

dr inż. Joanna Rut

E-mail: j.rut@po.edu.pl, ORCID ID 0000-0001-9014-8874, tel. 793 164 105
Opole University of Technology, Faculty of Production Engineering and Logistics,
Department of Logistics

dr inż. Monika Wengel

E-mail: m.wengel@po.edu.pl, ORCID ID 0000-0003-0981-701X
Opole University of Technology, Faculty of Production Engineering and Logistics,
Department of Logistics

Improvement of the manufacturing and logistic process in the researched company

Doskonalenie procesu produkcji i logistyki w badanym przedsiębiorstwie

Manufacturing and logistics process in conditions of the contemporary market must be multidimensional and multicriterial. Activities associated with production and logistics are closely related. Improvement of the manufacturing process and logistics areas in enterprises has a great importance and can bring a lot of benefits. Each optimization of the manufacturing and logistics process should be analyzed, adapted to needs of the given enterprise and successively implemented. The article describes proposals to improve the manufacturing and logistics process in researched enterprise, through identification of functional problems. In addition, indicates important possible benefits, resulting from the use of tools, systems and techniques to optimize production and logistics areas in the organization.

Key words:

improvement, manufacturing process, logistics, IT systems, Lean production

W warunkach współczesnego rynku proces produkcji i logistyki musi mieć charakter wielowymiarowy i wielokryterialny. Działania związane z produkcją i logistyką są ze sobą ściśle powiązane. Doskonalenie procesu produkcji i obszarów logistyki w przedsiębiorstwach ma ogromne znaczenie i może przynieść wiele korzyści. Każda optymalizacja procesu produkcji i logistyki powinna być przeanalizowana, dostosowana do potrzeb danego przedsiębiorstwa i sukcesywnie wdrażana. Niniejszy artykuł przedstawia propozycje doskonalenia procesu produkcji i logistyki w badanym przedsiębiorstwie, poprzez identyfikację problemów funkcjonalnych. Ponadto wskazuje istotne możliwe do uzyskania korzyści, wynikające z zastosowania narzędzi, systemów i technik optymalizujących obszary produkcji i logistyki w organizacji.

Słowa kluczowe:

doskonalenie, proces produkcji, logistyka, systemy IT, Lean production

Introduction

In the enterprise, above all, effective providing the reliability of machinery and devices, as well as proper organization of the material and information streams flow is an attitude of smooth manufacturing and logistics process function.

Activities associated with the production and logistics are closely related. The manufacturing process largely relies on smooth logistics function, and the logistics has an important role in integration of manufacturing operations.

Management of the manufacturing and logistics process in enterprise is associated with constant search for improvement possibilities. One of the most important optimization elements of the manufacturing and logistics process in enterprises is the use of wide improvement possibilities by development tools (i.e. Lean Production), IT systems and management techniques.

Implementation of improvement tools, methods or IT systems enables to improve the efficiency of enterprise function in many its areas at the same time. In addition, enables to gain full control over the

enterprise and provides further undisturbed development (Chwesiuk, 2011).

It should be noted that currently, in contemporary enterprises the primary determinant of success is the efficiency of activities. This efficiency includes proper planning, optimization and synchronization of material, human, financial, and information flow (Jaworski, 2009, p. 23-39). Therefore, it is reasonable to say that on the competitive market, the enterprise success depends on its ability to adapt to constant changes in the environment. It is necessary to survive and develop in the situation of constantly changing conditioning and needs of the emerging market. The change constitutes a development foundation for the contemporary enterprise, it is imminent and inevitable (Knap-Stefaniuk, 2010).

An aim of the study was to present proposals to improve the manufacturing and logistics process in researched company, through identification of functional problems, as well as to present relevant and possible to obtain benefits arising from the use of tools, systems and techniques to optimize production and logistics areas in the organization.

Systems, methods and techniques supporting the production and logistics in the company

Production and logistics management in conditions of the contemporary market requires to connect them into one decision-making processes. This process must be multidimensional and multicriterial, taking into account various aspects of the structure and specificity of the organization function. A very large number of data from different sources is needed for its good planning and efficient operation (Parys, access 18.12.2016). Such data can provide only advanced IT systems including Enterprise Resource Planning (ERP), facilitating decision-making Business Intelligence (BI), Material Requirements Planning (MRP), monitoring production processes Manufacturing Execution System (MES), industrial automation control Supervisory Control And Data Acquisition (SCADA), supply chain management Advanced Planning Systems (APS), Warehouse Management System (WMS), Product Lifecycle Management (PLM), as well as Computer Integrated Manufacturing (CIM). Amongst methods and techniques as the effective tools to achieve satisfactory results by enterprises, it is necessary to mention the wide range of Lean production tools (which lead to numerous positive effects and enable to develop many innovative solutions), as well as benchmarking, controlling, procedural management,

competence management or knowledge management.

Presented systems, methods and techniques are just some tools regarded as the most useful in the production and logistics management, used in the contemporary enterprises. All the systems, methods and techniques that support the production and logistics, largely simplify and organize the enterprises function. However, it is necessary to remember that caution is required in the selection of tools to improve the production and logistics process, because the production is a very demanding area of business, and logistics is an important element of business management. Therefore, implementation of changes with improving tools should be well thought out and properly selected for individual enterprises.

