

USE OF THE CONCEPT OF CONTINUOUS IMPROVEMENT AS A TOOL FOR OPTIMIZATION OF LOGISTIC PROCESSES

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*Received: 20 May 2016**Accepted: 24 June 2016***USE OF THE CONCEPT OF CONTINUOUS IMPROVEMENT AS A TOOL FOR OPTIMIZATION OF LOGISTIC PROCESSES****Petr Besta**University of Entrepreneurship and Law, Michálkoviccká 1810, 710 00 Ostrava, Czech Republic,
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kamila.janovska@vsb.cz**Keywords:** innovation, benefits, costs, pricing, competition**Abstract:** Manufacturing companies in today's highly competitive environment are under great pressure. They are constantly forced to seek reserves in their processes. Within logistics we can use dozens of quantifiable parameters which offer us a range of indicators. Manufacturing companies, however, have recently also been trying to use soft tools for the development of the employees' human potential, which can secondarily influence these parameters. One possibility is the application of the Kaizen philosophy. The article deals with the analysis of the research implementing this philosophy in the mechanical engineering production within a company in the Czech Republic.**1. Introduction**

Lean manufacturing is not cost reduction as an end in itself. It is, above all, about maximizing the added value for the customer [1]. Slimming down is a way for the plant to produce more, to reduce overhead costs, to use its resources and production areas more efficiently. Lean production should lead to the elimination of the following forms of waste:

- Overproduction,
- Unnecessary work (activities beyond defined specifications),
- Unnecessary movement (movement that does not add value),
- Inventories (the amount that exceeds the minimum required to meet the production targets)
- Waiting (for components, material, information, or the end of the machine cycle)
- Renovation (reduction of poor quality)
- Transport (each redundant transport and handling)
- Unused abilities of workers [2].

If the manufacturing enterprise wants to eliminate potential resource wastage within business processes, they mainly have to be correctly identified and measured. In general, lean manufacturing can be understood as a philosophy, which seeks to shorten the time between the customer and the supplier, through the elimination of waste in the chain or between chains.

The basic tools of lean manufacturing include these techniques and methods: Kaizen, TPM, lean workplace, Kanban, TPM, teamwork, quality processes and standardized procedures, value flow management [3].

The initial steps towards leaner processes have four main objectives: improving the quality, eliminating losses, shortening the time of the production, reducing overall costs. The loss means any activity of the enterprise that requires time, resources or space, but that does not bring value to the product or the entire production process. Some activities, such as moving materials during the production, are necessary, but do not add value. The overall costs are the direct and indirect costs associated with the manufacture of a product or with the preparation of a service. For an organization to be successful, the prices of its products and services and their operating costs have to be constantly compared. If its price or its operating costs are too high, it may lose market share or profits. To reduce its overall costs, the company must eliminate losses and reduce the time required to realize its processes.

2. Kaizen as a concept for reducing costs

One of the alternative possibilities to constantly seek ways to improve and eliminate wasting can be the application of the Kaizen philosophy. Kaizen means continuous improvement across all corporate levels. When applied in a manufacturing company, Kaizen means continuous improvement involving everyone - from managers to ordinary workers [4]. In the scope of Kaizen, improvement is perceived as an ongoing process consisting of small steps. In each area, for each segment, it is always possible to make small changes that will lead to the improvement of the status quo. It is therefore a sequence of small but continuous improvements that will be implemented continuously in all business processes. The diagram of continuous improvement through small steps is basically the opposite of the improvements

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realized through major investments and costly projects. These processes are the basis for reengineering philosophy. The introduction of the principles of Kaizen does not require any special techniques, but it uses proven methods which have been known and in many cases used for a long time: customer orientation, absolute quality control, process automation, quality control circles, system of improvement proposals, discipline at the workplace, just – in – time, the movement of zero defects, developing new products.

Kaizen is a core element of the concept of lean production mainly to identify what represents a value and what represents wasting for the production company [5]. Things that do not provide the company with a positive effect represent a potential source of waste, or they may represent it in the future. The main causes of waste can generally be divided into three basic terms: Muda – a loss, uselessness; Mura – irregular, uneven; Muri – disproportionate, tight. In the area of manufacturing companies, the largest part of the potential sources of waste include the following areas: unnecessary production processes, high inventories, poorly organized workplace, manufacture of low-quality production.

