SAFETY MANAGEMENT IN LOGISTIC PROCESSES OF THE METALLURGICAL INDUSTRY

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Abstract

The results of the risk assessment in the logistics processes at the metallurgical industry are presented in this article. The paper contains a comparison of safety systems based on the PN-EN 18001 and OHSAS. In the process of risk assessment FMEA method was used. The most critical of safety areas have been determined obtained from analysis.

Keywords: Work safety system, chain of logistic processes, risk assessment

1. INTRODUCTION

The implementation of the integrated system in the enterprises is mainly characterised by standardizing the common documentation for particular management systems. The integrated system has a task to facilitate work in a system combining several norms or standards, what translates directly to the smooth functioning of the company. An important factor of the decision-making on the implementation of the Integrated Management System is also the fact, that the cost of certification of the Integrated Management System is much lower than the total cost of a single certification for every norm. Guidelines for the implementation of certificates of the management systems are based on the structure of quality management system, due to the versatility and the need to adapt and integrate the functioning of a greater number of standards in one production system [1, 2]. In practice, this means creating one common procedure (e.g. supervision of documentation) for all components of the integrated management system. An additional element of the integration of the applied standards is the widely available set of computer tools that improve the operation of the company itself.

The aim of the presented paper is to characterise the functioning of the management systems in the company and indicate the common elements important from the point of view of the integration of the implemented standards. Determination of the integration elements was made based on the quality management system as well as safety and work hygiene in the company from the metallurgical industry. The subject of the research is a company operating within trade and steel processing. The performed identification of logistic processes was used as an indicator of important integration points for the analysed management systems functioning in the company.

2. COMPARISON OF THE PN-N 18001 AND OHSAS SYSTEMS

OHSAS 18001:2007 is the international equivalent of the Polish **PN-N 18001:2004** norm “The Occupational Health and Safety System". These standards have very similar requirements and the implementation of the system for the occupational safety and hygiene management according to one of them is almost synonymous with the implementation of the requirements of the second one. The BS OHSAS 18001 norm bets on the protection of individuals, occupational safety and prevention of health care. Through preventive measures in managing the occupational safety and hygiene it enables the workers the undertaking of necessary actions, before an accident or a damage to the property takes place. OHSAS was developed by the British Standards Institution together with the international certification units and it enjoys the growing popularity and acceptance throughout the world.

Both PN-N 18001, and OHSAS 18001 specify the requirements for the management system of the occupational safety and hygiene to enable the organisation to define the policy and objectives in this scope. Between the PN-N 18001 norm and OHSAS 18001 are slight differences. **Table 1** presents the synthetic comparison of the most important elements of the management systems based on health and safety standards.

Table 1 Comparison of the most important elements of the management systems based on health and safety standards.

PN-N 18001 standard	OHSAS 18001
PN-N 18001 is issued by the Polish Committee for Standardization and is known only in Poland	standard was developed by several well-known institutions - BSI, BVC, DNV, LRQA, SFS, SGS; a few of them are certification organization
it determines strong emphasis on participation of workers in the design, implementation, maintenance and improvement of work safety management system	OHSAS guidelines also define the participation of workers in the development of the system, but in a much less extent
risk assessment applies only to employees	according to OHSAS risk assessment should also include the work of subcontractors and the presence of guests

Source: SKOWRON-GRABOWSKA B. Strategic Innovation in Polish Transport Industry

However, despite the differences the construction of both standards is similar and they have the same goal - ensuring safety in the organisation. So, regardless of the fact on which of them the organisation will be based while implementing the health and safety management system, the effect should be similar. The PN-N-18001 norm is the Polish equivalent of OHSAS 18001. The benefits from the implementation and certification of the health and safety management system:

- increasing work safety, and hence also the satisfaction of employees,
- reducing the risk of accidents at work and occupational diseases,
- increasing the awareness of employees in the field of health and safety,
- improving the management efficiency by reducing the number of accidents and reducing the downtime, lower insurance costs, damages and penalties for violations of the law provisions (including PIP),
- reducing the amount and nuisance of PIP and safety services,
- meeting the requirements of the global corporations in the field of health and safety.

