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POSSIBILITIES OF APPLICATION OF INDUSTRY 4.0 AND CURRENT SITUATION OF FUNCTIONING OF PRODUCTION SYSTEMS IN LARGE ENTERPRISES

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Abstract: Modern enterprise in new conditions, conditions of globalization, turbulence, the global market, numerous rapid and increasingly frequent changes, has been forced to adapt and change, in order to achieve competitiveness and survive in modern business. From theoretical point of view, authors of this paper analyzed the importance of the application of modern industrial production lines in serial production in the case of large enterprises. Through the work, several aspects that affect the quality, such as productivity, efficiency, effectiveness and other parameters that directly or indirectly affect the quality of finished products are considered.
Keywords: Industrial lines, production, large enterprises, quality, productivity, efficiency, effectiveness

INTRODUCTION

Modern enterprise in new conditions, conditions of globalization, turbulence, the global market, numerous rapid and increasingly frequent changes, has been forced to adapt and change, in order to achieve competitiveness and survive in modern business. Companies that want to be successful and to advance in the marketplace must be innovative, flexible, and ready to adopt and apply new knowledge, strategies and technologies. The strategy of constant innovation and the dynamics of change is the response to demands posed by market struggle.

Over the past twenty years, many companies have realized that the demands of the global market, including increasingly demanding and more sensitive customers, set new standards for production flexibility. Additionally, nowadays in very difficult times of the recession and financial crisis, enterprises of all sizes and shapes, from industrial giants, through middle and small, to micro enterprises, face numerous challenges of their own survival. Gradually, mass production, which was inherent in a large number of companies, opened up space for the introduction of a new system whose focus is exclusively on the buyers. In one word, the need to shift from the economies of scale strategy to the strategy of the width of an enterprise's activity is imposed.

According to the [1], system that revolves around the customer is created with the idea that through the process optimization, it enables a cheap product, on time and with the best possible quality. Such a system is just a lean production. By introducing a lean production system, a continuous process of continuous systematic identification and removal of redundant phenomena in the company's operations is established by eliminating everything that represents no value from the buyer's perspective. Thus, in the conditions of crisis, the costs are significantly reduced which enables the achievement of small, but long-term financial benefits, which is the key to achieving a long-term and sustainable competitive advantage. On the other hand, if we neglect the current crisis for a moment in a modern business environment where the life cycle of products drastically reduces, lean production, also known as the world class production, enables companies to respond in an adequate manner, quickly and successfully to various and numerous requirements and users, both in terms of low cost / cost, as well as in terms of quality, time and innovation.

INDUSTRY 4.0 AND THE POSSIBILITY OF ITS THEORETICAL AND PRACTICAL APPLICATIONS

The goal of this philosophy is to enable a company to achieve satisfactory, if not leading, market position in the conditions of growing competition, falling customers' loyalty, constant technological innovations, drastic shortening of the life of products. It is known for its direction to reduce 7 types of losses (7 wastes), and its intention is to increase value in relation to the customer or each of the next in the value chain. For many, this is just a set of tools that help us identify and continually eliminate losses, and consequently improve product quality, reduce production time and reduce costs. There is also an alternative approach to lean production that is changing, Toyota, where it intends to establish a "flow" and a continuous flow of work through the organization of work, which is not based on the elimination of losses. The difference in both approaches is not in the goals, but in the way how to reach them. The advantage of this second approach is that it requires a complete (systemic) approach, while

in the first approach we focus only on one narrow part of the problem in the production process [2]. There have been only a few aims to actually calculate readiness factor. Mostly it has been based on the level in the industrial revolutions, but that can really be adequate to decide is the certain company ready or not for the new concept. Figure 1 shows four industrial revolutions.

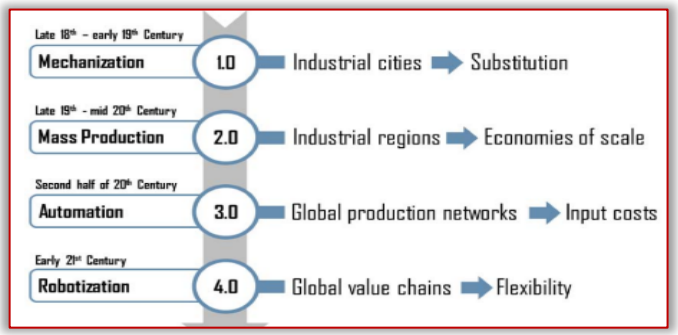

Figure 1. Four industrial revolutions [3]

Through surveys that have been carried out [4], optimization of production and business processes has become the target point for all of the enterprises to strive. Traditional analytical tools used to increase process efficiency and reduce costs have been mostly focused on physical processes that participate in all production stages, while alternative methods of increasing efficiency consider the process as a whole and optimize the integration of each stage of production. The integration of all processes in an enterprise, in itself, has the primary goal of providing such a system that will provide the right information at the right time and in the right place. Today, lean actually represents every effort to achieve greater effects with less investment, exploring value from the customer's perspective, and on the basis of the obtained knowledge, processes are redesigned to increase the value. The socio-technical effects of global competition compel companies to develop and implement new product development strategies, in order to provide the customer with a high-quality product in the short term, with less cost and faster response to customer demand [5].