Implementation of this philosophy within manufacturing companies in the Czech Republic, however, is based on four important factors. The aim of the Kaizen philosophy within lean manufacturing is mainly to motivate employees to creative thinking, which supports limiting the possible sources of waste. Therefore, it is important to promote staff training and motivation in the production company. Furthermore, the goals of the entire implementation process must be set properly, and, above all, it is necessary to build an active level of communication across the whole hierarchy of the company.

Ultimately, Kaizen is based on bilateral orientation, where maximum attention is paid to customers, but also to employees of the company. In our conditions, what is proving most effective is to start continuous improvements in the area of removal of waste directly within the production.

The four areas that are important for the successful implementation of the Kaizen philosophy within lean manufacturing:

- Communication – ineffective communication processes hinder or even prevent the successful process of continuous improvement. Underestimating this area can have negative consequences for a company seeking to implement Kaizen.
- Goals – clearly and transparently defined objectives at all levels of management enable the establishment of a visible management.
- Motivation – a key factor is that employees themselves were interested to participate in the continuous improvement process.

- Education – as the main instrument for the development and improvement of employees and the entire company.

Kaizen as a system is subject to the involvement of the broadest spectrum of the company employees. This is possible only in cases of the effective functioning of communication in the company [6], both in terms of interpersonal communication within the company, and public communication. To achieve this, it is also necessary to set up a system of visible management, where employees will be clearly and accurately informed about what is happening in the enterprise. Effective communication in the company is not only a prerequisite for the use of the principles of continuous improvement, but generally it makes all business processes easier and faster. Within the development of the communication, it is particularly necessary to support all its vertical forms [7].

During the implementation of the Kaizen philosophy in the concept of lean manufacturing, it is advisable to start with the use of good management (5S). This technique focuses primarily on order and preventive activities at the workplace, and its application is undemanding in terms of organization and demands on further education of workers.

3. Benefits of the implementation of good management 5S in the selected mechanical engineering enterprise

As part of the research, the benefits of introducing the concept of good management within a mechanical engineering enterprise in the Czech Republic were identified. Within the implementation of five steps to good management, the machinery was fundamentally reordered in some divisions in the monitored mechanical engineering enterprise. Within the first S, excess machinery was removed. The means of production were then divided into several parts, according to the individual projects. As a first step of good management, all the machinery was assessed against the following criteria:

- Utilization of equipment,
- Functionality,
- Operations carried out,
- Technical condition.

For example, in the hydraulics division, 12 pieces of the machinery out of a total of 82 were removed based on the results of this analysis. Most of this machinery was used rather infrequently and the activities carried out at this machinery could be taken over by other machines. Sorting the machinery was originally conceived technologically; the individual pieces of machinery were grouped according to technological operations, although it was not the case of separate workshops. Due to two large long-term projects, the original production hall of the hydraulics division was divided into three parts. Two parts were intended for realized projects and the third one

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was intended for individual (custom) manufacturing. Given these facts, the division switched from the technological rather to product arrangement. Figure 1 shows the distribution of the original production machinery in the hydraulics division. The marked machinery (grey colour) was removed from the operation for its redundancy.

