

Draft questions of 5S pre-audit with regard to health and safety standards for tires retreating plant

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Abstract. A continuous technological progress forces an improvement of the production process. The article describes the sole beginning of changes in the process of tires retreading on the 5S management method with regard to health and safety standards. The authors point out that the process of the production of retreaded tires is associated with the relationship between a man and a machine. The process improvement can dispense only by improving the machines but it should also pay attention to the man. The improvement of the production process must precede the audit, which can show areas that require intervention. Any such change in the production process cannot be performed without the participation of health and safety inspector, because his knowledge, skills and competence are able to determine whether the proposed changes interfere with the level of safety at the workplace. The authors emphasize that the process of production improvement production should be compatible with the process of improving the health and safety of workers involved in the production process. The combination of 5S audit with health and safety standards results in a holistic approach to the improvement process.

Key words – audit, 5S method, occupational health and safety standards

1. Introduction

A continuous improvement is one of the most important tasks for management and production engineers in a company. Whether it is a large factory or a small factory, the owner will strive to improve the process, to lean production, or to increase the level of safety and health at work. It is very difficult to achieve such desirable elements without the participation of employees in the improvement process. Meeting the requirements of improvement requires the interest of the whole company resources (owners, managers, workers, etc.) as this allows the efficient conduct of the process (ANTOSZ K., PACANA A., STADNICKA D., ZIELECKI W. 2015, PACANA A. BEDNÁROVÁ L. 2009).

2. Improvement of production processes in the context of occupational health and safety standards

According to the art. 207 § 1 of the Labour Code it is an employer who is responsible for the condition of occupational safety. In the following section, namely art. 207 § 2, 3 and 4, the employer is obliged to respond to the needs of health and safety standards in the workplace and to adapt the measures taken to improve the level of safety. The employer has a duty to ensure the implementation of a policy to prevent accidents at work and occupational diseases, with particular emphasis on:

- the technical conditions,
 - organization of work,
 - working conditions,
 - social relations at work,
 - the impact of environmental factors at work
- (Journal of Law of 2016 item. 1666 later amended).

The right employer's approach to the issues of occupational health and safety in a company (and especially in a manufacturing company) should be systemic. The employers should care about the right protection of workers as the quality of the production process depends on them to a large extent. Thus, it is reasonable when an employer takes care of it, so that the likelihood of an adverse event causing the loss will be small. Adverse events are associated with the condition of safety, but also with unwarranted interruption of the production process (PACANA A. 2010).

The research described inter alia by (DOBOSZ M., SAJA P., PACANA A., WOŹNY A. 2016) indicate that it is difficult for management to approve grassroots activities of employees without the support of people from managerial staff. Therefore, the actions in the field of organization of production and safety should be carried out spinning the whole crew, i.e. management and employees.

3. Method 5S with regard to occupational health and safety

The 5S method consists of five guidelines to streamline the organization of the processes in the workplace:

- seiri (selection);
 - seiton (scheme);
 - seiso (cleaning);
 - seiketsu (standardization);
 - shitsuke (discipline).

The result of the application of the 5S method is reducing waste and production time and improving safety in the work environment.

The five elements that make up the 5S method should be implemented in the company in the right order and the right time. The first three "S" elements concern an introduction of the method, and the last two are connected with the standardization and mainten-

ance (SELEJDAK J., KLIMECKA-TATAR D., KNOP K. 2012).

A proper process improvement, which refers to the production, can take place without the active participation of health and safety inspector. The leader, who is planning the implementation of 5S properly, should implement a safety inspector, because he has the knowledge and competence relevant to the assessment of health and safety at the workplace where the 5S method will be launched. His experience can help to change the concept of improving the organization of production at the position where the 5S method exists. This procedure takes place, and in literature it is called 6S, where the 6th S (safety) concerns safety in the workplace. However, such a solution is not always the most appropriate. The use of knowledge and competences of the safety inspector for only the so-called sixth S seems to be inefficient. Therefore, it is advisable that the safety inspector should work at every stage of the implementation of the 5S method. He ought to take part in the selection, systematics and so on. This method could be described as 5S in occupational and safety standards. Such an action may actually increase safety and at the same time the position of the organization as the result of the implementation of the 5S method (PETERSON J., SMIT R. 1998).

4. 5S safety and health audit in tires re-treating plant

5S safety and health audit was applied in a tires re-treating plant which deals with storage, sale and re-treading of tires for various vehicles. So far in the plant no elements improving work organization have been introduced. The results of the audit have caused the need to introduce changes that sparked the decision to merge the implementation of the 5S method with occupational safety and health standards.

Tab. 1 shows a set of control questions which allowed diagnosing organizational and safety problems in the context of implementing the various phases of 5S safety and health standards.

Table 1. Control questions of 5S safety and health standards for the tires retreating plant

