



PRODUCTION ENGINEERING ARCHIVES

ISSN 2353-5156 (print)
ISSN 2353-7779 (online)

Exist since 4th quarter 2013
Available online at www.pea-journal.eu

Selected problems of managing work safety - case study

Artur Woźny¹ 

¹Rzeszow University of Technology, al. Powstańców Warszawy 10, Rzeszów, Polska,
Corresponding author e-mail: awozny@prz.edu.pl

Article history

Received 24.05.2020
Accepted 31.07.2020
Available online 30.09.2020

Keywords

Occupational accidents
Safety management
Culture

Abstract

The article presents a case study; an analysis and a proposal concerning the improvement of the conditions of occupational health and safety in a reloading terminal of a logistics company. The specificity of the workplace means that employees are exposed to a permanent overload of the musculoskeletal system, which is determined in the process of transporting loads of significant mass. After the analysis, the introduction of changes in the conditions of safe and hygienic work at selected positions was suggested. Qualitative research using the observation method, as well as a quantitative approach after introducing changes in working conditions show a change in employees' attitudes to their work, as well as their higher performance. After a year of operation of the proposed and introduced changes, it was decided to introduce them for new employees and external companies working at the transshipment terminal.

DOI: 10.30657/pea.2020.26.20

JEL: J28, M11

1. Introduction

Effective management of occupational health and safety (OHS) continues to pose a challenge to many organizations. While significant advancement has occurred in terms of knowledge about traditional workplace risks, organizational and labour market changes have created new risks, psychosocial risks are more prevalent, and the trend towards the adoption of OHS management systems has produced only mixed results (Gallagher and Underhill, 2012).

In the creation and application of safety management procedures, apart from technical activities, a significant role was assigned to the organization of professional selection, conducting trainings, improving professional qualifications and motivating to safe conduct. However, it appeared that these activities were not effective enough, if they did not change attitudes towards risk and did not teach the attachment of values to behavior compliant with safety regulations, and if they did not make employees sensitive to perceiving and negatively assessing dangerous behaviour. The organization's safety culture is created by both employees and management, and, frequently, by the owner.

This individual sensitivity of people was termed the culture of security. Creating the desired safety culture in the company is now recognized as the main task of security management (Piontek, 2019; Reiman, 2011; De Koster et al., 2011).

In order to build an organizational culture, any action undertaken by an entrepreneur should comply with applicable law. One of the main provisions regarding occupational health and safety in Poland is art. 207, which indicates that in accordance with available methods, techniques and tools, an employer is responsible for the condition of health and safety at work.

The regulatory approaches reinforced the responsibility of employers to prevent work-related injury and ill-health, allowed discretion on how prevention responsibilities could be met, and encouraged organizations to establish internal processes to manage risk and improve health and safety performance, in consultation with workers.

In order to meet the safety needs and considering both the law and employees, the employer undertakes a number of actions that aim at the appropriate level of health and safety (Ulewicz et al., 2019; Simitkov et al., 2019; Krynke, 2020).

Occupational safety is particularly important in logistic processes (transport) where there are a large number of variable factors (Deja et al., 2019) and also in systems generating a high stress factor, for example in the case of shipping reverse supply chains (Deja et al., 2019).

The constant pursuit of improvement and optimization not only in logistics processes introduces the necessity of constant changes in process management, which increases the level of risk, e.g. in the steel industry (Nowicka-Skowron and Ulewicz, 2015; Ulewicz, 2014).

Therefore, by organizing safe work in the warehouse (especially in the high storage warehouse), the employer in particular ensures:

- medical examinations, including examinations at heights above 3m,
- general initial training with on-the-job training,
- proper occupational risk assessment which takes into account all existing hazards in the workplace,
- health and safety instructions for stations, machines and devices, which are written in accessible language and contain elements necessary to understand the nature of activities performed with the help of machines, devices, etc.,
- personal protective equipment which is adapted to work in a given position and, most importantly, an appropriate selection of means that does not restrict employee movements,
- procedures and orders that indicate how to deal with different situations,
- and other documents that increase the level of security.

