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FEATURES OF THE IMPLEMENTATION OF THE “LEAN PRODUCTION” CONCEPT AT ENTERPRISES

The article considers the essence of the concept of "lean production", as well as the evolution of its origin and development. The article defines the concept of lean production which is focused on simplifying the manufacturing procedures, speed up production and reduce losses. The main features, principles and tools of the concept of lean production were studied, and the effectiveness of the implementation of the concept of lean production by foreign enterprises was analyzed. The article also describes the main methods of the concept of lean manufacturing, as well as the features of their application. The analysis of the features of the introduction of the lean production concept revealed the specifics of the lean production concept application in Ukrainian enterprises. The results of the analysis can be used in the process of developing and implementing an operational business strategy.

Keywords: conception, lean production, production system, production processes, 5S system, Kaizen system, Just-in-Time system, SMED system.

Introduction. In an effort to increase their competitiveness Ukrainian companies demonstrating deeper interest in best practices in the field of technology and business management are actively seeking ways to build efficient production systems. Particular importance attaches to the realization of the potential of the industrial enterprise by successfully overcoming the contradictions between the quality and the term of customer satisfaction, price and cost, value and losses, necessary productivity and available limited resources. Along with a seemingly sufficient number of business concepts, there are not so many systems of production management in the world, which offer real methods of increasing the efficiency of production. One of these systems is the concept of Lean production. In domestic and foreign literature you may find the title Lean and TPS (Abbreviation production system of Japanese automobile company Toyota – Toyota Production System). Therefore, it is necessary to study the change of approaches to management of an industrial enterprise in the context of lean production.

Target setting. The purpose of this article is to analyze the characteristics of lean production implementation at the domestic plants relevant to their operation and review of the main methods of Lean Production and algorithms of its application.

Analysis of recent research and publications. An overview of the publications of scientists on this issue suggests that until now the discussion period starts from the concept of lean production and the identification of the stages of historical development. So, Steven C. Bell and Michael A. Orzen consider the development of the concept from the end of 1800 in three stages¹:

– 1890–1940 – the stage of scientific management with a focus on improving processes and increasing productivity;

– 1940–1995 – the stage of participation in the formation of the basic principles, the development and implementation of tools aimed at improving the efficiency of production through respect to the work of workers, taking into account the needs of customers and quality assurance;

¹ Bell, S.C., Orzen, M.A. (2011). *Lean IT: Enabling and Sustaining Your Lean Transformation*. Boca Raton, Florida: CRC Press. Taylor & Francis Group, 349.

– з 1996 – the stage of integration of the best practices of different countries of the world and the active dissemination of Lean ideas in practice.

Scientists Don Tapping and Anne Dunn consider the evolution of the concept of lean manufacturing since 1900¹. There are introductions of theories: Frederick Winslow Taylor – Time and Movement, Eli Whitney – Interchangeable Parts, Toyoda Sakichi – Jidoka. And in 1935 in the United States, thanks to the efforts of H. Ford who extends the principles of mass production in Japan, Toyoda K. introduces the Just-in-Time (JIT) concept.

Since 1945, Taiichi Ohno has articulated the main provisions of the production system (Toyota Production System, TPS), which obtained further recognition and popularization worldwide, first of all, among car manufacturers in the United States.

Based on the data of modern professionals the principles of TPS were complemented and improved. So, scientist Jeffrey K. Lyker in his book "Tao Toyota: 14 Principles of Management of the Leading Company of the World" describes in detail the basic principles of the company by providing relevant examples².

B. Maskell and B. Baggali explain the peculiarities of changes in financial activity in enterprises that implement lean production. They describe the gradual transformation plan of the financial system in accordance with Lean implementation stages economical production system across the enterprise³.

In spite of the popularity of the concept of lean production and production systems as a whole among foreign researchers, this concept has become relatively new in Ukrainian enterprises, due to lack of knowledge of domestic scientists and difficulties in its implementation.