Observing the differences, traditional or mass production is considered as an outdated paradigm, precisely because there is no direct link between production and demand. On the other hand, lean represents a new paradigm, since the production of different models in small series directly meets the needs of customers, and allows the company to adapt to market changes more easily and quickly. According to [6], the smaller the series, the overall business process is easier and better run. Lean production takes place continuously, from a single-phase flow, emphasizing the optimization and integration of machines, materials, people and objects, which can be defined as a whole. The emergence of a lean production system is not related to the attempt to fully exploit traditional ways of production, but rather to answer the company's ability to survive in a highly demanding, rapidly changing and completely unstable modern market.

Table 1: Basic management principles [7]

	Traditional production	Lean production
Production planning	Forecasting (push)	Buyer order (pull)
Production Time	Supplies	Buyer order
	Long	Short
Size of series	Big	Small (continuous the flow)
Control	Based on samples (inspection)	All effects (on itself source, by workers)
Layout	Functional	In line with the movement product
Training workers	Low	High
Inventory turnover	Low (<7 crafts)	High (> 10 crafts)
Flexibility	Low	High
Purchase value sold goods	High (with tendency growth)	Low (with tendency decay)

If we look at the previous table and take into account all the comparisons between the traditional production systems and the lean system, it can be concluded that the introduction of the Lean concept increases the degree of automation, which in the traditional system is at a very low level, the functions of the system are turning to customers. Observing the presented differences, traditional, or mass-production is considered an outdated paradigm, precisely because there is no direct link between the pace of production and the pace of demand. On the other hand, lean introduces a new paradigm, since the production of different models in small series directly meets the needs of customers and allows the company to adapt more easily and quickly to market changes. Lean production takes place continuously, from single-phase flow, emphasizing the optimization and integration of machines, materials, people and objects [6].

MODERN PRODUCTION SYSTEMS AND THEIR FUNCTIONING IN THE REAL ENVIRONMENT ON THE EXAMPLE OF LARGE ENTERPRISES

Modern companies in the world that deal with large-scale and mass production mainly use line-production systems. The foremost question with such systems is whether the proper quality that is required on the market will be achieved and if it does not achieve what is needed to be improved in order to meet the relevant standards.

The world market dictates the conditions that need to be met so the product and the relevant system together

with the product can to penetrate the market. New Age demands both time and quality, the ratio of short time and high quality. According to this way of functioning of the market, most of the large companies that contain production are using linear-serial production.

From the aspect of linear-serial production, the theoretical claims about the quality for a little time are incomplete, and in this paper the research on the real case of linear series production was carried out. The serial, linear organization of the production process includes drives with specialized plants and devices in which a certain technological process exists in the form of a production process.

In this organization, production scheduling is conditioned by the existing technology, and the equipment in the process is arranged in the line order given in technological processes for the production of products. The linear-serial form of organization of production is characteristic of the activities such as food industry, dairy, pharmaceutical, textile, leather, automotive, and metallurgy [8].

According to the research carried out at the Novares Serbia factory, which belongs to the companies that produce plastic parts for car bodybuilders in large series, the following results on the quality, productivity and efficiency of line-production have been achieved.

Figure 2 shows the percentage of examined workers in order to create an image of the eloquence of the response.

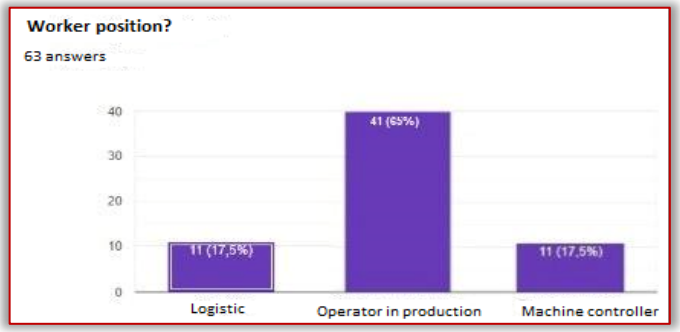

Figure 2. Percentage of examined workers

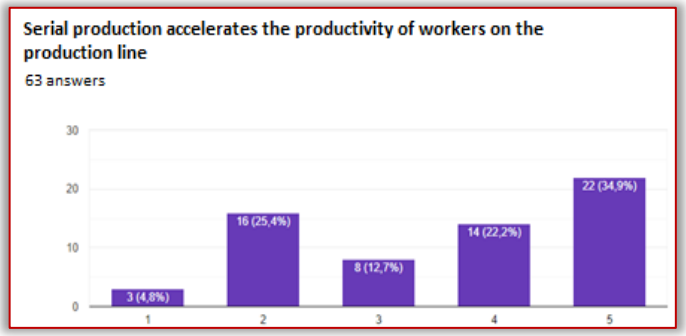

Figure 3. Display of worker productivity on the production line

Figure 3 gives a graphic representation of the productivity of workers on the production line.

