EMPLOYEES' PERCEPTION OF THE IN-COMPANY TRANSPORT'S SAFETY

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Abstract

The safety of the people participating actively and passively in the in-house transport depends on the development of the proper principles of this transport and appropriate employees' training. The rules developed must be legible to employees and enforced by their superiors. The article presents data on accidents related to in-house transport in Poland and the results of questionnaire surveys conducted among employees of an industrial plant. The research concerned the assessment of the principles of transport organization in the plant.The aim of the conducted research, on the example of one plant, was to indicate the differences in the assessment of transport by employees, organized at the plant on the basis of the same guidelines.

Keywords: In-company transport, safety, process, accident in work

1. INTRODUCION

Organization of in-house (internal) transport is one of the most important organizational areas of an industrial plant. The principles of in-house transport adopted by the organization influence, above all, the flow of materials and products, but also to a large extent on the safety of employees. Both above aspects of internal transport influence the production capacity of the plant greatly, because the lack of material or qualified staff results in a major disruption of the production process
In-house transport is classified as close transport, constituting total transports, which takes place within a single workplace. The boundaries of internal transport are determined by the boundaries of the workplace. In-house transport includes:

- manual transport,
- mechanised transport:
  - horizontal transport, np. forklifts and other vehicles using company roads,
  - vertical transport - transport using cranes, overhead cranes and similar cranes.

The organization of transport / in-company traffic is employer's responsibility. In Poland, the requirements for traffic on in-house roads and in plant facilities are regulated by the Regulation of the Minister of Labour and Social Policy of 26 September 1997 on general health and safety at work regulations [1]. The regulation imposes on the employer an obligation to develop rules of traffic on internal roads, compliant with traffic law. This should be based on determining, in particular, the maximum speed of means of transport and communication on in-house roads and in the premises of the workplace. In addition, the provisions contained in the Regulation and Polish Standards on the organization of in-house transport regulate:

- marking of communication and transport routes,
- width and surface of roads and crossings,
- weight and distribution of loads for manual transport and the use of transport equipment [2-6].

2. ACCIDENTS RELATED TO THE IN-HOUSE TRANSPORT

The author's observations indicate that, in practice, the employer, while working out in-house rules regulating the organization of internal traffic, most often delegates this task to the health and safety department, and less

often to the logistics department. The most difficult task is to develop such a vehicle movement organization so that the accident risk resulting from the movement of e.g. trucks is at an acceptable level. This risk can be assessed using various methods, e.g. according to PN-N-18002: 2011 or PN-EN ISO 12100: 2012 or ISO / TR 14121-2: 2007. Extremely dangerous are collisions of trucks with pedestrians, because in case of a collision of a truck moving at a very low speed with a person, the consequence may be the death of a pedestrian.

The way of moving loads and people generates numerous hazards in the work environment, resulting in the impact by moving or falling objects / materials, overrunning, bumping by moving vehicles, up to crushing or crushing parts of the worker's body. Accident statistics on the sector of the national economy - industrial processing, published by the Central Statistical Office (CSO) [7] indicate that in 0.98 % (272 employees in 2016) of victims of accidents at work, the accident results in serious injuries or death of an employee. In the case of national statistics, it is 0.81 %. Numerous of these accidents are associated with the organization of in-house transport. When comparing the accident rate in the industrial processing sector with the data on the national accident rate, it should be noted that the frequency of accidents at work $W1_{000}$ is much higher in the industrial processing sector - **Figure 1**. In 2016, W_{1000} in Poland was 7.00, while in the processing sector it was 10.99. This means that employees employed in this sector were more than 1.5 times more likely to be injured at work than all those employed in Poland, and more than twice as likely in case of heavy accidents [7,8].

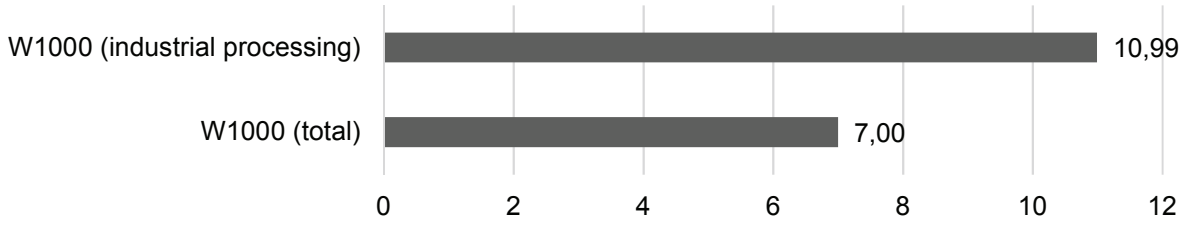

Figure 1 Frequency of accidents in Poland in the industrial processing sector in 2016 [7]

Internal transport is related to the dynamics of spatial changes caused, for example by moving materials or elements. Objects in motion should be visible, communication routes on which they move clearly marked and prevent collisions. Unfortunately, despite the guidelines in this area, many workers still suffer from accidents being hit by objects being in motion. In 2016, those injured as a result of such an impact accounted for approximately 15.5 % of all accident victims in Poland. In the industrial processing sector, it was 19.4 % of all those injured - **Figure 2**.