Research results and discussion. The necessity to develop and implement projects in the field of "lean production" is connected with the need to ensure the high competitiveness of modern enterprises, increasing global competition in traditional markets. As the updating and development of any activity takes place due to the improvement of the methods of its implementation, it is necessary to introduce innovative conceptual approaches to improvement of the management system, which determines the innovative strategy of the enterprise. One of these methods of increasing the efficiency of enterprise management and improving its activities is the introduction of the concept of "lean production".

The essence of the concept of lean production lays in identification of market needs and creation of maximum value for customers with minimal resources, material resources, human effort, equipment, time, production areas. This concept is the foundation for a variety of ideas about enterprise management efficiency^{4 5 6 7}.

¹ Тэппинг, Д., Данн, Э. (2012). *Бережливый офис: устранение потерь времени и денег*. Москва: Альпина Паблишер, 322.

² Лайкер, Д. (2010). *Дао Toyota: 14 принципов менеджмента ведущей компании мира*. Москва: Альпина Паблишер, 509.

³ Маскелл, Б., Баггали, Б. (2010). *Практика бережливого учета. Управленческий, финансовый учет и система отчетности на бережливых предприятиях*. Москва: Институт комплексных стратегических исследований, 384.

⁴ Давыдова, Е.Ю. (2013). Некоторые аспекты понимания понятия «управление предприятием». *Территория науки*, 2, 123-127.

⁵ Лисин, С.Ю., Походова, И.С. (2015). Бережливое производство как образ мышления. *Автоматика, связь, информатика*, 9, 24-26.

⁶ Соколова, С.А., Горячева, Е.В. (2013). Организационные изменения: классификация и политика изменений. *Развитие экономики региона: взгляд в будущее: материалы II Городской научно-практической конференции. Волгоград*, 131-133.

⁷ Шипилова (Клиот), Ю.М. (2016). Причины возникновения и критерии оценки работы коммерческих медицинских организаций. *Успехи современной науки и образования*, 1, 36-38.

Organization of lean production involves optimization of production processes with maximum orientation to the market and taking into account the motivation of each employee. Lean production is a management concept aimed at losses elimination and production processes relief of the stage of product development, production and interaction with suppliers and customers. This approach particularly focuses on continuous improvement of production processes and the constant increase in the number of competitive advantages, increase of economic efficiency by reducing losses.

Within the concept of lean production, there are many methods. The most famous are:

- 1) system 5S – technology for creating an effective workplace;
- 2) Kaizen – continuous improvement;
- 3) Just-in-Time system – "accurately on time";
- 4) SMED system – quick adjustment of equipment;
- 5) Kanban and others.

The introduction of a lean production system should begin with the 5S technique. This method involves the organization of the workplace (space), in view of creating optimal conditions, maintaining purity, accuracy, order, energy saving and time. Only in such conditions the manufacturing is not defective, which meets all requirements of consumers of products. The implementation of the 5S technique implies the implementation of 5 steps:

Step 1. Seiri – sort and remove unnecessary. At this stage, all the objects on the desktop are divided into the necessary and unnecessary. Then make the removal of unnecessary things, which leads to job security and improve the culture.

Step 2. Seiton – compliance with the order, self-organization, defining its own place for each item. Things should be located on the desktop so that they are easily accessible.

Step 3. Seiso – systematic cleaning of the workplace, cleanliness, thorough cleaning of equipment.

Step 4. Seiketsu – the standardization process, the writing of the previous three steps. Creation of documents on maintenance of equipment, on safety engineering and others.

Step 5. Shitsuke – Improving discipline and order. The workplace support should be in accordance with the company's standards, which should be constantly improved.

The second method is Kaizen (translated from the Japanese "kai" – change and "zen" – good) – gradual continuous improvement of all business processes, conducted continuously from day to day and all employees of the enterprise. Thus, the change is not engaged in individual people at a certain time, but every one and every day. These changes can be achieved by, for example, workplace organization at which reduces time searching for tools and materials, or by improving equipment operation and maintenance, reducing the number of breakdowns, etc.

The essence of the system of Just-in-Time is: the process of moving products in production and deliveries from suppliers of materials, resources, raw materials, there is clearly time. The parties arrive for processing just at the moment when the previous party is completed, thus there are no downtime in the workers, nor waiting for the processing of parts.

The SMED system is dedicated to re-adjusting the equipment for the shortest period of time so that it does not affect the speed of performance at all.

