

INDIVIDUALISATION OF LEAN CONCEPT IN COMPANIES DEALING WITH MASS PRODUCTION

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Abstract

The methods of lean manufacturing primarily designed for businesses dealing with serial production, are also used in other types of production. However the concept of lean production was not designed for these types of businesses, they are utilized only partially. Paper focuses on applying methods of lean concept in companies which are dealing with mass production and their options of exchange for other methods in the event of disagreement. Basis of the article is a list of lean methods with its description and its utilization in practice. The questionnaire was utilized to identify information from the practice. Based on this survey were identified the critical methods that are no longer appropriate for companies dealing with mass production. However, there are alternative methods of describing the problem. It is possible to say that companies are trying to get closer to their goal by modification of the basic concepts. And the concept of Lean Enterprise serves as a standard.

Key words

lean production, mass production, alternative methods, and lean methods

Introduction

Apart from past or recent times, the aim of production businesses was always to produce goods with low costs and high profit. Economic crisis showed that it is necessary to focus on reducing costs. Hiding problems of production lines by high stocks is no more solution in mass production. Corporate management has to focus on revealing and solving problems. The portfolio of solutions of these problems is globally large. It consists of complex systems of e.g. lean manufacturing, six sigma, TOC (Theory of Constraints) or elder approaches through simple methods. In this article, we will focus on application of lean methods in mass production and their modification with utilizing knowledge obtained from questionnaire survey. The modification is necessary because it is not primarily designed for mass production. This concept deals with restricting all activities to those that add value to the customer. When the conditions are ideal, the concept is very good and utilization is possible

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in current production system. In non-ideal world, many conditions limit the applicability of this concept. The main condition is to utilize well-repeated production with no major changes in orders.

Main text

The major part of article is to inform about the state of utilizing lean methods in praxis in mass production so we realized the survey in the V4 countries focused on knowledge and level of utilization of lean techniques in industrial enterprises. In this questionnaire, we contacted 605 respondents from industry. 161 organizations answered the questionnaire, which represents return 26.7%. 39% of that was large companies with a staff of more than 250, 35% was small companies employing up to 50, and 26% was medium-sized companies, where the number of employees ranges from 51 to 250. We evaluated the utilization of the fundamental concepts of lean manufacturing, which are usable in the production system, namely: KAIZEN, teamwork, bottleneck management, KANBAN, visual management, VSM (Value Stream Mapping), 5S, production cells, TPM (Total Productive Maintenance), SMED (Single-Minute Exchange of Die), EPE (Every Part Every day).

The questionnaire was focused complexly on utilization of lean methods in all types of industrial businesses. In the next step, we separated the corporations with mass production. It is possible to say that all methods of lean concept which not impact the production processes are applicable also in mass production.

The survey results showed the applicability of lean methods in mass production. The methods are ranked from most utilized to least utilized: Teamwork, KAIZEN, Visual Management, 5S, TPM, KANBAN, Bottlenecks Management, Production Cells, SMED, VSM and EPE. The order of these methods can be divided into two groups, methods applicable in mass production (blue zone at the figure 1) and the methods not applicable in mass production (red zone at the figure 1).

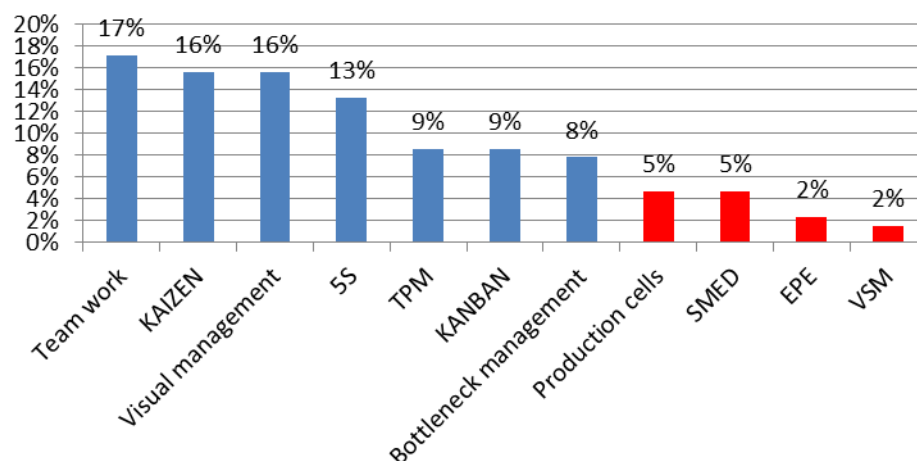


Fig 1 Utilization of lean methods in mass production

Mass production has specific conditions in some areas. We will discuss these conditions in descriptions of individual methods.