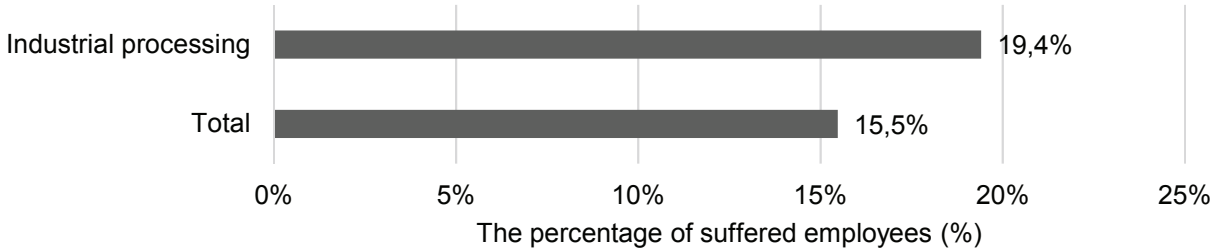

Figure 2 The percentage of employees who in 2016 in Poland suffered an accident at work as a result of being hit by an object in motion [7]

In-house transport is associated with a number of operations in which employees are employed at numerous positions. Each of them, while performing their duties, should not only follow general safety regulations, but in

particular pay attention to the principles of internal transport developed by the employer. The CSO's systematics lists two groups of positions, especially related to internal transport:

- drivers and operators of lifting and transport machines and equipment or any related,
- workers doing simple work in transport and simple warehouse work.

In 2016, 245 drivers and operators of lifting and transport machinery and equipment and 1197 workers performing transport and warehouse works were injured at work. Of the 1442 victims recorded, 4 of them were fatalities - 0.17 % of injured workers and as much as 0.82 % of machine drivers and operators. The causes of accidents at work give the picture of the organization of the work environment and employees' behaviour. **Figures 3 - 5** present the causes of accidents at work in Poland in 2016 in general, in the sector of industrial processing, transport and warehouse management. The figures indicate: 1 - improper condition of the material factor, 2 - improper organisation of work, 3 - improper organisation of a workplace, 4 - lack or incorrect use of the material factor, 5 - failure to use protective equipment, 6 - improper arbitrary behaviour of the employee, 7 - incorrect psychophysical condition of the employee, 8 - incorrect employee's behaviour. It should be noted that the most frequent cause of accidents at work was abnormal employee's behaviour, while in the processing this percentage was 5 % lower than in the other analysed groups. Differences in other causes did not exceed 3 %.

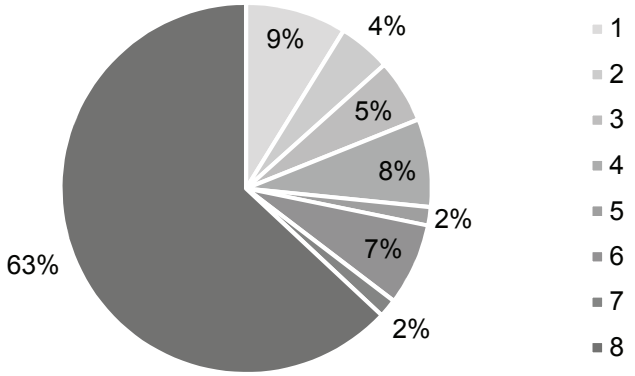

Figure 3 The causes of accidents at work in Poland in 2016 [7]

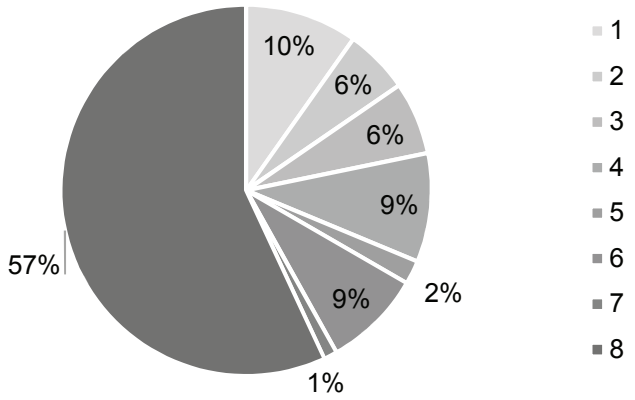

Figure 4 The causes of accidents at work in Poland in industrial processing sector in 2016 [7]