Kanban (from the Japanese "Signboard, billboard") – a method that allows you to manage production lines, using special information cards for the transfer of orders to the manufacture of the next process.

In summary, the new approaches to production based on the principles of Lean presented in the Table 1¹.

¹ Slak, N. (2009). *Operations management*. Moscow: INFRA-M, 790.

Table 1

The basic principles of the organization of lean production

Types and functions of activity	Approaches to Lean Production
Production strategy	Determination of production goal, expansion of specialization and reduction of the list of products and services
Process design	Ensuring uniform flow of products, small-scale production, coordination of output with the market
Product (service) development	Product design taking into account the capabilities of the enterprise, simplification of production operations, the use of simple equipment
Supply chain management	The introduction of lean principles, the transition to work in small batches, promotion of all participants in the supply chain
Placement of jobs	Reduction of transmission routes, the application of the principle of straightness in the location of machines, the creation of spatial cells
Production regulation	The use of "pulling" system of organization of processes, the production of products only at the request of consumers
Inventory planning	Minimizing inventory at all stages of production, preventing excess inventory, reducing the cost of maintaining inventory
Maintenance	Introduction of complex maintenance of equipment, prevention of failure and downtime of machines, reduction of changeover time
Quality management	Ensuring a high level of product quality, the introduction of automatic control, the possibility of stopping the conveyor
Process improvement	Continuous improvement of production processes, improvement of the organization of workplaces, mapping cost changes
HR management	Full use of the abilities of workers, development of human resources, ensuring work safety, a system of lifelong hiring of personnel, labor motivation

Using the principles and methods of the concept of lean production, according to the experience of foreign companies, you can achieve the following improvements, presented in Fig. 1^{1 2 3}.

¹ Болдырев, В.Н., Кудряшова, О.В. (2013). Теоретические и практические аспекты мониторинга финансовой устойчивости коммерческого предприятия. *Территория науки*, 4, 36-42.

² Сафронова, К. (2011). Концепция «бережливое производство»: особенности использования на отечественных и зарубежных предприятиях. *Проблемы теории и практики управления*, 12, 114-119.

³ Тяглов, С.Г., Воловик, В.М. (2011). Управление инновационным развитием корпоративных структур в рамках программ ресурсосбережения и повышения энергоэффективности. *Terra Economicus*, 9 (2-3), 45-49.

