

## LEAN PRINCIPLES APPLICATION IN BUSINESS LOGISTICS

Roman BEDNÁR, Helena VIDOVÁ, Martin BELUSKÝ

*Slovak University of Technology, Faculty of Materials Science and Technology in Trnava, Institute of Industrial Engineering, Management and Quality, Paulínska 16, 917 24 Trnava, roman.bednar@stuba.sk, helena.vidova@stuba.sk, martin.belusky@stuba.sk*

### Abstract

The aim of the successful company is to provide added value of all inputs by connecting all the value-adding steps to a continuous flow. Other activities that do not add value to the inputs and are not necessary, we refer to as the waste or inefficiency. The article deals with the forms of inefficiency removal by Lean principles. Practical experience shows that many companies are focused mainly on introducing elements of lean manufacturing. Production has a massive effect on added value for the customer, but other business activities as logistics, determine how fast and effectively the company will finally earn money.

### Keywords:

Logistic, methods, research, lean principles

### 1. INTRODUCTION

Logistics and its processes are an integral part of any industrial enterprise. It can be seen only as a separate area. Logistics processes are so variable, that their change is way to increase productivity and save money without changing the manufacturing or production facilities. There are tested methods and techniques, that specifically deal with cost reduction of processes, which do not create a value. In our article, we will pay attention to these methods.

At present, the car factories put pressure on their suppliers and force them to be lean, often leaner than they themselves. Similarly, many companies from other fields try to apply the concept of leanness. This sort of approach enters the banks, retailers, chain stores, hospitals, public sector, construction and civil engineering companies, and so on. The leaning period occurs worldwide. Recently, many organizations dealing with the "lean logistics" appeared.

The U.S. National Institute of Standards and Technology as a part of The United States Department of Commerce is a federal technology agency offers the following definition of lean manufacturing: [1]: "A systematic approach to identifying and eliminating waste through continuous improvement (non-value-added activities), flowing the product at the pull of the customer in pursuit of perfection and sustainable development."

According to Košturiak the leanness of the company means [1, p. 17] "doing only those activities that are necessary, doing them right away, faster than others and spending less money. However, No one ever becomes rich by saving money. Lean philosophy is on improving business performance by higher production on particular area than competitors, a given number of employees and equipment create a higher added value than the others, at that time, we carry out more orders, the particular business processes and activities require less time. The leanness of the company is that we do exactly what our customer wants, with a minimum of activities, which increase the value of a product or service. Therefore, being "lean" means earn more money, make them faster and with less effort."

The aim of the successful company is to provide added value of all inputs by connecting all the value-adding steps to a continuous flow. Other activities that do not add value to the inputs and are not necessary, we refer to as the waste or inefficiency. To express its meaning, the Japanese use the term "Muda".

Its impact results within logistics in a form of [1]:

- *stocks, excess property, components and spare parts* – materials are delivered to companies in an untimely fashion or in excess quantity, the reason being inexact documentation or mistakes made in the planning system or by the supplier,
- *redundant handling* – useless material movements, relocation, transport,
- *waiting* – for components, materials, information, vehicles,
- *repair failures* – in transport, handling or information system,
- *mistakes* – setting out materials and components in incorrect quantity and time,
- *absent transport capacities,*
- *absent skills of the employees.*

The following section will be devoted to the characteristics of particular Lean methods used in business logistics.

## 2. MAIN TEXT

Methods of Lean concepts can be used in all areas of business. The biggest intersection can be seen between logistics and production area. Therefore, we attempted to separate the methods, that directly enter into the business logistics. We conducted a survey in V4 countries, focused on knowledge and level of use of lean techniques in industrial enterprises. Within this questionnaire, we contacted 605 respondents from industry. The 162 organizations answered the questionnaire, which represents return 26.8%. 39% of that were large companies with a staff of more than 250, 35% of small companies employing up to 50, and 26% of medium-sized companies, where the number of employees ranges from 51 to 250 We evaluated the usage of the fundamental concepts of lean manufacturing techniques usable in the logistics system, namely: **Kaizen, teamwork, kanban, visual management, VSM, 5S, TPM.**

The results of our survey showed, that companies use this method regardless of the type of production. The type of production is closely related to the vastness and complexity of the logistics system. The methods are ranked from most used to least used in mass production in order by frequency: **Teamwork, 5S, Kaizen, visual management, TPM, KANBAN and VSM.**

