importance of occupational health and safety has escalated for modern enterprises. This shift can be attributed to the emergence of the COVID-19 virus, which compelled numerous businesses to adopt crisis management strategies and embrace remote work arrangements. It can be argued that the pandemic necessitated employers to implement suitable health and safety measures in order to sustain their operations in the labor market. The objective of this study is to evaluate occupational risks, considering the implications arising from the pandemic, and subsequently assess the provision of safe and hygienic conditions during this period. It is important to note that workplace hygiene requirements can vary based on the company, industry, and job role. Different work environments will entail distinct hygiene demands, and certain occupations or industries may even entail additional risks warranting extra protection. Hence, the assessment focused solely on production positions such as machine operators, fitters, quality inspectors, and warehouse workers.

Introduction

The SARS-CoV-2 virus pandemic has created a number of new challenges for employers and obliged them to take specific actions. With the advent of the COVID-19 pandemic, modern enterprises had to quickly adapt to the prevailing conditions in order to survive on the market. At that time, employers played a key role along with employees involved in occupational health and safety (OSH) activities. [1,2]. Under international law, the obligations to ensure the safety and health of workers are the responsibility of:

- an employer - in relation to employees employed under an employment contract and performing work for the employer on a basis other than an employment relationship (including self-employed), provided that the work is performed at the workplace or in a place indicated by the employer;;
- an entrepreneur - in relation to persons employed by him on a basis other than an employment relationship (including self-employed).

Among the actions aimed at ensuring the safety and health of employees undertaken by the employer, the basic action is to assess the risk at the workplace and apply the necessary preventive measures to reduce this risk (according to the Labor Code). Pursuant to the above provisions, the employer, when assessing occupational risk, is obliged to take into account all factors occurring in the work environment and related to its performance. Due to the COVID-19 epidemic, in addition to the existing threats, a new threat caused by the SARS-CoV-2 coronavirus has appeared in workplaces. Therefore, the employer is obliged to take actions aimed at limiting the risk related to exposure to this biological agent [3-5]. The purpose of the study is to assess occupational risk (taking into account aspects resulting from the pandemic situation), and then to assess safe and hygienic conditions during the pandemic among production employees.

Materials and Methods

Risk assessment is the process of evaluating the risks to the safety and health of workers arising from workplace hazards. It is a regular analysis of all aspects of the job, covering the following areas: what could cause injury or damage, whether hazards can be eliminated, and if not, what preventive or protective measures are or should be in place to control the risk. It should be emphasized that risk assessment is only one part of the overall process used to control risks in the workplace [6]. For this reason, it should be treated as part of good business practice and a means to ensure effective improvement of operational activities [7, 8].

The currently applicable occupational health and safety regulations contain a reference to occupational risk assessment, distinguishing a number of factors subject to assessment. Taking into account the nature of the impact on the affected person, in accordance with the standards, four types of dangerous and harmful factors can be distinguished, i.e.: physical (e.g. noise, vibration, radiation, low and high temperature); chemical (e.g. dust, toxic, irritating, allergenic substances, etc.); biological (e.g. viruses, fungi and microorganisms); psychophysical (e.g. physical and neuro-psychic stress).

Taking into account the work positions of employees of the production division from the group of machine operators, fitters, quality inspectors and warehousemen selected for the purpose of work, the occupational risk assessment before 2020 did not include the threats related to the occurrence of the biological agent, which is the SARS-CoV-2 virus (Table 1).

Table 1. Occupational risk assessment for production positions considering pandemic situation: machine operator, fitter, quality inspector, and warehouse worker [own study based on company information]

No.	Hazards	Indicator value			Occupational risk level (R)
		S	E	P	
1	Sound volume too high	5	5	10	250
2	Electric current	15	2	1	30
3	High/low temperatures	3	4	8	96
4	Artificial lighting	3	4	8	96
5	Slippery surfaces	7	6	2	84
6	Sharp tools	3	4	9	108
7	Moving elements of machines and devices	3	6	4	144
8	Toxic substances	7	6	1	42
9	Substances and solutions containing metals and their derivatives	7	6	1	42
10	Aerosols, paints, solvents	7	6	0.5	21
11	Pathogenic microorganisms, bacteria, viruses, fungi	4	5	9	180
11a	Contact with a person infected with the SARS-CoV-2 virus	2	5	7	70
11b	The spread of the SARS-CoV-2 virus	7	5	6	210
12	Working in a shift system	3	3	1	9
13	Flexible scope of duties	3	3	1	9
14	High degree of responsibility for the implementation of the entrusted tasks	3	2	1	6