3. IDENTIFICATION OF THE CHAIN OF LOGISTIC PROCESSES

The analysis of the supply chain is certainly not a linear structure of the interconnected elements, but a network of involved organisations, through linkages with suppliers and customers, in various processes and activities, which create the value in the form of products and services provided to the final customers [3]. The assumptions of the integration approach to the supply chain management are presented in **Fig. 1**.

In the deliberations concerning the management of the supply chain we should also pay attention to the place of contact of the production system with the market environment, where the logistics and transport are the main parameters determining the achievement of the competitive advantage [4]. Given the approach to the management, not through another processes in the supply chain, but the management of the system functions, the supply chain management is connected with the following problems: Maintaining standards of customer service, Comprehensive cost analysis, Management of the action time [5]. Regardless of the approach to the supply chain management, we should remember about the dominant role of the client. It is the customer that constitutes the most important link (entity) in the supply chain, and ensuring the standards of his service becomes the primary goal of management. Such an approach to the logistic chain management focuses on

the links between different functional areas in the supply chain. It focuses on the attempt to use the better management of the contact points in order to achieve a significant competitive advantage. This concept is based on the management of product flows through the next chain segments, what makes the logistics and transport needed as the main variables for achieving the competitive advantage. Given these considerations, the supply chain management can be defined as: technology oriented towards all contact points in the chain from raw material suppliers, through various levels of production, storage and distribution to the final customer [6].