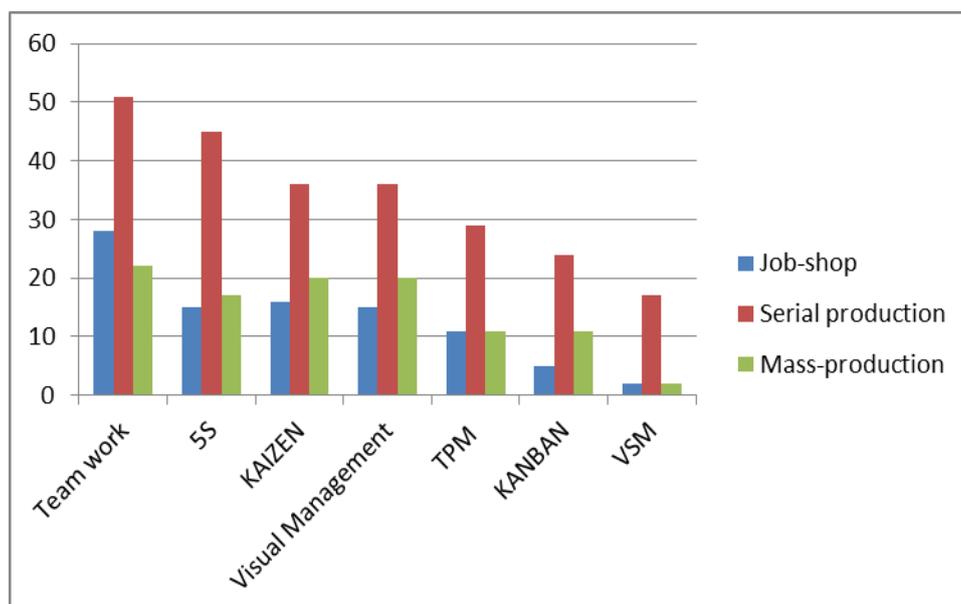


Fig. 1 Utilize LEAN techniques in practice

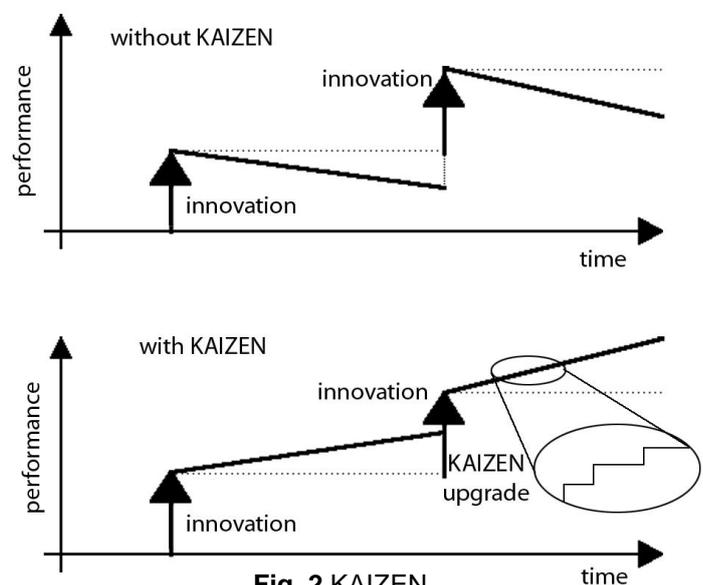
From the graph you can see the differences between different types of production. The most frequent is the usage of lean techniques in businesses dealing with mass production. For this type of production has also been suggested LEAN concept. It is also clear, that neither type of production will remain outside the disused.

There are all types of productions in the metallurgical industry. From small companies dealing with the casting of an order to large companies dealing with production of stocks for anonymous market. The specifics of such a logistics system are vastly different from each other, but the wide adaptability of lean methods allows to use them. In the following part of this paper we will briefly address the characteristics of different methods and their use in practice.

**Teamwork** – is a way of organising the work based on common participation, common cooperation and responsibility all of the team members. It affects logistic processes supportively. Benefits in the area of increasing production and application of the idea “more people, more inspiration” are appreciable. Application of teamwork decreases the risk of making wrong decisions; it helps to strengthen interpersonal relationships and brings many other benefits, which are undeniable. Teamwork has disadvantages, too. Some of them are: we cannot utilise the management methods based on commands; shared responsibility can have consequence of lower personal responsibility; if the work can be cumbersome; if the team has too many members, there are higher demands on time than individual. The research also shows that method of teamwork is one of the most common [2].