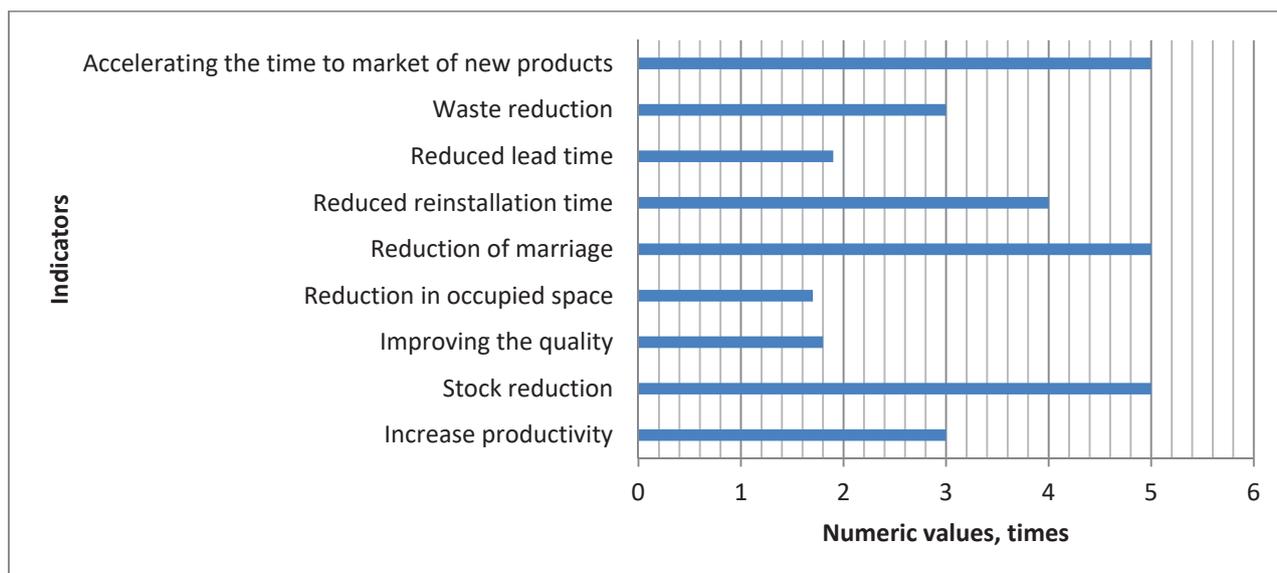


Fig.1. Illustration of the results of implementing lean production concepts to foreign companies

Actuality of the introduction of lean production at domestic enterprises is conditioned by the simple principle – at the minimum use of resources to obtain maximum results in production. Lean production compared to mass production requires a reduction of approximately two-fold: the production area; human effort in production; engineer-hours for the development of a new product; investment in tools; engineer-hours in the production process. In addition, the implementation of lean production concepts can achieve reduction in staffing needs, improve pay and motivation, reducing the number of errors in the processing of orders, increased creativity organization and optimization of customer service^{1 2 3 4}.

As an example of the successful application of lean production can be noted Japanese production system. At present, 98% of Japanese enterprises have already introduced a Lean system, while in the EU and US, such enterprises are more than 57% and 72% respectively. In Ukraine there are from 3 % to 5% of domestic enterprises, which introduced the concept of lean production, and in some areas they did not⁵. The comparative estimation of the distribution of the system of lean production in different countries of the world is presented in Fig. 2.

Experience in implementing the concept of "lean production" practices in Ukrainian companies currently exist. The expansion of the system of lean production at a number of domestic enterprises has become a consequence of awareness of the leaders of the importance of this system. Managers understand the need for systematic actions to improve the company's

¹ Ахмедов, А.Э., Смольянинова, И.В., Глеков, П.М. (2014). *Финансовый менеджмент*. Воронеж: ВЭПИ, 144.

² Балтачева, Н.Р. (2015). Бережливое производство как метод повышения эффективности производства на предприятии. *Science Time*, 8 (20), 26-29.

³ Быковская, Е.В. (2016). Блочно-модульный подход к идентификации резервов обеспечения эффективного функционирования производственных систем. *Успехи современной науки и образования*, 1, 44-47.

⁴ Овсянников, С.В. (2015). Финансовый мониторинг как инструмент кризисо-устойчивого развития предприятия. *Территория науки*, 4, 196-202.

⁵ Лисицин, В.Д., Лисенко, О.И., Вовк, Ю.С. (2009). Роль «ощадливого виробництва» в діяльності підприємства. *Вісник НТУУ КПІ*, 1, 39-61.