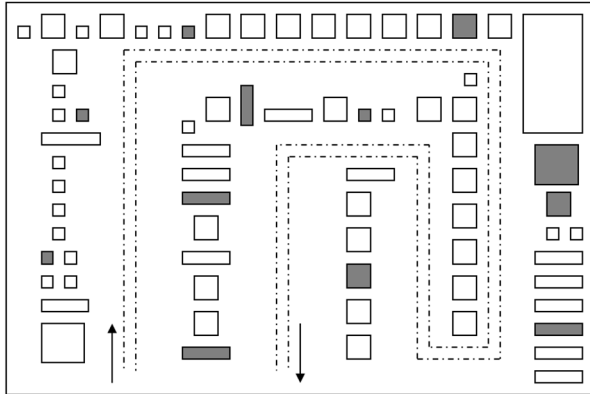


Figure 1 The original layout of the production machinery

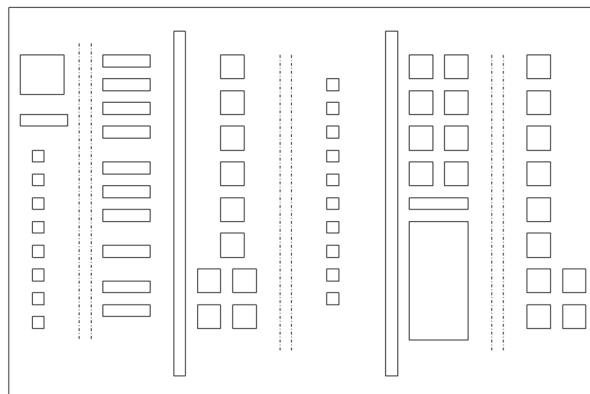


Figure 2 The new layout of the machinery

Figure 2 shows the new layout of the hydraulics division. The machinery is grouped according to the individual projects. Old unused machines were completely taken out of the operation. The production hall is divided into three parts. Besides reducing the cost of maintenance and operation of unused machinery, this measure significantly increased the clear arrangement in the production hall area. Moreover, in the previous system of the machinery arrangement (Figure 1), there were also places that were minimally used (dead spots – areas) due to improper positioning of machines. During routine checks of the hall, it was not even possible to take a look at these places (Figure 3).

Rearranging the production space also greatly improved the transparency of the workplaces and checking the personnel. The new arrangement also facilitated handling pallets, in which semi-finished or finished goods are stored. In the old model, a higher

volume of production was not much considered, and basically, no space for their storage was specified. Pallets were often placed on completely inappropriate sites, such as routes between machines. With higher production volume, movement in the production areas was very difficult. In the new arrangement, there are places marked in colour, reserved for a variety of products, semi-finished products and waste. The creation of three separate projects also meant the division of workers. The division into smaller groups working on the particular project has resulted in the development of employees' team approach. Smaller groups of workers make it possible to establish and develop a philosophy of teamwork more easily.



Figure 3 Inefficient use of a desktop

4. The development of work in progress

Inventories of work in progress are a core group of stocks. For the monitored company operating in the field of heavy engineering, it is a significant item in the inventory, the amount of which considerably affects competitiveness. One of the great successes of the introduction of the Kaizen philosophy was a substantial reduction of work in progress. In a period of four years, the amount of work in progress was reduced by more than fifty percent (Table 1). An important step towards this success was the introduction of good management 5S, as well as the SAP information system, which enabled to accurately monitor the status of work in progress at individual workplaces. Thanks to accurate records, it was possible to set a specific value of work in progress, which was decreased in small steps. Given the scale of the production and its smooth operation, it was not possible to proceed too aggressively in this case and significantly reduce the value of work in progress. The current status of the value of work in progress is getting closer to the optimum level. Another positive effect is that employees themselves started to be interested in this issue because of the positive value of this indicator for them meant a financial reward (small bonus). The management of each division currently regularly informs employees about the development of this indicator on the company bulletin boards.

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Table 1. Development of the status of work in progress

Date	Division					In total
	Engineering plant	Hydraulics	Forge and tempering room	Tool room	Loading cranes	
30.3.2013	721 212	2 117 456	2 965 509	75 537	667 089	6 546 803
30.9.2013	796 443	2 982 865	2 501 500	83 465	828 200	7 192 473
30.3.2014	527 313	2 070 737	1 807 615	80 371	807 900	5 293 936
30.9.2014	376 059	1 191 037	1 635 310	104 944	1 026 451	4 333 801
30.3.2015	409 604	1 228 997	1 485 767	195 291	666 787	3 986 446
30.9.2015	373 483	1 445 271	984 450	173 067	469 799	3 446 070
30.3.2016	596 386	1 153 658	841 306	122 366	366 581	3 080 297

Table 2 shows the development of work in progress as a percentage. A high decrease in work in progress, which is in tens of percent, can be seen very well. The only workplace, which, in turn, showed an increase, is the tool room. It is, however, due to the acquisition of new products that other centres utilize as well.

Table 2. Development of the status of work in progress in percentage

Division					Company as a whole
Engineering plant	Hydraulics	Forge and tempering room	Tool room	Loading cranes	
- 17.3 %	- 45.5 %	- 71.6 %	+ 61.9 %	- 45.0 %	- 52.9 %

5. Conclusions

According to the conclusions of the research, the Kaizen philosophy as a tool of continuous improvement can also fundamentally affect purely logistical parameters. Within the implementation of this concept, the manufacturing workplace was rearranged, but there was also a substantial reduction in the value of work in progress. Continuous improvement can permanently affect the company's competitiveness. It is, however, always necessary to realize that this is a never-ending process. Achieving a certain level should be seen only as a temporary state before the system is moved to another level.

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