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**OPTIMALIZATION OF PRODUCTION PROCESSES IN THE ENTERPRISE
BELOS PLP S.A. IN BIELSKO-BIALA**

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Leading the production in the modern, turbulent environment close to the high level of competitiveness of product as well as in the era of globalization, becomes even harder than it occurs. Therefore new methods are being searched in the field of production management which should optimize it and lead to the growth of its profitability, however it does not have to lead to the maximization of profits.

Keywords: *Kaizen, Kanban, Lean Manufacturing, methods of production optimization, reduction theory, the effectiveness, 5S.*

Introduction

The enterprises and all the production processes that occur in them, that define the directions of their development, are constantly changing. The definition of so-called “turbulent environment” is strongly connected with it. Most of the modern enterprises are forced to function in such conditions. These conditions require the rapid adaptive changes- mainly technological and organizational ones.

Above mentioned phenomenon of “turbulent environment” is also connected with micro- and macro environment of each modern company that operates in the production zone.

The globalization of the economy opens a lot of new possibilities in the area of service and activity distribution feature serves a very important role. Such globalization processes affect the overall structure of industrial activities, such as export – import of products and services, or the relation between employment-unemployment, consumption – investments. Constant growth of global competition created the need of direction of all the production activities. Such activities should bring to a company a certain positive value, in the form of a profit/proceeds, in the form of solid product, satisfied customer or usage of physical and human resources or

“know how” knowledge.

Because of that Polish modern companies need to accustom the rules of Lean Management. Mainly due to the fact that they do the business with the companies from all over the world.

This article consists of three parts. The first part describes the company’s profile and all the theoretical aspects of the rules and methodology of lean. The second part is devoted to the results of the survey that concern knowledge and compliance with the principles of the lean by all employees of the company. The third, last part of the article focuses on the conclusions and the summary.

1. The characteristics of the company.

As mentioned before a lot of Polish companies are forced to initiate the lean management rules into their production processes.

In the second part of this article the findings of the research will be analyzed, as well as the data that was provided by the company BELOS PLP S.A. in Bielsko–Biała. The surveys were conducted among 70 employees of the company in April 2015. The questioned employees constituted of 30% of overall workers of the enterprise.

BELOS PLP S.A. in Bielsko-Biała is one of the few companies that managed to get through all the restructuring processes that took place in Poland after 1989.

Nowadays, it is the biggest manufacturer of high voltage accessories, medium voltage, low voltage in the eclectic power industry over 60 years. It is best known for the production of accessories for overhead lines of high voltage transmission from Silesia to Lodz [6].

In the next years activities of the continuous development within a company took place through its expansion and an idea of the business development, mainly because of the creation of the equipment for the first in Poland 400 kV line Turoszow – Czestochowa.

The last two decades have brought also many changes, mainly organizational, these have begun in 1990 by changing its form of functioning (state owned enterprise). In 1994 it was transformed into State Treasury Company. The next changes in the organizational structure consist of appointment of Two Business Units: in 2006 BU Cynkownia with BU Konstrukcje Stalowe and in 2007 BU Elektryczny with BU Osprzet Sieciowy.

At the same year, the strategic investor, the company called Performed Line Products, with its headquarters in Cleveland (Ohio, USA) has bought up 84% of Belos S.A. shares, thanks to what Belos entered into an international group PLP.²⁾

The position of a leader is strongly connected with the fact that Belos is in continuous collaboration with many design offices and research and scientific institutions. It is very significant, because of at least two reasons: it influences on the innovation and secondly according to E. Pająk the process of research and

development is responsible for the preparation of the production in the structural, technological and organizational area [1].

The various types of certificates, such as ISO 900 standards or Environmental Management System (ISO 14001) are one of the most important steps in the development of the Belos enterprise, its image.

1.1 The rules of lean management – theoretical aspects

Nowadays the accurate and effective organization of each production process, plays a leading role in the modern companies. Each of such a process can be disturbed by some kind of obstacles. That can be a reason of decrease in the efficiency of the process and quality of the product. Such factors include, among others, retrofitting of the machines, improper organization of workplaces, redundant operation (for example; transport operations) or finally so called: “human factor” – means the aspect if the work of each employee is well organized because excessive fluctuation of staff is present in many companies.

PN ISO 3534-2: 1994: mentions two types of consequences that interact on the process: random and special consequences [5].

During the production process some of above mentioned consequences may take place, and may contribute to the quality and time of the production. These may include: machine failure, faulty process control, errors of the machine operators and so on. It results in a poor quality of a product.

The most important thing is to exclude the defective goods at the beginning of the manufacturing process, not at the end of such process. Early detection of the errors allows a quick correction and prevent financial loss for the company [4].