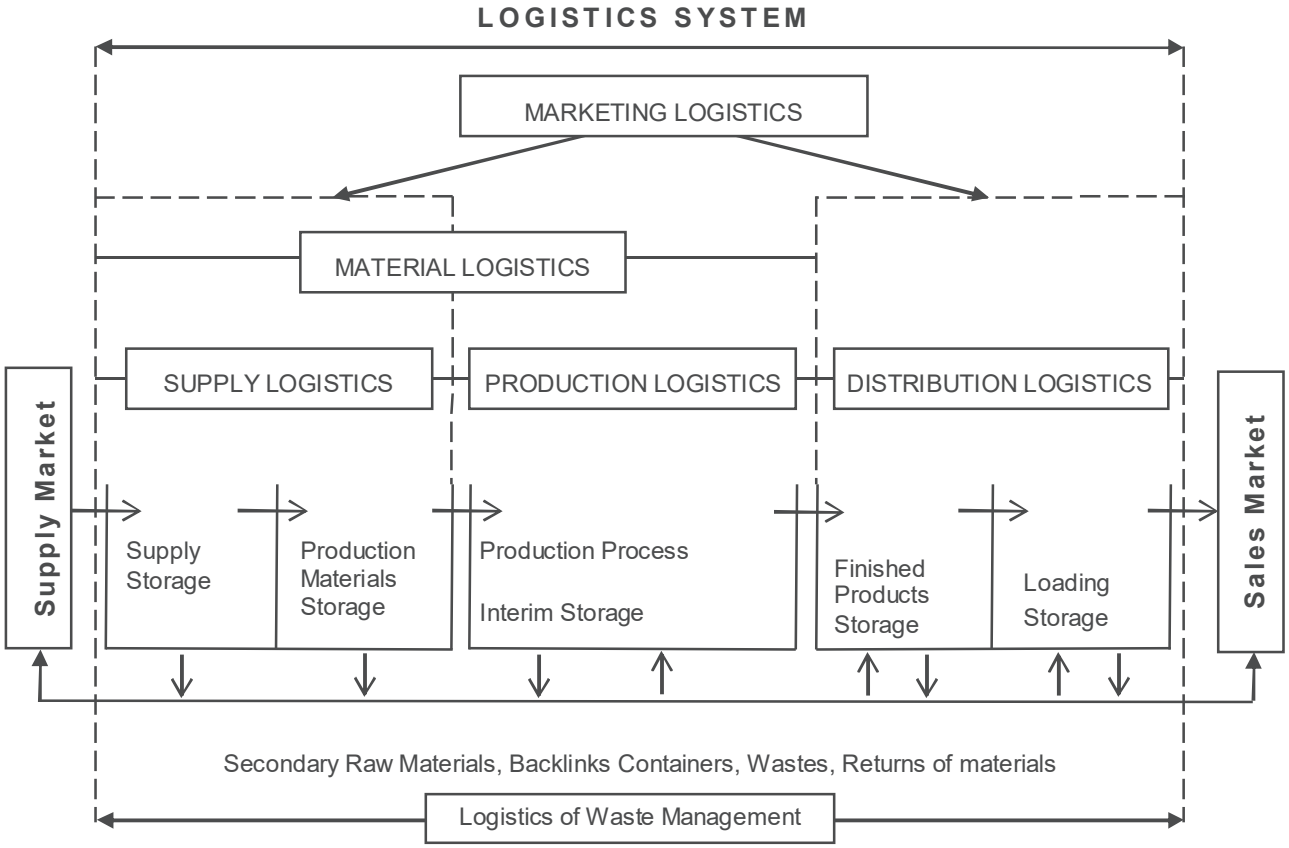

Fig. 1 The logistics system of production company according to functional division
(Source: RUTKOWSKI K., Zarządzanie łańcuchem dostaw - próba sprecyzowania terminu i określenia związków z logistyką)

The research entity is a partnership, which started its activity in 1994 at that time dealing with the trade of seamless tubes made of carbon steel. After numerous structural changes in 2001 it transformed into a consortium after establishing cooperation with a foreign investor. From that time the research subject has continued developing its offer, first with another product groups, that is stainless steel and aluminium. Then, a modern storage and service centre in the Greater Poland was created. In subsequent years, the development of the company caused the creation of the next modern storage and service centre, this time in Silesia. The development of the company has also covered the introduction of another product group into the offer that is plastics. Investments in the development of the company's services have borne fruits in a wide range of laser cutting, sheet cutting in a circle on the sheets (CTL line), welding and protective coating. In 2012 the first phase of the logistic infrastructure was ended, which included the construction of storages in the south, west and east of the country. In the same year the next - third storage and service centre in central Poland was ready for use. Since 2011 the company has its representative offices in Lithuania, Latvia and Estonia. Currently, the analysed company is a leading distributor of steel products and plastics in Poland. The company also offers products of special purpose, construction systems and consumables. The wide range of products is available directly from warehouses across the country. Services provided by the company allow the adjustment of the

material to individual needs of the client and the reduction of costs connected with the involved capital by reducing own processing processes. On the customer's request, they also provide materials in special formats or with the additional processing of the surface according to his guidelines. Product Manager deals with the planning of material needs, who is responsible for the implementation of goals according to the company's strategy. The basis for planning is the monthly and thorough analysis of the client's needs on the market. Planning the material needs is also made taking into account the rolling processes in steel mills, with which the company cooperates. On this basis the purchases are made, which include up to 40 000 - 50 000 tonnes a month.