5s	CONTROL QUESTION	CONDITION ASSESSMENT		REMARKS
		ACCE-PTABLE	UNACCE-PTABLE	
1s SEIRI	Are the machines and devices to retread tires necessary for the work?	•		In the retreating hall there are machines and tools necessary only to the process.
	Do the machinery and equipment needed for the retreading of tires have a valid maintenance (service) and their moving parts are adequately covered?		•	Machines to shear the old tread is not enclosed on one side. This can cause a seizure.
	Are there any elements unnecessary after the preceding steps of retreading?		•	In the hall there are scraps tread, damaged tires unsuitable for retreading, empty containers, etc.
	Do the elements of the previous stages of the retreading reduce visibility and can cause a stumble, fall on a surface, fire or explosion?	•		
	Are there specific storage sites for the waste after the process of retreading tires?		•	In the hall there is no clearly defined storage location for redundancies.
	Is there any place where redundancies are stored and properly secured?		•	Redundancies are not stored according to any scheme.
	Do workers have an easy access to the machines and equipment in retreating plant?	•		
	Do workers have an easy access to semi-finished products used for retreading?	•		
	Are machinery, equipment and semi-finished products available in a convenient way for the employee (while following the principles of ergonomics)?		•	Some of half-finished products are stored on the floor forcing the workers to bend down and lift heavy items.
Is the manner of storage elements before and after the retreaded correct?		•	Some employees throw the remaining products into a collecting container - they do not segregate waste	
2s SEITON	Is the place of storage marked in the same way before tires retreading, when retreading etc.?	•		
	Do you have a separate area tire storage (yellow-black belt)?		•	
	Is it possible to easily find the tools needed for the retreading process?		•	On the table the tire disassembly lack of standardization, the employees forget to deposit the tools
	Do workers store tools in place designed for this purpose, and in a certain way?		•	
	Are the distance and height of tools and components used for retreading appropriate?	•		
	Do the distance and height of the tool meet the requirements of ergonomics?	•		
	Are communication paths marked in an appropriate manner?		•	Traffic routes clear, but marked with a white color which is constantly dirty
	Are communication paths marked with signs and evacuation warnings as required by PN or EN?		•	There are no signs that comply with standards.
3s SEISO	Do workers clean up their workplace?	•		
	Do the employees care about the cleanliness of machines and tools used in the retreading process?		•	It is difficult to keep machine clean during the process
	Is the division of responsibility for the cleanliness of the retreating plant right?	•		
	Is cleaning systematic and compulsory?		•	Employees sometimes forget about cleaning
	Is cleaning an element of safety control safety of retreating plant?	•		

4s SEIKETSU	Are the instructions available, current and complete?		•	No current instruction for machinery and equipment and the occupational health and safety instructions.
	Are there visible in the workplace the elements of the selection, cleaning and standardization during the retreading process?		•	Employees do not carry out selection, cleaning and standardization systematically.
	Does the staff treat the elements of selection, cleaning and standardization as daily responsibilities?		•	
	Do workers have defined responsibilities in the plant?	•		
	Do employees have personal protective equipment at the selection, cleaning and standardization process?	•		
5s SHITSUKE	Are there any improvement methods applied in the tires retreading plant?			The changes introduced were not accepted by all employees
	Do the employees properly store their personal belongings	•		
	Do employees accept changes made in the plant	•		
Audit questions concerning the improvement of the process of tires retreading				
Audit questions concerning the improvement of the process of tires retreading with regard to health and safety				

5. Conclusions

Improvement of the production process using the 5S method cannot take place without the participation of health and safety inspector, because he cares about the safety of employees. The essence of the improvement process is the quality and efficiency of production, but it seems necessary to take into account health and safety standards at every stage of the implementation of the 5S method. The right approach to health and safety issues can increase the quality and productivity of employees.

The measures taken by the leader of process improvement and safety inspector resulted in a detailed analysis of the condition of occupational safety and health in the tires retreading plant. An analysis of 5S safety audit caused that according to the inspector the probability of an adverse event associated with work in the plant can be reduced at every stage of the implementation of 5S.

This may result in the fact that the result of occupational risk assessment may fall for such hazardous situations as:

- stumble and fall on the surface,
- fire or explosion,
- overload the musculoskeletal system,
- impact of inanimate objects,
- rapture by moving parts of machines and equipment.

Another element that from the point of view of safety will improve is the visibility of all the safety instructions in the manual describing each of the elements of the retreading process, which will be

mounted on any device and at any stage of tire retreading.

However, it should be noted that the most important role in the audit played the employees themselves, who honestly answered the questions posed by auditors. The presence of the safety inspector has helped in the interpretation of different employee behavior during the observation of the tire retreading. The knowledge, skills and competences of the safety inspector were very helpful and reinforced the belief that the synergistic combination of 5S safety and health audit can bring higher efficiency of the implementation process to improve the process of retreading tires.

Literature

1. 5S dla operatorów. 5 filarów wizualizacji miejsca pracy. Wydawnictwo Productivity Press. Wrocław, 2008
2. ANTOSZ K., PACANA A., STADNICKA D., ZIELECKI W. 2015. Lean Manufacturing: doskonalenie produkcji. Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów.
3. PACANA A. BEDNÁROVÁ L. 2009. Organizacja rozbudowanego stanowiska pracy z wykorzystaniem metody 5S. Zeszyty Naukowe Politechniki Rzeszowskiej. Zarządzanie i Marketing. Kwartalnik. Zeszyt 16 nr 3/2009, Folia Scientiarum Universitatis Technice Rzesoviensis 260. OWPRz, Rzeszów.
4. PACANA A. 2010. Analiza wdrożenia praktyk 5S z wykorzystaniem burzy mózgów i diagramu Ishikawy. Przegląd Organizacji, 6/2010.

5. PETERSON J., SMIT R. 1998. 5S Pocked Guide. Wydawnictwo Productivity Press.
6. PN-EN ISO 9001:2015-10. „Systemy zarządzania jakością – Wymagania”. PKN, Warszawa 2016
7. Regulation of the Minister of Labour and Social Policy of 26 September 1997 on general health and safety regulations (Journal of Laws of 2003 No. 169, item. 1650, as amended).
8. SELEJDAK J., KLIMECKA-TATAR D., KNOP K. 2012. Metoda 5S: Zastosowanie, wdrażanie i narzędzia wspomagające. Wydawnictwo Verlag Dashofer Sp. z o.o., Warszawa.
9. Act of 06.26.1974 of Labour Code (Journal of Law of 2016, item 1666 later amended).
10. 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. In: Production Management and Engineering Sciences, London.