Based on the data presented in Table 1, it can be concluded that despite the increased risk of Covid 19 infection, noise is still the most dangerous factor. So, the employee at the workplace is most exposed to too much noise. It is worth noting that even before the declaration of a pandemic, the risk associated with the presence of biological agents "Pathogenic microorganisms - bacteria, viruses, fungi" was very high. The introduction of the state of pandemic introduced some kind of restrictions (partly obligatory), which allowed for a slight minimization of this threat. However, the introduction of additional items 11a and 11b finally meant that the risk associated with the occurrence of coronavirus (as a biological agent) is high. The research was carried out independently in two departments of the company, among production employees, i.e. machine operators, fitters, quality inspectors, as well as warehouse employees. The main assumption of the study was to determine whether the employer adjusted the way of organizing work and working conditions in such a way as to ensure full safety for employees regardless of the current situation. The survey involved 52% men and 48% women (which is a kind of balance), with the positions of warehousemen and machine operators mostly men, and the positions of assembly and quality inspectors were women. As many as 30% of the respondents are employees aged 31 to 35, with the younger staff coming mainly from department 2. Most of the people participating in the survey (37%) had technical education, a comparably large group of respondents were employees with secondary education (33%). The largest group consisted of respondents with 11-16 years of professional experience (37%) and employees with a slightly shorter work experience of 6-10 years (31%).

Results and Discussion

Moving on to the main part of the questionnaire, 9 aspects were analyzed relating to the disclosure of actual activities and work organization in the company, taking into account the observance of safety rules – both commonly known work safety and those resulting from the restrictions introduced.

Thus, in the first place, respondents were asked to rate the following statement "In the enterprise, safety is the most important thing". The results of the obtained tests are shown in Fig.1.

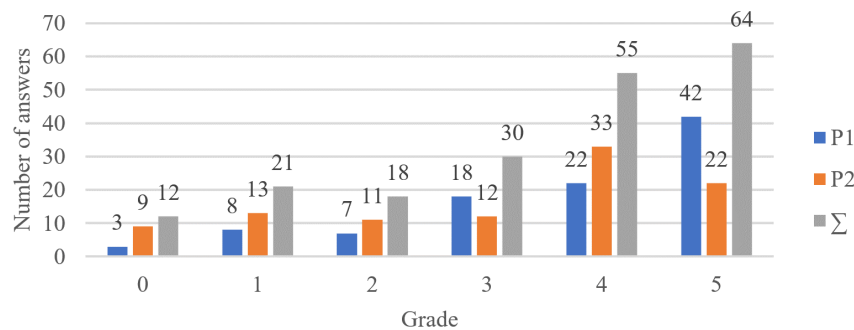


Fig.1. Comparison of assessments of the statement "Safety is the most important thing in the company".

As shown in Fig.1, in the first branch of the company (X), the employees rated the importance of safety in the company very well, as many as 42 respondents gave the statement "Safety is the most important in the company" the highest rating. On the other hand, in the second branch (Y), only 22 employees gave the highest rating. Taking into account the summary assessment, it can be concluded that security aspects play a very important role.

With regard to the data presented in Fig.2 (*Management supports safety activities*), significant discrepancies can be observed in the respondents' assessments. In this case, 45 employees from the first department (X) awarded the highest rating, thus confirming the management's

commitment to creating safe working conditions. On the other hand, in department 2 (Y), the same number of respondents (45) gave a rating of 3 – it is difficult to say, which directly indicates a marginal or complete lack of involvement of the management in the ways of organizing safe and hygienic working conditions. As in the previous question, the summary assessment indicates that the management supports the activities in the OSH scope.

Regarding question 3 "All employees are involved in general health and safety activities", employees in both departments are quite in agreement – Fig.3. And the graphs for both departments are quite flat. In department 1 (X) the highest number of ratings was obtained by note 2 (22 respondents), while in department 2 (Y) the highest number of ratings was obtained by note 0 (27 respondents).