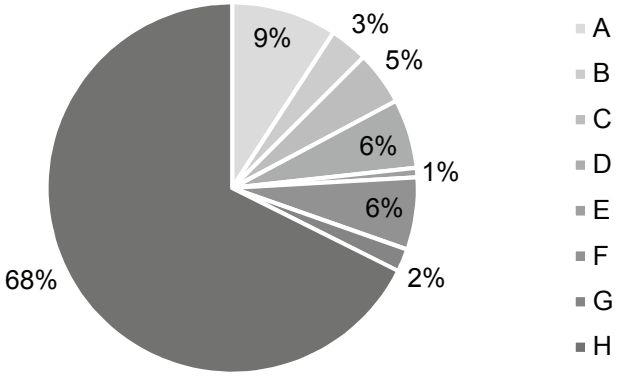

Figure 5 The causes of accidents at work in Poland in sector of transport and warehouse management in 2016 [7]

3. INDUSTRIAL RESEARCH

The organization of in-house transport must be clear and understandable for all employees, regardless of their tasks and occupational position. In connection with the above, the analysis of safety perception related to the organization of in-house transport in an industrial plant was taken as a goal of the presented research.

Questionnaire surveys were conducted in a large industrial plant producing welded constructions. The plant is located in several halls, but the main production (welding shop, assembly) is carried out in one hall separated by internal walls. The plant has designated communication routes both inside and outside the halls. Communication routes are correctly marked with road signs. In-house transport is carried out using forklifts and overhead cranes. The unit responsible for developing the rules of in-house transport was the occupational health and safety department.

The study involved 187 workers, over 80 % of employees in production departments. Two questions were posed to the respondents:

Q1. Are dangerous zones well marked?

Q2. Is the in-house transport well organized and does not create an additional threat?

Answers to the questions were provided on the five-point Likert scale, with the option of choosing "definitely yes", "rather yes", "yes", "rather not", "definitely not". Based on the analysis of the results, points were designated for each answer on a scale from 0 to 4. The maximum mark was 4. For each question and area, the arithmetic mean value was determined. Test results for 10 departments (A-J) are shown in **Figure 6.**

The obtained average results of tests concerning the marking of dangerous zones were within the range of 2.00 - 3.23 points, which constituted 50 - 81 % of the maximum mark. The worst zone marking was assessed in the departments: parts and components (2.00) and repairs (2.17). The average assessment of the organization of in-house transport was in the range of 2.17 - 2.76, which constituted 54 - 69 % of the maximum mark. The worst in the organization of in-house transport was the employees of the following departments: renovations (2.17), flashing (2.30) and electrical installations (2.33).

The local inspection carried out by the author did not show any deficiencies in the organization of internal transport. However, differentiation of assessments at individual departments indicates significant differences in the perception of the organization and the safety of transport by employees. The employees of the renovations department rated the lowest both areas. Probably this is due to the variety of work they do.

Conducting structural renovations, despite their similar geometry, due to the diverse nature of damage, is not a repetitive work. Therefore, employees do not stay at one specific point in their position during work, and when carrying out inspections and carrying out a single repair work, they rotate between work places and even positions. This requires from them to interact more with the internal transport's elements, which in turn may lead to the crossing of communication routes and disturbances. If such disturbances occur, then the lowest assessment of hazardous zone marking is also justified.

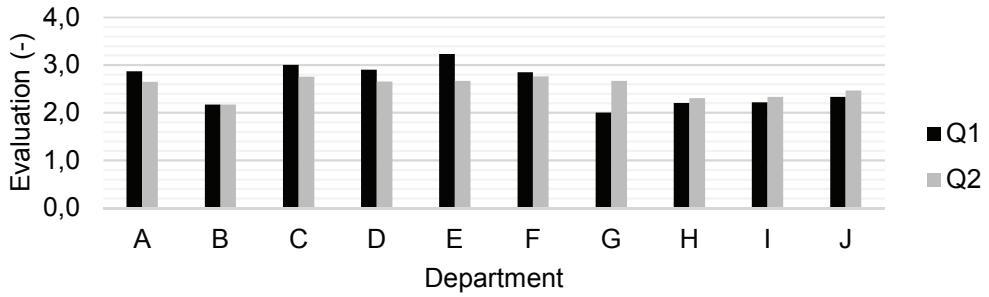

Figure 6 The evaluation of hazardous area marking and organisation of in-house transport in the analysed production plant; designation of departments: A - production, B - renovations, C - assembly of parts, D - assembly, E - surface preparation, F - welding shop, G - parts and components, H - flashing, I - electrical installations, J - machining

4. CONCLUSION

To ensure the safety of people performing work in zones to which the roads of lift trucks are adjacent, it is recommended to separate these zones from the traffic zones of trucks. In addition, the boundaries of places for which the movement of lift trucks is permissible, should be marked with at least a line on the floor's surface and marked accordingly. However, this does not state a physical barrier between man and machine.

The presented results of the questionnaire surveys conducted among employees of the workplace, which are subject to the same principles of in-house transport, have allowed to identify differences in its perception. The analysis allowed to identify the department where employees assess the internal transport the worst. The obtained results are a valuable hint for the occupational safety and health department, which defines safety rules when organizing for example forklift traffic in industrial halls.

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