Lean manufacturing - a method of managing a manufacturing enterprise

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Abstract. The article describes the relevance of the concept of "lean production" based on the analysis of manufacturing enterprises. The main methods of lean production are highlighted. The features of the method implementation are formulated. To ensure the reliability of the conclusions, we used materials from scientific conferences, publications of domestic and foreign experts on the problems of lean production, and actual data of industrial enterprises. The methods of classification, comparison, system analysis, and generalization were used. The research results will allow industrial enterprises to correctly use such lean production tools as 5S, Kaizen, Kanban, Poka-Yoke, etc., and build a management model focused on continuous improvement. Both the positive aspects of the "lean production" concept and a number of specific difficulties and features that the company has to overcome to create an effective lean production system are shown.

Labor productivity is the main and necessary indicator of the competitiveness and efficiency of the national economy. The condition that determines the increase in labor productivity is the improvement of production and management processes. Today, the concept of lean production is considered to be a generally recognized and more successful concept of labor productivity.

The phenomenon of lean production originated in Japan, whose enterprises from the mid-50s formed a special approach to the organization of production, and later other processes, which allowed the country, which has almost no natural resources, to take the second place in the world in terms of GDP. Starting in the 80-ies, the system is becoming more widely recognized in the world, when USA Industrialists, who felt sharp competition from the Japanese in their own car market, began to study the "secret of the Japanese miracle".

In most sources, lean manufacturing is mistakenly identified with TPS - Toyota Production system, Kaizen (continuous improvement), or even one of the 5S tools and is characterized as an enterprise organization in which products are manufactured in exact accordance with customer requests and with fewer defects compared to products made on the principles of mass production, while reducing the cost...
of labor, space, capital, and time. However, based on the Toyota Production system, the concept of lean manufacturing includes many other methods to improve production efficiency.

Lean manufacturing is a broad management concept aimed at eliminating losses and optimizing business processes: from the product development stage, production, to interaction with suppliers and customers. Lean production management is focused on identifying the needs of the market and creating maximum value for the customer at the minimum cost of resources: human effort, equipment, time, production space, etc. Lean production is the basis of a new philosophy of production management [1].

The term "lean manufacturing" is a concept of managing a manufacturing enterprise that is based on a continuous effort to eliminate all types of losses. Lean manufacturing involves the involvement of every employee in the business optimization process (from the CEO to the cleaner) and maximum customer orientation. At the same time, the goal of lean production is to systematically reduce processes and operations that do not add value [2].

The relevance of the research data is determined by a number of factors, among which the most significant is the possibility of increasing the competitiveness of enterprises in the industrial sector of the economy through the use of innovative economic tools, leading to a maximum reduction in production losses.

You can create a lean office by working at all levels of the management vertical, while implementing lean production tools adapted to the specifics of office work.

In Russia, attempts to introduce lean manufacturing for the first time began only in 2004. Pioneers in this case were such large companies as KAMAZ, "GAZ Group", VSMPO-AVISMA Corporation "RUSAL", "Evraz", "EuroChem", etc. Unfortunately, the introduction of lean production in these companies was provoked by large losses and a growing number of failures in the enterprises, but soon after the first positive results, the companies did not stop there, and more and more deeply implemented this system.

Another reason for many enterprises was the crisis in production, as a result of which organizations began to consider Lean as one of the successful ways out of an unpleasant situation.

The most popular methods of lean production are:

- **5S** - a set of actions aimed at creating order in the workplace, a systematic approach that increases work efficiency (figure 1).

![Image of 5S system](image)
The problems that were caused due to improper organization of the production space are not as harmless as it may seem at first glance. The loss of time that inevitably results from a messy workplace most often leads to low productivity.

Main stages:
- sorting accessories and tools, removing excess;
- rational arrangement of necessary things;
- keeping the workplace clean;
- creating standards that help you monitor results;
- continuous improvement.

For example, in 2011, the Zavolzhsky motor plant started gradual introduction of lean production elements.

As a result of using this tool during 2011, the company received:
- visual control-instant visual detection of deviations from the standard and forms of production losses by any employee;
- special marking of equipment (color marking, direction of movement and direction of rotation);
- disciplinary standards [3].
- Kaizen (Continuous improvement)

The kaizen method (figure 2) articulates common goals and coordinates the efforts of all employees to create and maintain a unified corporate culture. The result of this approach is the effort of each employee who reduces costs, increases efficiency and increases productivity in their place [4].

At Zavolzhsky motor plant, this system is implemented as follows: proposals for improvements are submitted by production personnel and are aimed at improving the quality of products and work performed, improving labor safety, improving the organization of the workplace and working conditions, reducing costs and increasing productivity.

![Kaizen](image)

**Figure 2.** Kaizen.

- Kanban
  This method is aimed at regulating the flow of finished products, at the production stage and after its completion. Signal cards (Kanban) are used to indicate the need for specific parts or components.
  As a result of implementing this Lean tool, you can see a decrease in unclaimed inventory, as well as minimize losses and simplify inventory.
  For example, the Metalwork Plant “Apollo” was the first to use this method in June 2012.
- Poka-Yoke (error protection, fool protection)
This method of lean production is used to eliminate the possibility of various errors during the creation of the product. Ideally, companies strive for a zero defect rate.

This implementation allows the company to save significantly, since the cost of preventing problems related to quality is much lower than those that will occur if they are detected after a considerable time.

Experts of the professional magazine "production Management" conducted a study of 500 companies that at the time of the study were engaged in improving the management system. According to the results of this study, 33 % (168 companies) use LP tools [5].

The Institute for integrated strategic research conducted a survey on the prevalence of Lean manufacturing in Russia, which was attended by more than 700 enterprises with a staff of 200 to 2000 people, where 70% of respondents are senior managers. 32 % (224 companies) apply the LP concept, while only 5 % (35 companies) implement at least three lean production tools [6].

It is worth noting that in comparison with foreign companies implementing Lean manufacturing, the mention of Russian production systems in Internet sources is much less.

Despite the positive aspects of the "lean production" concept, there are a number of specific difficulties and features that the company has to overcome to create a lean production system. The main difficulties are:

• significant organizational changes and the desire of all staff to make forced changes;
• training of personnel;
• creating a close relationship in the supplier-customer chain;
• lack of state support;
• long-term implementation.

Also, organizations that implement "lean production" in their activities face negative factors that can reduce the pace of implementation at Russian enterprises, namely:

• lack of knowledge and experience in the field of lean manufacturing
• staff distrust of the lean production system
• weak competition - as a result, lack of motivation to implement the concept
• implementation of a small number of system elements, and the expectation of a significant result
• lack of implementation of lean programs in the public sector.

However, today the concept of "lean production" in Russia is being promoted at an increasing pace. Every year, summits and forums are held, thanks to which an increasing number of organizations in the Russian Federation are adapting different approaches to Lean not only for industrial production, but also for other areas that need changes.

The study of domestic experience in implementing lean production in machine-building and other enterprises proves the relevance and necessity of developing the theory and methodology of planning and organizing lean production in relation to the specifics of the Russian economy and its industrial sector.

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