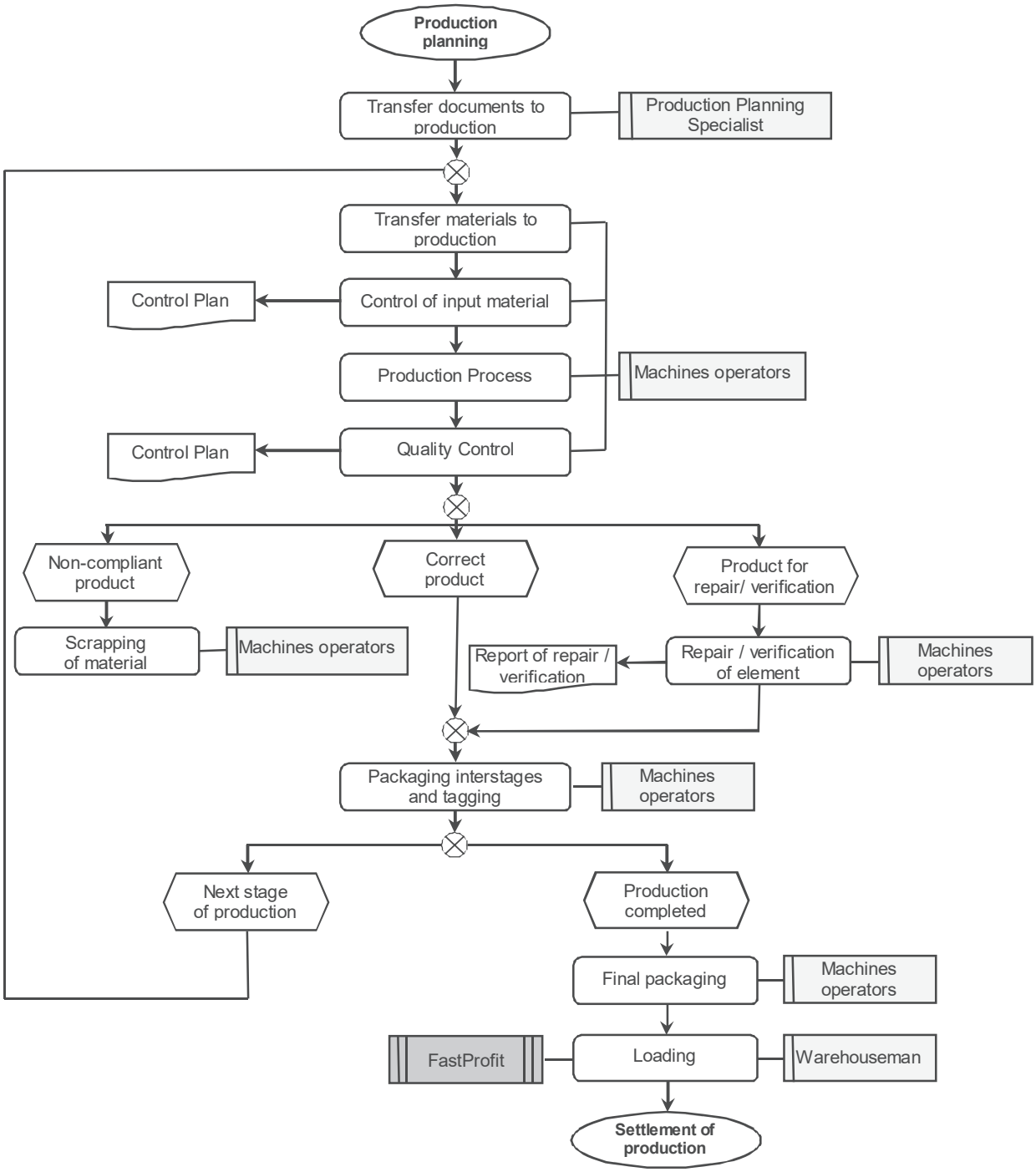

Fig. 2 Diagram of the distribution process at research company

Source: author's own study

A specialised material purchase department cooperates only with the renowned manufacturers in the country and the world from almost 30 countries, so thus they can guarantee the highest quality of products. The research entity is the leader in the distribution of carbon steel in Poland. It offers a wide range of over 9 000 products available in stock from warehouses throughout the country and the service, thanks to which it adapts the material to individual customer Leeds. The diagram of the distribution process and implementation of the customer's order is presented in **Fig. 2**.

4. RISK ASSESSMENT BASED ON THE FMEA METHOD

Failure Mode and Effects Analysis can be used at every stage of the production process. The main goal of FMEA metod is to maximie detection of errors at the early stages of the manufacturing process, because that's the easiest way to prevent the occurrence of errors. Through the use of FMEA method, product or process can be constantly improved by subjecting it to further analysis. Results are used to determine a new solutions, which are introduced to eliminate the causes of defects and innovative ideas improving products properties. Therefore, the method is implemented based on the principle of continuous improvement, along with the use of the Deming cycle (PDCA).