A number of activities carried out by the employer with the help of the OHS service are intended to reduce the likelihood of adverse events related to an accident at work. The purpose of the paper is to indicate the process of improving transport works in the warehouse hall, which were the result of inspections from the Chief Labor Inspectorate (Saja et al. 2017).

This study may also be of interest in those R&D area, where there are physical risk factors (e.g. high power laser radiation in laser texturing (Dwornicka et al., 2017; Radek et al., 2018), temperature and pressures in the processing of high-strength steels (Mazur et al., 2013; Lipiński and Wach, 2015)) or biological risk factors (e.g. biotechnological processes (Skrzypczak-Pietraszek et al., 2018)). It seems worth considering the creation of a database (Gawlik et al., 2015) in which the collected observations would be subject to in-depth analysis (Ulewicz, 2014b) in the future.

2. An analysis of health and safety conditions during manual transport works

The scope of activities carried out in the high-storage ties warehouse is focused around:

- discharging,
- loading,
- reloading goods

The warehouse has tires of various sizes and wheel elements, e.g. rims, inner tubes, etc. The variability of the load mainly results from the different size of tires which are stored on special transport baskets. The Regulation of the Minister of Labor and Social Policy on occupational health and safety during manual transport works indicates in (in Polish legislative conditions):

§ 21 1. *The permissible mass of the load moved on a trolley on flat, hard surface, including the mass of the trolley, cannot exceed:*

- 1) 350 kg - on a 2-wheel trolley,
- 2) 450 kg - on a 3- or 4-wheel trolley.

2. *When moving a load on a trolley of the slopes more than 5%, the weight of the load, including the weight of the trolley, cannot exceed:*

- 1) 250 kg - on a 2-wheel trolley,
- 2) 350 kg - on a 3- or 4-wheel trolley (Polish Official Journal 2003, No. 169, item 1650 as amended).

When organizing manual transport operations, the need to avoid manual handling of items should be considered when the following circumstances occur:

- 1) the item is too heavy, too large, bulky or difficult to maintain according to the assessment of the person managing the employees,
- 2) the item is unstable or its contents may move,
- 3) the object is located in such a way that it requires keeping or operating at a distance from the employee's trunk, or tends to bend or wrap around the employee's trunk,
- 4) the shape or structure of the object may cause injury to the employee, especially in the event of a collision,
- 5) the energy expenditure necessary for lifting and moving objects exceeds 2,000 kcal (8.375 kJ) per shift,
- 6) the object may be moved only by turning the trunk,
- 7) the performance of work requires inclining the employee's trunk by an angle greater than 45° or performing activities of moving in an unstable position,
- 8) sudden movements of the object may occur,
- 9) the workplace or its surroundings prevents the object from being moved at a height ensuring safety or with the correct body position of the employee,
- 10) the surface is uneven, creates a danger of movement or is slippery in contact with the underside of the employee's footwear,
- 11) the floor and work surface have different levels, which forces objects to be moved at different heights,
- 12) the floor or footrest surface is unstable,
- 13) the subject limits the employee's field of view,
- 14) temperature, humidity and ventilation are not adapted to the work performed.

Pursuant to the *Ordinance of March 14, 2000*, one employee cannot lift or carry objects exceeding 30 kg in the case of permanent work and 50 kg in the case of occasional work. Moving an object that weighs more than 30 kg to a height of over 4 m or over a distance of more than 25 m is not allowed.

During two-handed movement of objects, the force used by the employee necessary to initiate the movement of the object must not exceed 300N when pushing and 250N when pulling.

- 1) It is permissible to manually roll round-shaped objects (in particular barrels, pipes with large diameters), provided that the following requirements are met: the mass of manually rolled items on a horizontal area cannot exceed 300 kg per one employee,
- 2) the mass of manually rolled objects on ramps by one employee cannot exceed 50 kg.

Moving objects whose length exceeds 4 m and a mass of 30 kg should be done in teams, provided that there is no mass per employee: 25 kg - for permanent work and 42 kg - for occasional work. It is unacceptable to group objects over a distance of more than 25 m or weighing more than 500 kg.