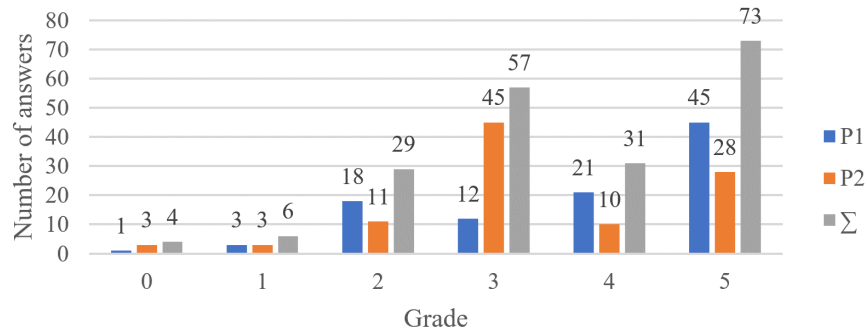


Fig.2. Comparison of assessments of the statement "Management supports safety activities".

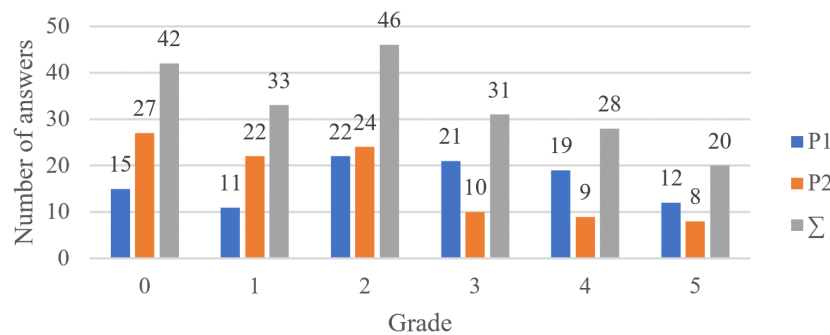


Fig.3. Comparison of assessments of the statement "All employees are involved in general health and safety activities".

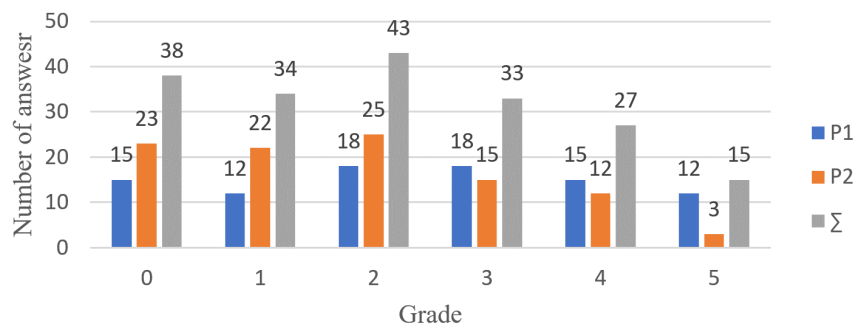


Fig.4. Comparison of assessments of the statement "Employees are constantly informed about changes resulting from the Regulation of the Council of Ministers".

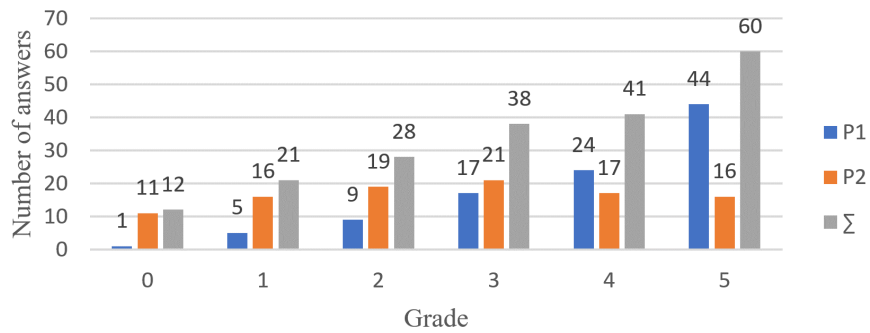


Fig.5. Comparison of ratings for the statement "Employees comply with all health and safety rules and the sanitary regime against COVID-19".

Which also informs that the involvement of employees is determined by the interest and actions of the management. This statement is confirmed by the structure of the answers to question 4 "Employees are constantly informed about changes resulting from the Regulation of the Council of Ministers" – Fig.4.

As can be seen from the chart presented in Fig.4 (Employees are constantly informed about changes resulting from the Regulation of the Council of Ministers), employees of department 2 (Y) are not informed or are only occasionally informed about changes in safety regulations in the field of sanitary regime introduced due to pandemic state. In department 2 (Y), almost 75% of respondents gave the lowest scores 0-2. On the other hand, in department 1 (X) information on changes in the organization of work in the company is provided to employees, as many as 22 people confirmed it by awarding a rating of 5. This distribution of ratings also affects the structure of answers to question 5 (Fig.5) - Employees comply with all health and safety rules and sanitary regime against COVID-19.