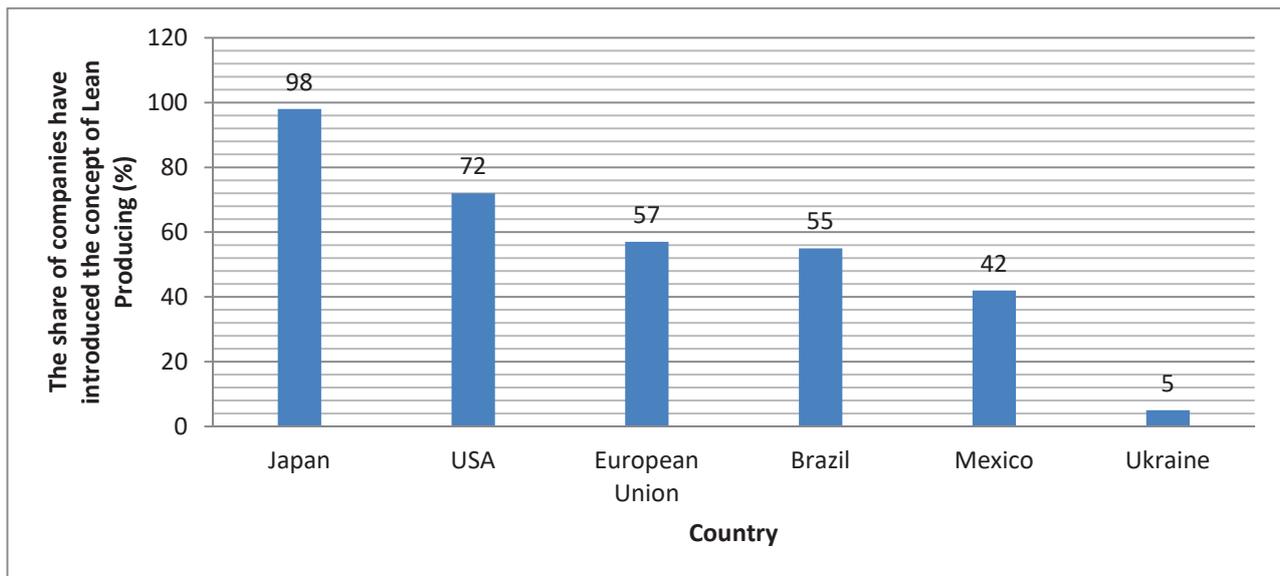


Fig.2. Comparative estimation of the level of distribution of the system of lean production in foreign companies and at domestic enterprises

business in the very near future, as well as the fact that if now they do not start taking urgent measures, then enterprises will become uncompetitive.

It should be noted that projects to improve the efficiency of a number of Ukrainian enterprises (Arterium Corporation, Agrosoyuz Corporation, Printing Company Univest Print, etc.) did not pass under the slogan of the introduction of lean thinking, but by the nature of the changes that took place in the company and continue it can be said about the application of many elements of this concept. So there is every reason to emphasize that any enterprise in any country in the world, and Ukraine is no exception, can successfully learn the principles of lean production. The most important thing to be aware of is the need for an integrated approach. That is, the transformation must cover the three most important areas: the use of lean production tools, organizational model optimization and management culture change¹.

Analysis of the methods and approaches of the implementation of the concept of lean production allowed to distinguish the peculiarities of the application of this concept at Ukrainian enterprises, in particular:

1. Ukrainian enterprises are aiming for a quick result from the introduction of lean production tools that would not radically change the situation in the enterprise and would not require changes at the level of senior management of enterprises.

2. The enterprises are ready to invest considerable resources in technology and equipment, which, in the opinion of the managers, allow a significant leap, while continuous and gradual improvement is a long process with a vague economic effect.

3. Domestic companies use tools of "lean production" and underestimate the importance of the philosophy of "lean production", while Toyota's success is based on the philosophy of lean production, which involves a profound and comprehensive cultural transformation (the philosophy of long-term prospects, the correct process gives the right results, increase the value of the organization through the development of employees and partners, the constant solution of fundamental problems stimulates the continuous training of the organization).

¹ Лисицин, В.Д., Лисенко, О.І., Вовк, Ю.С. (2009). Роль «ощадливого виробництва» в діяльності підприємства. *Вісник НТУУ КПІ*, 1, 39-61.

Conclusions. The concept of "lean production" is based on the disclosure of the creative potential of employees of the enterprise. Unlike other management technologies focused on strict regulation of activity, this approach allows to involve workers in all levels in the process of optimization. At the same time, the complex effect is achieved: the enterprise works more efficiently, the employees are involved in the project realization and have the opportunity to improve their working conditions and material compensation.

Despite numerous examples of the effective use of lean production tools, there are difficulties in implementing these methods into company activities on an ongoing basis. The philosophy of lean production must become a corporate culture and a way of thinking. The system of lean production orientates the enterprise to effective work in the long run only if it is possible to reorient the thinking of employees from narrow-tech tasks to understand the productive, economic and financial interconnections.

So, using principles and tools of lean production taking into account the revealed features of the introduction of lean production at domestic enterprises can significantly increase the efficiency of production, product quality, productivity, reduce material and time costs, reduce the time of execution of orders, reduce the period of development of new products, improve the competitiveness of the enterprise. Methods and tools of lean production can play a decisive role in increasing the efficiency of production at domestic enterprises and ensure their successful development in the harsh conditions of the modern world economy.

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