Table 2 The most important inconsistencies in the welding process realized in the company

INCOMPATIBILITIES	CAUSES	EFFECTS	SEV	DET	OCC	RPN	CORRECTIVE ACTIONS	SEV	DET	OCC	RPN
N_1 - Lack of root fusion	Bad edge beveling of connected elements	Negative result of visual inspection or ultrasonic	10	5	5	250	Introduction in technological process of additional self-control operation before proceeding to welding	10	5	3	150
N_2 - Abnormal termination	Lack of appropriate qualifications of welder	Negative result of visual inspection	10	5	6	300	Putting emphasis on self-control and training for welders	10	3	6	180
N_5 - Uneven knit line	Improper welding technology	Understated aesthetics of product performance	9	7	5	315	Modernization of welding technology, increasing the range visual inspection	9	6	3	162
N_{13} - Undercut in fillet weld	Wrong parameters of arc voltage	Understated structural strength	5	6	5	180	Implementation of welding instructions	5	6	3	90
N_{15} - Leakage	Poorly prepared weld groove	Low quality of weld	10	3	6	180	Development of self-control system, training of welders	4	4	6	96

Source: author's own study

One of the main processes this company is welding metal structures according to client guidelines. Good quality of welded structures can be obtained through effective organization of control in welding works. Integral components of this control are non-destructive testing of performed welded joints during all stages. Using the method of the FMEA identification of the factors influencing the quality of welded joints in steel structures has been made. The most important results of FMEA analysis are shown in **Table 2**.

Risk priority number [RPN] was calculated by multiplying the Severity [SEV], Detection [DET] and Occurrence [OCC] for each incompatibility. Analyzed welding process revealed a number of generated during its lasting non-compliance. Specified corrective actions have been predominantly focused on the worker (man) - as the main element and the main source of improvement to motivate workers to work effectively should be introduced incentive system as part of the operation, which workers would be rewarded for their work effectively. In order

to reduce the number of occurrence of non-compliance with the highest RPN number in technological processes were added: the additional operations of self-control before welding; increase attention on the inspection stage and training for workers; modernization of welding technology, modernization of welding technology, increasing the range of visual testing associated with a lack of root fusion, leaking, and lack of penetration ridge. Implemented corrective actions have caused a decrease the RPN number.

5. SUMMARY

Current market requirements impose the necessity of paying attention to the problem of realizing the process of welding metal structures at an adequate quality level of welded joints, as well as at a cost production level acceptable by the client. Today's market requirements make it necessary to control the welding process of metal structures to ensure adequate quality level of the welded joint, as well as the manufacturing cost accepted by the Client.

For enterprises the most important area that determines production process are quality of delivery and cooperation with suppliers. The other hand sale is an area which determines the market success of the company. Buying and selling are the two "extreme" business area. The first one decide on the possibility of production in strictly designated time, but subject to obtaining appropriate input material. The second one allows for structured cooperation with customers. Inventory and invested capital optimization brings lower costs of the company and increase its financial capacity. The prevalence standardized system solutions in the field of quality led to the development auditing practices. Audit is an important component of quality management system. It is a basic control mechanism aimed to ensure the implementation of quality improvement program.

REFERENCES

[1] ULEWICZ R., SELEJDAK J., BORKOWSKI S., et al. Process Management in the Cast Iron Foundry. In METAL 2013: 22nd International Conference on Metallurgy and Materials. Ostrava: TANGER, 2013, pp. 1926-1931.

[2] SELEJDAK J., ULEWICZ R., INGALDI M. The Evaluation of the Use of a Device for Producing Metal Elements Applied in Civil Engineering, In METAL 2014: 23rd International Conference on Metallurgy and Materials. Ostrava: TANGER, 2014, pp. 1882-1888.

[3] NOWAKOWSKA-GRUNT J., JELONEK D., KOSCIELNIAK H. Logistics' Clusters as a Part of Regional Policy in Poland. In ICALT 2014: International Conference on Advanced Logistics and Transport. Tunisia: IEEE Intelligent Transportat Syst .Soc., 2014, pp. 206-210

[4] SKOWRON-GRABOWSKA B. Strategic Innovation in Polish Transport Industry. In EBES 2013: 10th Conference of the Eurasia-Business-and-Economics-Society. Istanbul: Eurasia Business & Econ Soc, 2013, pp. 282-287.

[5] MESJASZ-LECH A. The use of it systems supporting the realization of business processes in enterprises and supply chains in Poland, Polish Journal of Management Studies. Volume 10, Issue 2, 2014, pp. 94-103.

[6] RUTKOWSKI K., Zarządzanie łańcuchem dostaw - próba sprecyzowania terminu i określenia związków z logistyką. Gospodarka Materiałowa i Logistyka 12/2004, pp. 2-18.