It can be seen from the graph in Figure 3 that the worker productivity on the production line is mostly produced by serial production, since 63 respondents 23 answered with a score of 5 (34.9%), while 14 responded with 4 (22.2%), which sums up the majority of opinions on the side of the positive impact of serial production.

In Figure 4 the answer to the question about the relationship of efficiency and effectiveness in this type of production lines is presented.

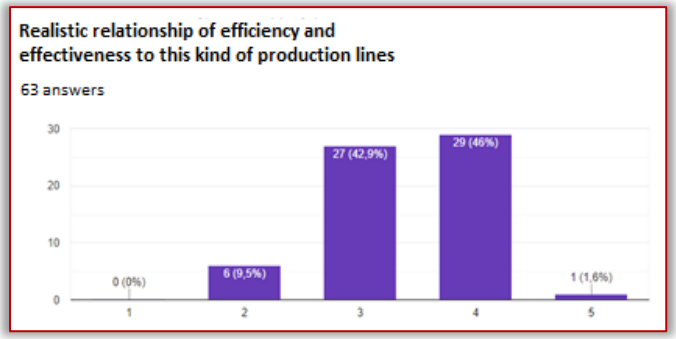

Figure 4. Efficiency and efficiency ratio on line serial production lines

According to Figure 4 and the graphic representation, it can be concluded that the ratio of efficiency and effectiveness to a satisfactory level using this type of production, as 29 respondents gave a high grade of 4 (46%), while a good majority of the majority gave a mean score of 3 (42, 9%).

The graphic representations in the previous figures can be used to answer the fact that linear production by production increases the efficiency of production, where it can be freely stated that according to the given answers this hypothesis can be confirmed, and it is concluded that there is enough space for the ratio of efficiency and effectiveness in this type linear serial production can increase.

Figure 5 gives a graphic representation of the effect of a routine action that requires linear serial production to the very quality of the product that comes out of such production.

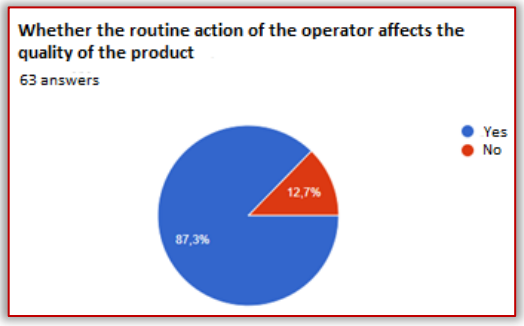

Figure 5. Pie display of the impact of routine on quality

CONCLUSIONS

Basic knowledge of modern production management, basic theoretical knowledge about Lean concept of production and its influence on production parameters are set out through the work.

The Lean concept is a wide system totally implemented in production systems. It takes time, resources, personnel to establish a stable system that is capable of implementing the Lean concept and ultimately applying it to production systems. Until such a type of production is applied in detail, production losses will continue to occur, as in most large production companies we have the presence of line-production, which, as a final result, besides the standardization, has large losses, which are reflected in the decline in quality due to the achievement of the appropriate time frames in which it is necessary to dispose of the product on the market.

The stack of combined production systems cannot combine productivity and effectiveness, in order to improve this relationship as already mentioned, it is necessary to first analyze all aspects of the nature of production, and then thoroughly approach the introduction of new methods of production management, modern concepts that strive for the Japanese zero-error philosophy.

With a large number of existing, already established production systems, a very small percentage of the overall time spent and dedication in the business process of waste to activities that really add value to the end consumer (Figure 6).

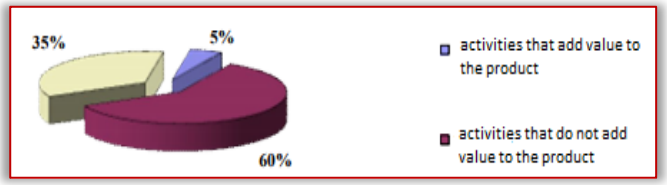

Figure 6. Framework structure of traditional activities of production system [7]

The basic advantage, that is, the basic novelty of the business system, in relation to all other business systems, is the insistence on eliminating all defects and all empty movements, without exception, in the entire business process. It is considered that the tolerance of any kind of disadvantage distorts the overall idea of a successful market operation, because one deficiency leads to the other and as a tower of cards, in a very short time, the market position of the company will be shaken, if not permanently disturbed. This, so called domino effect, in line with the lean concept of business, can be noticed by observing four categories of waste:

- primary category, excessive, unnecessary amount of production resources (labor, equipment, facilities), leads to the creation;
- secondary categories (in the opinion of many authors of the worst categories of waste), hyper production, which, then, leads to the emergence;
- tertiary categories, excessive stocks (additional workplaces obscure the problem of hyper production and increase the losses included in the opportunity costs), leads to the creation;
- quaternary categories, unnecessary capital investment.

Note: This paper is based on the paper presented at IIZS 2019 – The 9th International Conference on Industrial Engineering and Environmental Protection, organized by Technical Faculty "Mihajlo Pupin" Zrenjanin, University of Novi Sad, in Zrenjanin, SERBIA, in 03–04 October, 2019.

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