Many of the so called disturbing factors can be eliminated thanks to appropriate methods, such as Lean Management.

These methods are not new, but without a doubt, they are still effective and contribute to the business activity.

The manufacturing process of Toyota is a prototype of the Lean Management Method. It was created after Second World War as a conglomerate of many methods, techniques, concepts and rules [2].

There are many methods when it comes to the deployment of the Lean Management in the enterprise.

The most commonly used are:

- SMED (the quick method of retrofitting machines)
- TQM (comprehensive quality management)
- POKA YOKE (prevent errors)
- JIT (the manufacturing method and providing inventory on time)
- Method of quality circles
- 5S (system of maintenance of order)
- TPM (system of maintenance of the efficiency of machines)

- VSM (Value Stream Mapping)
- Mapping of the processes
- KANBAN
- KAIZEN

The reduction of spendthrift is one of the many reasons why above methods should be applied. The types of spendthrift were already defined in the Manufacturing Process of Toyota. Its founder, the COE of the Manufacturing process, faced the issue of the lack of the recourses. The solution for such a problem was found and applied by many of the car producers. It consisted on the significant limitation of resources that are necessary for production, such as: employees, time, costs of investments, and so on.... [3]. He listed 7 types of spendthrift:

- Over- production
- Unnecessary transport operations
- Anticipation
- Inadequate processes
- Inventory
- Unnecessary movements
- Manufacturing defects.

1.2 The analysis of the survey results concerning Lean in the BELOS PLP company.

In the survey the emphasis was put on few important aspects connected to function Lean Management in the analyzed company.

They are as follows:

- the sources of knowledge of the lean rules by the workers,
- the will to get part in trainings in the Lean Management field by the workers,
- the attitude to the lean methodology,
- the knowledge about implemented lean methods,
- the effects (positive as negatives) of implementation of lean system in Belos PLP S.A. and its efficiency,
- the knowledge of the other methods of optimization of implemented methods in the company,
- the issue of adapting (or not adapting) to Lean Management rules in the everyday work.

The issue I have decided to consider by dividing the workers into 3 groups:

- the workers of higher level (i.e. management, the directors),
- the workers of the middle level (foremen),
- production workers.

Workers of the lower level of management represent 15% of the respondents. All of them have tertiary education and the knowledge of Lean Management. They have

also declared the will to take part in the trainings concerning the Lean Management subject.

When it comes to knowing lean method- all the workers from the analyzed group have known them while working in BELOS PLP S.A. – during the trainings 5% have known them from previous place at work. What is more, 100% of them show that the lean methodology is absolutely important for the correct functioning of a company.

As the arguments they have shown for example: lowering the costs, shaping company's culture (5%), increasing the efficiency, improving production processes and improvement of quality (7%).

The workers of the elaborated part of this article have specified positive and negative results of implementing lean rules.

In the group of higher level worker's indications toward positive effects were:

- a) higher quality of the final product – 33%,
- b) higher awareness of pro-quality – 33%,
- c) reduction of costs and higher competitive advantage – 67%,
- d) appreciable advantage of improvement of comfort of work and the environment of work – 100%,
- e) higher workers motivation and identification with the company successes - 34%,
- f) faster and fuller flow of information as all levels of management - 80%,
- g) higher efficiency of work – 100%,
- h) faster decision making – 85%,
- i) better customer service – 80%,
- j) growth of productiveness – 85%.

When it comes to negative effects of implementing lean rules, 86% of respondents have not shown any of such, while 14% have shown that they occur in badly set goals, not giving any results, but requiring engagement of certain products (people assets finance).

Taking into account the effectiveness of the lean rules in the company BELOS PLP S.A., 100% of workers of the higher level point mostly on the financial effects and as mentioned before progress of organization culture. All of them in their everyday work apply Lean Management and other functioning methods of optimization such as: TPM, WCM, TQM.

The second group make workers of the middle level of management. They are 30% of respondents. 32% of them have tertiary education and 68% vocational education (foremen, leaders).

Similar as in the previous group, all them know lean rules. As the source of getting this knowledge they have pointed – learning about it while working in the company BELOS PLP S.A. (75%).

37% - have learnt about it during trainings and 12% - received this knowledge from the co – workers.

50% of them have pointed lean methodology as absolutely necessary for the company. As the arguments they have mentioned: effective improvement of the overall company and lowering the costs. The rest of respondents (50%) declared, that it is for sure needed action, but the same time they have shown their doubts, concerning issues of production processes – which is production specification, big production assortment, too low production series and repeatability of orders for certain details every few days.

Striking is the fact that 25% managers, leaders and foremen declare that the attitude toward lean method is connected with the intellectual level of workers.