When moving objects collectively, it is necessary to provide:

- 1) a selection of employees in terms of height and age and supervision of an employee experienced in the use of appropriate methods of manual movement of objects and organization of work, designated for this purpose by the employer,
- 2) distances between employees of at least 0.75 m and the use of appropriate auxiliary equipment.

In case of a group carriage of items on the shoulders, one needs to ensure that employees:

- 1) put and leave the object being moved simultaneously and at the command,
- 2) they were on one side of the object being moved,
- 3) use personal protective equipment to protect the shoulders (Woźny et al. 2015).

3. Correct unloading, loading and storage of tires in the warehouse

For works related to unloading and loading tires, employees should use manual transport trucks with or without drive (low lift) and forklifts. When unloading tires from a truck, warehouse employees should wait for the driver to properly prepare the vehicle, i.e. open the loading space, drive up to the ramp, place safety wedges under the vehicle wheels and apply the handbrake (Pacana and Jurgilewicz, 2019).

The method of unloading depends on the form of delivery if the delivery is carried out in baskets (transport and storage pallets) - for loading use a front forklift with forks with a length of not less than 1400 mm.



Fig. 1. Forklift lifting the basket from tires

The driver prepares the car for unloading and after reporting readiness, the pallet should be removed to the floor (ground) from the load box. After confirming that the pallet is "securely seated" on the forks, take it to the storage location in the correct location. When traveling on roads and internal warehouse corridors, employees should comply with the general traffic regulations, signs and speed limits allowed on the premises. In

places where roads intersect, the driver is required to warn their presence with a sound signal.

In the event of loading or unloading at the indicated location, these activities are performed manually using the "rolling" feature of the tire. The storage method in accordance with Polish Norm PN-C-94300-7:1997. In the event of "loose" delivery or loading - the car should be directed to the transshipment dock. Unloading is done manually by a team of two or three people depending on the type of tires supplied. Make sure that the car is parked at the loading platform, i.e.

- maintain the same level of the car's load bed and freight ramp,
- clearance between the ramp boom and the load box up to 5 cm.

The car driver has the right and obligation to participate in loading and unloading activities, his task is to verify the correctness of delivery and to ensure the correct distribution of cargo in the freight compartment. The tires are moved from the load box to the dock, using the "rolling" feature of the tires, and then placed in transport and storage pallets. The loaded pallet is transported with a forklift to the storage place.



Fig. 2. The method of rolling tires from a tractor unit.

At the target location, one follows the rules that we place one pallet in front of stacked pallets to prevent picking goods from the bottom (lowest) pallet from the post.

Before unloading and loading a pallet in a "stacked" location, the safety barriers must first be removed and put away in a safe location (dismantling is done in 2-person sets, preventing them from falling). The truck forks should be supported on a skeleton structure to avoid accidental mast dropping. The employee loading or unloading tires is obliged to follow the instructions for safe movement on landings and mezzanines.

The release and receipt of a small amount of goods are carried out using wheelbarrows or electric pallet trucks. Do not transport tires on the forks from the inside so as not to damage the bead, use a wooden pallet. Rims are transported on wooden pallets.



Fig. 3. Storing tires in baskets

4. Non-conformity found by the Chief Labour Inspectorate

During the inspection of the Chief Labor Inspectorate, the inspector found a violation of occupational health and safety while storing tires in warehouse baskets. In the inspector's opinion:

- tires are stored in a way that threatens the health and life of employees as the basket is not fully closed,
- open space at the long edges of the basket may cause the tire to fall out and hit the worker (Figure 2),
- lack of appropriate safeguards that prevent the tipping or collapsing of stored tires when unloading the basket in the warehouse sections.

As a result of the inspection, the inspector, under pain of immediate enforceability, obliged the employer and OHS service to specify the detailed requirements of occupational health and safety when performing works at heights belonging to particularly dangerous ones, i.e. when reloading tires from a multi-level working platform (mezzanine) with the fall protection barrier removed. from the height of the platform intended for storing tires without the required protection at the long edge on the open space (above the truck) against falling from a height (Pacana and Jurgilewicz, 2020).