Useful method for application to mass production

The following sections briefly describe each method and its validity and utilization in mass production.

Teamwork - is a way of organizing the work based on common participation, common cooperation and responsibility of all the team members. The research showed that method of teamwork is one of the most common in mass production. Benefits in the area such as increasing production and an 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; supports competition between individual teams and brings many other benefits, which are undeniable. Teamwork has disadvantages, too. Some of them are: we cannot utilize the management methods based on commands; shared responsibility can have consequence of lower personal responsibility; the work can be cumbersome; if the team has too many members, there are higher demands on time than individual. Opposite of teamwork is classical management of employees, which can be centralized or decentralized. In mass production, both types of management can be utilized. In the long term, the utilization of teamwork seems to be more valuable especially in improving the corporate culture. However, this is related to the investment in education and training courses, which can be considered as the biggest disadvantage (1).

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 analyze 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 figure 2 shows us a gradual improvement by small steps after big innovations, instead of loss of performance without the gradual improvement (2). Corporations dealing with mass production do not have any restrictions for application of the KAIZEN method.

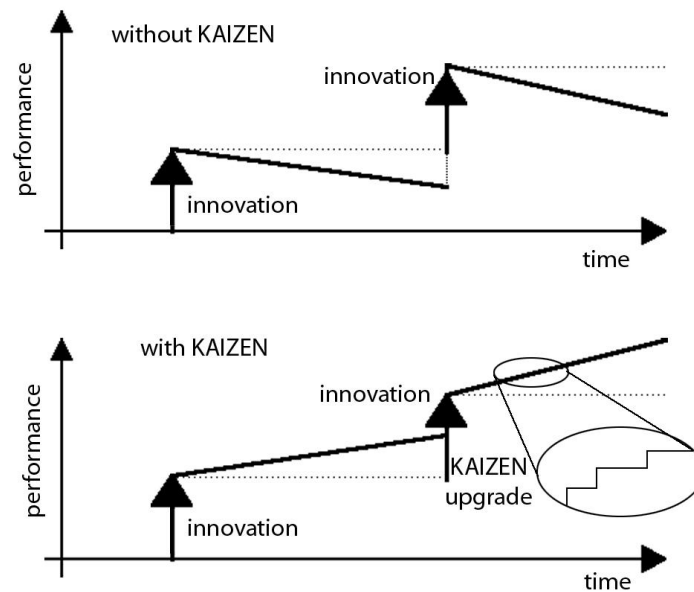


Fig 2 *Kaizen improvement*

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 production process. 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. The best example of utilization of visual management in mass production is marking the minimum, insured and maximum number of stocks.

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 utilize 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. Utilize of this method is suitable in all areas of the corporation. 5S method consists in the gradual implementation of these five steps: 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. The 5S is not restricted by conditions in mass production. It is possible to utilize the method in production and administration processes.

TPM – this method is utilized to maintain the constant working pace without unexpected failures. Although the mass production characterized by the production to stock, and thus the

variation in the consumption of products is ready, shutdown of production due to unexpected disturbances may take some time. 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 production processes indirectly by maintaining the system in operation without unexpected downtime. TPM has a supportive character on production processes, so the application without any restrictions is possible also in mass production.

Bottlenecks management – utilize principles of TOC (Theory of Constraints). In field of mass production is this method crucial. Removing bottlenecks and consequent increase in the flow line is the main objective of bottlenecks management. The traditional idea of the full utilization of all resources is not productive in this case. It is necessary to identify with the fact that the machines, which are bottleneck, must be the most utilized of capacity, and other devices must adapt production to the needs of bottlenecks, they cannot work otherwise. It is evident division of the production facilities, which are bottleneck facilities and are not bottleneck. The aims of TOC are maximize flow, minimizing stocks and minimizing operating costs. These objectives can be achieved by cycles of activities: **1 Identify bottleneck, 2 maximum utilize of bottleneck, 3 Customize the whole performance by bottleneck, 4 remove the current bottleneck, 5 back to point # 1.**

In accordance with the management of bottlenecks, it is necessary to invest resources to remove the bottleneck.

Less useful method for application to mass production

In the next part of this article, we will deal with methods, which have not been used often. These methods are in red zone in figure 1.