Personally, I do not think that the intellectual level has anything in common with positive or negative attitude to lean methodology but the will to change, accepting and using all the given norms and rules, not only those connected with lean method. Similar as in the previous group, also workers of the management sector have shown positive and negative results of Lean Manufacturing. It's positive effects are:

- a) higher quality of final product – 75%,
- b) higher awareness of pro - quality – 25%,
- c) costs reducing and increasing competition – 100%,
- d) perceptible improvement of work comfort and the environment of work – 89%
- e) increasing of motivation and identification with company's successes – 50%,
- f) faster and fuller flow of information on all levels of management – 76%,
- g) higher work efficiency – 89%,
- h) faster decisiveness – 78%,
- i) better customer service – 89%,
- j) growth in productiveness – 89%.

From the discussed group 85% did not show negative results of the lean method implementation. All the rest (15%) as the negative results have shown: too extortionate goals, and the fact that Kaizen “made” in their company rationalization movement.

All the respondents (100%) feel, that the lean rules functioning in their company are effective action – most often ground it with their own experience while implementing and using lean rules. 72% of them have pointed one more issue to important for all production companies – which is the support of production processes on each level.

In this group they have also took part in the trainings when it comes to using Lean Manufacturing rules in everyday work. 67% of workers do it in full range and 33% do it, but they point certain discrepancy, for example that the technology and the drawings of products are not always in line.

The third – last group make production workers. They are the biggest respondent group – 55%. Those workers in the number of 70% had vocational education, 20% of them secondary school diploma and 10% tertiary education.

The knowledge of lean rules was declared by 90% of production workers, lack of this knowledge show 10% of workers with vocational education only.

Among the sources of knowing the Lean Manufacturing they point:

- knowledge from the studies – 10%,
- knowledge gained during work in BELOS PLP S.A. – 42%,
- knowledge gained during trainings – 23%,
- knowledge gained from the coworkers – 25% - what is very positive in my

opinion, because it shows strong attachment with a company. It is also practical aspect one of the fourteen rules of Production System TOYOTA – the rule N^o 9, which says: “Support Leaders, who understand work and live with general concept of the company and teach others it’s rules”

If the need to take part in the Lean Manufacturing trainings occurred, 73% of production workers would take such chance and took part in it.

For the reason to use this method in the company BELOS PLP S.A. – 78% of production workers have pointed: quality improvement, awareness increase among workers, improvement of manufacturing time indicators and standardization. Workers (22%), who have pointed that lean methodology is important, but at the same time they had certain doubts, have indicated that this method takes a lot of time by the specification of certain elements of the process, what impede its use as well as not prove correct during small production parts.

Due to the fact that production workers are direct participants of the process, their opinions concerning positive and negative aspects of Lean Manufacturing constitute important input in constant perfecting of the company.

They have pointed:

- a) higher quality of the final product – 67%,
- b) higher pro - quality awareness – 30%,
- c) costs reduction and the increase of competition predominance – 30%,
- d) perceptible improvement in comfort of work and the environment of work – 82%,
- e) increase worker’s motivation and identification with company’s successes – 39%,
- f) faster and fuller flow of information on all levels of management – 48%,
- g) better work efficiency – 70%,
- h) faster decisiveness – 66%,
- i) better customer service – 79%,
- j) increase in productivity indicators – 64%.

80% from the respondents did not show negative results of implementing lean

method, whereas 20% mention here not full flow of information by workers of higher level, discouragement of workers and low flexibility.

To the effectiveness of lean method, 100% of workers are convinced, showing for example: improvement of production processes (as well as workers).

90% of workers have been trained in lean system. The lowest percentage in the analyzed group declare using Lean Manufacturing in everyday work – 55%. Those who do not use it name here: lack of possibility (but we do not talk here about such things) and lack of real time.

Summary

Lean Manufacturing in BELOS PLP S.A. in Bielsko-Biala has been functioning since 2006, when the Board of Directors decided to implement them. This process, as I mentioned before, the same in this case was not short term decision, for instance 5S, SMED, take 24-month implementation time. The rest of actions – are in the accordance with the principles of Toyota – all the time improved, even by every month audits of the person responsible for it.

According to the representative of the Board, Lean Management gave the positive motivation to work better for workers of each level – even without motivation system by using Lean Management. Respondents declare increase in the effectiveness of work, better final product and better customer service.

This study leads us to ascertain that all the respondents are convinced about effectiveness of implemented rules of Lean Management. All the same time, we observe the need to further actions, corrective and educational, for the reason of only 55% of workers who declare to use Lean Manufacturing method in everyday work (production workers) and 67% in the group of higher level workers.

In the company, next to functioning Lean Manufacturing rules new TOC (Theory of restriction) started to be implemented – which is to supplement already functioning rules of Lean Manufacturing.

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