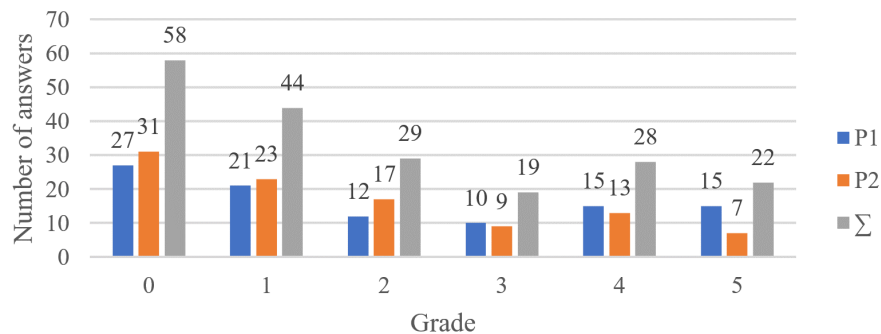


Fig.6. Comparison of ratings for the statement "Employees have on-the-job training due to the COVID-19 threat before starting work".

As the data presented in Fig.5 shows, a large percentage of employees from the department1 (X) comply with the health and safety rules and the sanitary regime against COVID-19. As many as 44 respondents gave a score of 5, additionally 24 respondents gave a score of 4 - which is the vast majority. Unfortunately, the situation is not so good in department 2 (Y), where respondents were reluctant to give the highest marks.

However, looking at the summary results, it can be seen that the employees of the tested production unit comply with the health and safety rules, especially in the period of increased risk. Despite such large discrepancies, employees of two departments of the company agree on the necessity and quality of on-the-job training (resulting from the COVID-19 threat) – Fig. 6.

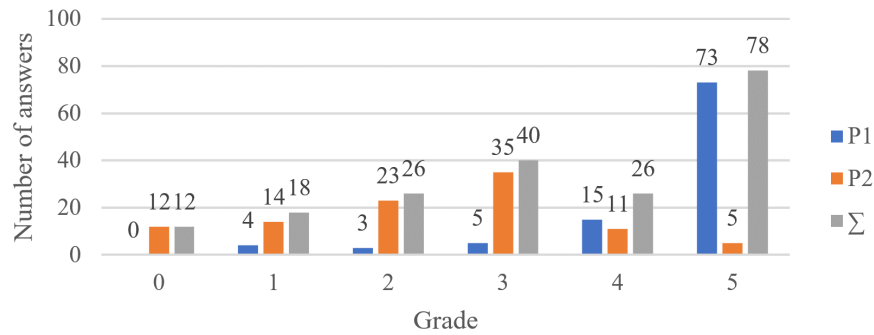


Fig.7. Comparison of ratings for the statement "The company keeps a reliable register of dangerous events in relation to the COVID-19 threat".

The data presented in Fig.6 indicate a high convergence of employees' answers to question 6: *Before starting work, employees receive on-the-job training resulting from the COVID-19 threat.* Unfortunately, the structure of the answers suggests that on-the-job training in terms of the threats caused by COVID-19 is not carried out. Both in unit 1 (X) and in unit 2 (Y) the highest number of ratings was obtained by the score 0 (*I have no opinion*) and 1 (*I completely disagree*). The percentage of positive evaluations (notes 4 and 5) in this case is marginal. Further, significant differences in the structure of answers were noted for question 7: *The company keeps a reliable register of events dangerous to the COVID-19 threat* (Fig. 7).

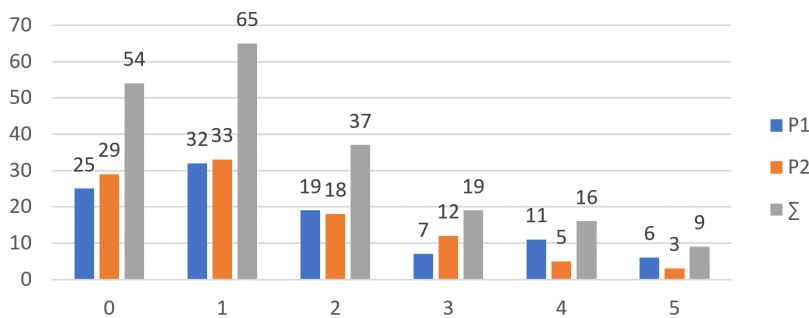


Fig.8. Comparison of ratings for the statement "Employees (conscientiously) inform about events potentially dangerous to the COVID-19 threat".