The problem the employer faced is that the manufacturer of loading baskets for tires did not provide for securing (in the models used) the longer sides with additional safety beams and other securing elements. It is worth noting that the manufacturer in the operating instructions forbade to make any structural modifications that would ensure the level of safety indicated in the inspection order.

5. Modernization of loading baskets for tires without interfering with the structure

The OHS audit of the team which undertook to improve the tire warehouse offered to equip the unloading baskets with transport belts. The change suggested concerned the appropriate protection of tire loading baskets with transport belts.



Fig. 4. Storing tires in baskets

Before starting work, the employee is obliged to check the condition of the pallet - by hand, check that the safety straps are not damaged, torn, cut, also check that they are well stretched and do not slip from their place. The employee must also check that the safety handles are not detached, have no cracks or visible defects. Before picking up a pallet from a van, the employee is obliged to check that the safety belts are properly tensioned and have no mechanical damage. One should also make sure that the goods on the pallet are stable and will not cause them to tip over on either side. In addition, metal railings on pallets and their connections should also be checked whether they are not torn or damaged.

When removing the pallet from the van, the employee is obliged to keep extreme caution to make sure that there are no people moving around the trolley and pallet and that there are no objects that could prevent unloading of the goods. When loading pallets with tires on the warehouse mezzanine, remember to place not only the forks of the transport trolley on the edge of the working platform, but also part of the pallet used during transport. When unloading tires, the employee is obliged to observe the behavior of the pallet, whether it is not moved when emptying, and the tires should be unloaded evenly to prevent the pallet from tipping over to one side.

Before lowering an empty pallet to the ground, check that the securing straps are properly tensioned, have no mechanical damage, and the metal gates are not damaged during unloading. Also make sure that the empty pallet sits firmly on the forks of the transport trolley and is not tilted to either side.

The security proposed by the team of OHS inspectors was approved by the CLI inspector. The fact is that the level of safety at the tire warehouse has increased.

6. Conclusions

The actions taken in the warehouse confirmed that the improvement was an ongoing process. Organizational changes were made properly and were included in the labor and health and safety policy. The role of the employer and health and safety inspector is to interact with all employees in the workplace. The actions carried out by a team of experts enabled an increase in the level of security. The Chief Labour Inspectorate's operations at the terminal brought the positive impact on the level of security.