**5S** – the name of the method is a short cut for five steps that help us to achieve clean workplace which is adapted only to work. It seems that the tidiness is a matter of every single employee, but it is not like that. Clean and to work adapted workplace enables the worker to utilise the time which he spends on searching for the tools and equipment. Saving the time is not the only benefit. Another benefit after application of this method is faster fault detection of the devices; increasing the workplace; increasing the stocks in workplace and also improvement of the corporate culture. Utilise of this method is suitable in all areas of the corporation. These are the five steps of implementing 5S method: 1. removing all the unnecessary elements from the workplace, 2. positioning necessary elements to a good reachable place, 3. cleaning the workplace and defining the areas of cleaning, 4. standardizing of the first three steps, 5. adherence of established standards and signing the confirmation of work which was done.

**KAIZEN** – the method is designed to capture the improvement from all the corporate employees. This method is not designed only for manufacturing process, but it is designed also for every process where it will be implemented. Its principle is to process every suggestion of improvement. The main part is to analyse the impact of the change to corporation. Only after this step we are enabled to apply the change. The changes are captured anonymously without any claim on reward or directly from the employee. The aim of application of this method in corporation is to transfer the effect of change on employees and motivate them to search for another possible improvement. Effort of this method is to implement big and also small changes and after this we are able to achieve more productive corporation. There is a traditional improvement opposite the KAIZEN. In traditional improvement the impact of the innovations is gradually disappearing. The picture shows us a gradual improvement by small steps after big innovations, instead of loss of performance without the gradual improvement.



**Fig. 2 KAIZEN**

**Visual management** – it is possible to share important information through visual management. Shared information can be static or dynamic. The benefit is that they are permanently available, but the disadvantage of static information is that they can be outdated. Of course not all of the commands can be mediated through visual management. Through visual management we can have information about positioning the elements of production, number of operating units, operating aisles, transit route, restriction of movement of the employees, operating performance, the aim of corporation, operating plan and process. Visual management influences the logistic processes directly. The benefits of this kind of management are: increase of the productivity, clarification of material flows, clarification of information flows, increase of work safety, decrease of accidents and reduction of stock.

**TPM** – this method is utilised to maintain the constant working pace without unexpected failures. Operating equipment has to be under control such as maintenance of the manufacturing machinery and equipment. The TPM method is closely related to the 5S method. The TPM program consists of six areas: program of autonomous maintenance of equipment, program of planned maintenance, program of education and trainings, planning program for new equipment and units, maintenance system and information system, program of increasing of OEE (Overall Equipment Effectiveness). The TPM method influences the logistic processes indirectly by maintaining the system in operation without unexpected downtime.

**KANBAN** – application of KANBAN supports decreasing of production batches. Lower production batches mean fewer semi-products in production. This minimizes the requirement for space (warehouse). The KANBAN system is trying to gradually eliminate the entire stocks. There are several conditions that have to be met for successful application of The KANBAN system:

- trained and motivated staff, repeated production without large fluctuations in sales,
- balanced capacities, fast sorting, fast removal of failures, efficient control of quality,
- properly designed layout[3].

**VSM** (Value Stream Mapping) – The VSM method belongs to the first ones that are applied in the concept of lean production. It is possible to reveal areas in which we have to start improvements through VSM. This method reveals the most of the waste in logistics.

In conception of the lean management it is possible to divide the methods to the ones that are directly involved in creation and editing logistic processes; and to the others that can be understood as a supportive and their effect is secondary. Tab.1 shows the divided methods.