As can be seen (Fig.7), employees of the production division from two departments of the company very differently assessed the statement "The company keeps a reliable register of dangerous events in relation to the COVID-19 threat". As many as 73 respondents confirm that a reliable register of events dangerous to the COVID-19 threat is kept in the workplace (employees show very high compliance). On the other hand, employees from department 2 (Y) with their assessments undermine the reliability of the register of dangerous events in the face of the COVID-19 threat. In this context, the structure of ratings obtained for statement 8 seems interesting: Employees (conscientiously) inform about events that are potentially dangerous to the COVID-19 threat – Fig.8. Very high convergence of answers to this question (in both departments) questions the reliability of the records kept.

The correspondence of the answers of employees of the production department in two branches of the company was summarized with question 9 - All employees act in accordance with applicable procedures and instructions. As it results from the data presented in the chart (Fig.9), employees of department 1 (X) confirm (although this confirmation is not unambiguous) that they comply with procedures and instructions (traditional and new ones). On the other hand, employees of

department 2 (Y) deny functioning in accordance with applicable rules (instructions and procedures).

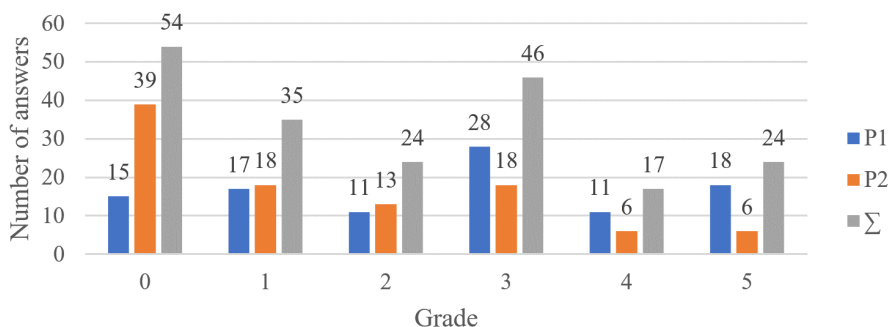


Fig.9. Comparison of ratings for the statement „All employees act in accordance with applicable procedures and instructions”.

Summary

The implementation of the tasks assigned to the employee is inscribed in a specific workstation, which is why great emphasis should be placed on the organization of a safe workplace in the area of both the principles of ergonomics and the sciences of organization and management. Despite clear guidelines, rules and regulations, as well as standards related to shaping an ergonomic, but also safe and hygienic workplace, it is sometimes difficult for employers to meet all the needs of employees. This is all the more a big challenge when we have to work in high-risk conditions – a pandemic that is present in the modern professional reality. It turns out that despite the functioning of the same management principles in two departments of the company (the same organizational structure, the same safety policy, the same quality and safety management systems implemented, etc.), employees differently perceive the organization of work in the production division – in one department, the employees rated the importance of safety in the company as very good, while in the second one, the rating is definitely lower. Significant differences in ratings were also observed respondents in relation to the management's involvement in creating safe working conditions. There are also differences in the assessment of whether employees are constantly informed about changes resulting from the Regulation of the Council of Ministers). The results of the conducted research confirmed that employees comply with all health and safety rules and the sanitary regime against COVID-19. But it's definitely different in both departments. Despite such large discrepancies, the employees are aware of the need to participate in training. In addition, there is a very high convergence of answers to this question about reliable register of dangerous events in relation to the COVID-19 threat (in both departments).

The proper implementation of industrial workstations with enhanced safety due to the threat of infectious viruses is a highly challenging issue. The practical implementation of measures such as ventilated isolation suits is not feasible due to restricted freedom of movement. Given the multifaceted nature of the problem, the application of optimization techniques [9-11], including those that do not require a priori model definition [12, 13], can be helpful. It would also be beneficial to employ spatial orientation techniques similar to stereology [14], where appropriate distancing of workers could be considered [15]. Additionally, the implementation of composite-based filtration curtains [16] and virus-killing coatings similar to special coatings [17, 18] could be considered.

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