References

- De Koster, R.B.M., Stam, D., Balk, B.M. 2011. *Accidents happen: The influence of safety-specific transformational leadership, safety consciousness, and hazard reducing systems on warehouse accidents*, Journal of Operations Management, 29(7-8), 753-765.
- Deja, A., Kaup, M., Strulak-Wójcikiewicz, R., 2019. *The concept of transport organization model in container logistics chains using inland waterway transport Smart Innovation*, Systems and Technologies, 155, 521-531.
- Deja, A., Strulak-Wójcikiewicz, R., Kaup, M., 2019b. *Management of ship-generated waste reception at the port of Szczecin as a key component in the reverse logistics chain Smart Innovation*, Systems and Technologies, 155, 533-543.
- Dobosz, M., Saja, P., Pacana, A., Woźny, A., 2016. *Improvement of health and safety conditions at selected workplaces – on the example of transshipment terminal logistics company*, Production Management and Engineering Sciences, London, 55-59.
- Dwornicka, R., Radek, N., Krawczyk, M., Osocha, P., Pobędza, J., 2017. *The laser textured surfaces of the silicon carbide analyzed with the bootstrapped tribology model*. 26th International Conference on Metallurgy and Materials, Conference Proceedings, Metal 2017, 1252-1257.
- Gallagher, C., Underhill, E. 2012. *Managing work health and safety: Recent developments and future directions*, Asia Pacific Journal of Human Resources, 50(2), 227-244.
- Gawlik, J., Kiełbus, A., Karpisz, D., 2015. *Application of an integrated database system for processing difficult materials*, Solid State Phenomena, 223, 35-45.
- Krynke, M. 2020. *Risk management in the process of personnel allocation to jobs*, In: Ulewicz, R., Nikolić, R., System Safety: Human - Technical Facility – Environment, De Gruyter Poland, 82-90.
- Lipiński, T., Wach, A., 2015. *Dimensional structure of non-metallic inclusions in high-grade medium carbon steel melted in an electric furnace and subjected to desulfurization*, Solid State Phenomena, 223, 46-53.
- Mazur, M., Ulewicz, R., Nový, F., Szataniak, P., 2013. *The structure and mechanical properties of domex 700 MC steel*, Komunikacie, 15(4), 54-57.
- Nowicka-Skowron, M., Ulewicz, R., 2015. *Quality management in logistics processes in metal branch*, 24th International Conference on Metallurgy and Materials, Conference Proceedings, Metal 2015, 1707-1712.
- Pacana, A., Jurgilewicz, M., 2019. *Zarządzanie bezpieczeństwem środowiskowym w przedsiębiorstwach*, Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów.
- Pacana, A., Jurgilewicz, O., 2020. *Elementy zarządzania bezpieczeństwem i higieną pracy w przedsiębiorstwach*, Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów.
- Piontek, B. 2019. *The theoretical basis of strategic security management for shaping the structural order and sustainability processes*, Polish Journal of Management Studies, 20(1), 344-358.
- Polish Norm Tyres and tubes - Packing, storage and transport, PN-C-94300-7:1997.
- Radek, N., Szczotok, A., Gądek-Moszczak, A., Dwornicka, R., Bronćek, J., Pietraszek, J., 2018. *The impact of laser processing parameters on the properties of electro-spark deposited coatings*, Archives of Metallurgy and Materials, 63(2), 809-816.
- Reiman, T., 2011. *Understanding maintenance work in safety-critical organisations - managing the performance variability*, Theoretical Issues in Ergonomics Science, 12(4), 339-366.
- Rozporządzenie Ministra Pracy i Polityki Socjalnej z dnia 26 września 1997 r. w sprawie ogólnych przepisów bezpieczeństwa i higieny pracy (Dz. U. z 2003 r, Nr 169, poz. 1650 j.t. z późn. zm.)
- Saja, P., Woźny, A., Pacana, A., Dobosz, M., 2017. *Additional components of risk assessment and their impact on the probability parameter*, Production Engineering Archives, 14, 11-14.
- Simtikov, Z., Sembinov, M., Chumachenko, T., Kurmangali, A., Matakbaeva, L. 2019. *International security management in Central Asia*, Polish Journal of Management Studies, 20(2), 478-490.
- Skrzypczak-Pietraszek, E., Reiss, K., Żmudzki, P., Pietraszek, J., 2018. *Enhanced accumulation of harpagide and 8-O-acetyl-harpagide in Melittis melissophyllum L. agitated shoot cultures analyzed by UPLC-MS/MS*, PLoS ONE, 13(8), art. e0202556.
- Ulewicz, R., 2014. *Practical application of quality tools in the cast iron foundry*, Manufacturing Technology, 14(1), 104-111.
- Ulewicz, R., Mazur, M., Novy, F., 2019. *The impact of lean tools on the level of occupational safety in metals foundries*, 28th International Conference on Metallurgy and Materials, Conference Proceedings, Metal 2019, 2013-2019.
- Woźny, A., Dobosz, M., Saja, P., Pacana, A., 2015. *Ryzyko zawodowe ryzykiem fiaska innowacyjnej działalności sektora MSP*, Zeszyty Naukowe Politechniki Częstochowskiej. Zarządzanie, 19, 75-88.

管理工作安全的若干问题-案例研究

關鍵詞

职业事故
安全管理
文化

摘要

本文提出了一个案例分析，并提出了改善物流公司装卸站职业健康和安全条件的建议。工作场所的特殊性意味着员工要承受肌肉骨骼系统的永久性过载，这是在运输大量负载的过程中确定的。经过分析，建议在选定的位置引入安全和卫生工作条件的变化。使用观察方法进行定性研究，以及在引入工作条件变化后采用定量方法，这表明员工对工作态度以及更高绩效的态度发生了变化。在对拟议和引入的变更进行了一年的运营之后，决定为在转运站工作的新员工和外部公司引入这些变更。