KANBAN – apply pull approach to managing the material flow. Its application is less applicable in companies dealing with mass production. The main reason is the gradual entry of work orders away from the final operation. Mass production is characterized by the production lines that are already configured for optimum run, it is not necessary to control the flow through the KANBAN. Push management system in this case is preferable especially in situations where it is necessary to use higher among stocks. It is mainly a single piece flow in KANBAN system, which limits the utilization of the method in mass production (3).

Production cells – material flow of production cells has a characteristic shape as a letter U or C. The requirements for successful application production cells are **one piece flow**, and variation of production, and multi-machine handling. The conditions of mass production are not adapted for the application of this method, similar to the method of KANBAN. Selection of conditions for application of production cells which are not in mass production: one piece flow, variant production small production cells with shape as a letter U or C.

SMED– the method of rapid changeover is in limit of applicability for mass production. Use of this method is of course possible, however it is necessary to compare the costs to implement of this method with saved resources. Among these costs, include preparation for production changes and training of personnel. Characteristic just for mass production, changeover will not be used. In the field of mass production would be possible to apply the

method in the first and second step. In Figure 3 shows the running applications SMED method. The length of the rectangle represents the duration of the activity.

First Step: Separate the work to be performed during switched off devices - internal activity from work that can be done on the fly - external activities.

Second Step: Move most of the internal activities to external activities.

Third Step: Reducing internal and external time, through changes in production.

Figure 3 shows course of application of SMED method. Length of the rectangle shows the duration of the activity.

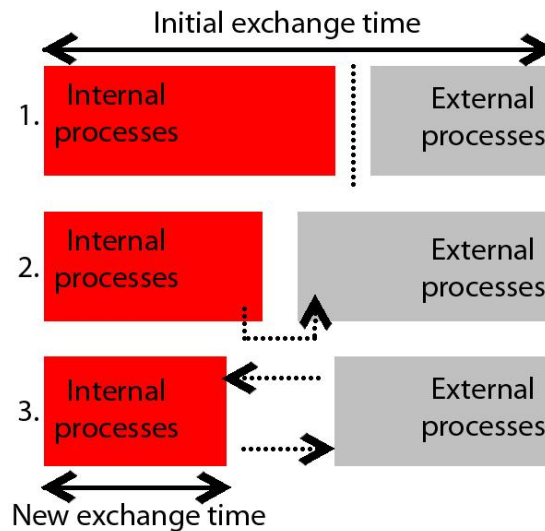


Fig. 3 SMED

EPE- Application of the method EPE is closely related to production of multiple products. The primary purpose of this method is the production schedule so that each product was produced in each day, which should result in increased flexibility to customer requirements. Production of each piece every day is closely tied to the SMED method, without which the rapid change during the day was not effective. Since flexibility and mass production are far from each other is not appropriate to use this method in the main production process. Labeling the amount of products produced in mass production is mainly provided by the prediction of demand. The company learns to predict accurate demand for its goods so it learns to save on its costs. The forecasting method is therefore a key to saving costs in mass production.

VSM – 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. However, if production does not change as it is in mass production using this method is not necessary. However, it must be guaranteed condition of good design of production. This procedure replaced VSM in mass production. Utilize these method is not excluded since can help especially with standardized processes and detect mistakes in the implementation of primary production, which has been revealed in the project documentation and simulation of production.

Conclusion

Mass production is mainly characterized by its production to the warehouse. It is focused on an anonymous customer. It is utilized in the production of large quantities. Its project part is much more important than in other types of production. Production lines are built for order. The production is limited by similarity of technological processes. That is why it is so important to well design the production lines at the beginning in corporations dealing with mass production.

Methods of lean concept support this type of production, with the exception of management bottlenecks. However, despite of the supportive character of these methods businesses dared to go in that direction. The stocks have the biggest impact on reducing the costs in mass production. The most important part of the production is the prediction of demand. In this case, mass production can save relatively higher costs compared to applying lean methods. However, the small improvement may prove after years as a significant cost savings.

References

1. WITKOWSKI, K. Quality of service in logistics. In: *Nové trendy v manažérstve kvality: 4. ročník medzinárodného vedeckého seminára*. Trnava: AlumniPress, 2011, pp. 285-289. ISBN: 978-80-8096-143-5
2. VIDOVÁ, H. Kaizen, áno či nie?. In: *Trendy ekonomiky a managementu. (Trends economics and management)*, 2010, p. 135-141. ISSN 1802-8527
3. SANIUK, S. *Prototyping of acceptable variants of manufacturing networks*. Transport & Logistics, 2011, iss. 9 spec., p. 286-293.

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