**Table 1**

	<b>Method</b>	<b>Effect on manufacture process</b>
<b>Methods with direct effect on logistic processes</b>	KANBAN	<ul style="list-style-type: none"> <li>• Pull production control</li> <li>• Production only required items</li> <li>• Increase of quality</li> <li>• Reduce of stock</li> </ul>
	VSM	<ul style="list-style-type: none"> <li>• Searching for waste</li> <li>• Process mapping</li> </ul>
	Visual management	<ul style="list-style-type: none"> <li>• Support for production management through visual tools</li> </ul>
<b>Methods with indirect effect on logistic processes</b>	Teamwork	<ul style="list-style-type: none"> <li>• Increased efficiency of work</li> </ul>
	KAIZEN	<ul style="list-style-type: none"> <li>• Gradual improvement of recent situation</li> </ul>
	5S	<ul style="list-style-type: none"> <li>• Clarification of workplace</li> <li>• Support of faster search for equipment</li> </ul>
	TPM	<ul style="list-style-type: none"> <li>• Support for operation of machinery without failures</li> </ul>

### 3. EXAMPLES FROM PRACTICE

A good example is the company Hella, a manufacturer of signal lights and lighting equipment for the automotive industry, which by mapping of the value stream in their company achieved significant savings in shortening of the interim period of production as well as manufacturing cycle, the tact time acceleration of the production line, reduction in personnel and a significant reduction of work in process.

The problems of standardization and visualization are currently the subject of interest in many companies. The attempt to the flexible material flows, labelling, clarity and order in the workplace leads many of them to think about changes that need to be taken.

The company IMC Slovakia struggled with similar problems in the organization of material flow in an assembly hall. It had to solve problems related to long material flows and complicated intersections of traffic routes. Likewise, the problems associated with a decrease in efficiency and productivity of assembly workers were reported. They resulted from:

- inadequate and inconsistent labelling of pallets with parts,
- lack of transparency of warehouse space for transportation pallets,
- inadequate or no labelling of the defined operating area,
- bad labelling of individual parts,
- missing labelling of space for tying balers and handling equipment,
- weak labelling of shared and specialized tools,
- as well as messiness at the workplace (see Fig. 3).



**Fig. 3** Deficiencies in the workplace [4]

(not marked and blocked the flow path of material, clutter and dirt, not labelled machinery, breach of safety at work, poor ergonomics in the workplace).

Applying the principles of Lean Logistics in the form of visualization, standardization, by 5S approach and reorganization of material flow, the company has achieved the elimination of the above mentioned problems, an increase in labour discipline, cleanliness at the workplace, and the growth in productivity of assembly workplace by approx. 10%.

KAIZEN: German manufacturer of the aluminium cans received new orders, so the next year it planned to buy two new machines to the six existing. At the same time they were trying to implement Kaizen and hired a specialized consultant. The advisor asked the Director of the company: How many percent capacity of existing machinery do you utilize? The director did not know. They together measured the use and found out that the machines are used only at 38%. This was followed by consultations and consideration of how the machine would be better used. Finally, the manufacturer was able to streamline their production so that at the new orders five machines were enough. They could sell one of the six machines. Kaizen approach cost them a lot of thinking, but not only they did not miss the money, they even earned them [5].

#### 4. CONCLUSION

In the article, we described selected methods from the basic concepts of lean manufacturing techniques, suitable for application in the logistics business. We based survey of the use of lean techniques in the V4 countries. The application of these methods is necessary to take complex and the methods described in the article seen as a stimulus for the development and adoption of lean manufacturing ideas. The use of lean manufacturing techniques can be separately and their benefit is largely without the huge investment in development. In the article, we divided the methods of entering directly and indirectly into the processes of logistics; likewise we have to understand benefits of their production processes. For indirect benefits of accessing methods we have to wait longer and vice versa. In the last part of the article we give a concrete example of the practice, pointing to the benefits arising from the use of the above-mentioned methods in practice.

#### LITERATURE

- [1] Koštriak, J.-Frolík, Z. a kol.: Štíhly a inovativní podnik. Praha: Alfa Publishing, s. r. o. 2006, s. 240, ISBN 80-86851-38-9
- [2] Witkowski K., QUALITY OF SERVICE IN LOGISTICS, In: Nové trendy v manažerstve kvality: 4. ročník medzinárodného vedeckého seminára, Trnava, Slovakia, 2011, Vydav. AlumniPress, 2011, pp. 285--289 [CD-ROM], ISBN: 978-80-8096-143-5
- [3] SANIUK S., Prototyping of acceptable variants of manufacturing networks, Transport & Logistics, 2011, iss. 9 spec., p. 286-293.
- [4] Ďurkovský, M.: Návrh na zvýšenie efektívnosti montážneho pracoviska prostredníctvom aplikácie prvkov štíhlosti vo firme IMC Slovakia, s. r. o. - diplomová práca, Trnava: MtF STU 2009, s.86.
- [5] <http://www.zivnostnik.sk>