Analyzed company

The analyzed manufacturing company was founded in 1999, currently employs 179 people. The enterprise specializes in large-serial and average-serial of production of die-cut parts, bent and deeply pressed. The enterprise offers also comprehensive services in the scope of plastic processing of each type of steel for different industry branches and laser cutting of any materials on machines with the highest technological level, providing high accuracy and quality of cutting edge. The main company's strategy is high quality of products.

Functional problems of researched company

There have been diagnosed with many functional problems in the manufacturing company, despite its many years position on the market, which cause disruptions in the production and logistics process. The study was carried out in order to verify the common problems, involving the functional and system evaluation of the enterprises.

The lack of IT system intended for business management was one of main functional problems of the enterprise. In the enterprise formally has the register data system, but the level of using collected information was very low and ineffective. Data from the manufacturing process and logistics area were entered manually to simple database Access, in which it was possible to create simple reports (based on copied data). The enterprise used also spreadsheet Excel to collect data, which were also entered manually. Recording necessary production operations from planning, manufacturing

Table 1

Functional problems in the manufacturing and logistics process of researched enterprise. Source: Own elaboration

Problems in the manufacturing process	Problems in the logistics area
<ul style="list-style-type: none"> ■ poor organization of the production process, ■ problems in production process control, in real time, ■ problems in establishing parameters of the production process, ■ inefficient use of machinery and devices, ■ problems in correct, reliable and fast flow of information from technological lines, ■ lack of used tools and systems streamlining the production process, ■ no functional strategy, ■ delays in order processing, ■ lack of software responsible for records of failures and malfunctions, as well as maintenance management of machinery and devices, ■ problem with maintaining production continuity, ■ problems with increasing work efficiency, ■ production of products to the warehouse. 	<ul style="list-style-type: none"> ■ congestions in liquid flow of products ■ lack of close cooperation of the logistics with production department, ■ lack of efficient physical delivery and handling components in the manufacturing system, ■ lack of IT system supporting the logistics, ■ problems in correct, reliable and fast flow of information in logistic processes, ■ problems in storing and warehousing of goods (semi-finished products, sub-assemblies and finished products), ■ problems with supplies and manipulation of materials and finished products, ■ lack of optimal shaping supply chains from the moment of acquiring raw materials, through their processing and distribution, ■ lack of automatic product identification, ■ too long time of the materials and products flow.

processes and quality control, as well as logistics area, was non-optimal and insufficiently. In addition, everyday manual data entry was more troublesome, and there have been more errors and gaps in registered data. Access to data saved in the database Access and Excel spreadsheet had only a few employees. Information from one department to other (production and logistics) weren't provided in a satisfactory way, which was associated with many problems such as inconsistency of data transmission or duplication operation. This also generated additional costs and lack of development possibilities of the enterprise.

Diagnosed problems in the manufacturing process and logistics area were presented in table 1.

Functional problems presented in table 1 are weak points of the enterprise, which may decide about the effective function and efficient of the enterprises. However, it is possible to eliminate these weaknesses, using available methods, systems and tools that optimize manufacturing process and logistics area in the researched company.

Experience, high quality of products, flexibility in adapting to the requirements of clients and competitive prices are strong points of the enterprise.

Conducted analyses show among others unused potential (possibility, ability, efficiency and productivities), which lies in possibilities of the enterprise function and correct implementation of the manufacturing and logistics process. It is possible to activate the unused potential by implementation of improvement tools in individual stages of the manufacturing and logistic processes.

Improvement proposals of the manufacturing and logistics process in researched company

Amongst the proposal to optimize the function of manufacturing and logistics process and the entire enterprise, it is proposed to implement an integrated IT system of ERP (Enterprise Resource Planning), which has in its structure expandable modular. The ERP system would streamline the business management, as well as reliable and credible information flow in the manufacturing process and logistics area. The result would precipitate previously performed works through their automation, more effective production planning and reduce the stock levels. The ERP system would also enable the control and to carry out logistic processes in a full area of the company activity. Moreover, the ERP system would give a new shape of the enterprise function, as well as would contribute to better, automatic generating orders and reports or archiving of data.

Another proposed solution is to use methods and tools of lean production. Amongst useful for the enterprise to improve the manufacturing and logistics process at the same time, it is proposed to implement a few model tools such as:

- Just in Time, it is an operation concept consisting in providing materials and other resources for production in specific quantities and exactly in time, in which there is a demand for their use. Just in Time enables to synchronize all activities in the production process. The main advantage of Just in

Time is the possibility of significant savings to reduce stops of employees and machines, and to minimize the costs of supplies of the work in progress.

- TPM (Total Productive Maintenance), it covers the entire life cycle of productive facilities with its task and enables to create a stable system to prevent losses in the enterprise. Implementation of TPM system in the enterprise would increase efficiency in the use of machines and devices by eliminating waste associated with their use. It would also reduce the number of unplanned stoppages and failures, as well as it would increase productivity, improve quality and reduce production costs.
- SMED (Single Minute Exchange of Die), it enables to reduce the time of rearming machines, devices and production processes. The SMED technique would contribute among others to improvement in indicators of using working hours of machines and devices, as well as manufacturing capacity of the enterprise, increasing the flexibility of production system, reducing supplies, and increase the production by a significant reduction of in-process and finished products.

Improvement of the manufacturing and logistics process by application of lean production tools would enable to obtain numerous positive effects. Implementation of lean production would improve the productivity of enterprise, contribute to limit the waste and streamline many processes carried out in the organization. Lean production tools would also enable to develop various procedural and organizational solutions. Moreover, effective application of lean tools production would organize and simplify material and information flows in the enterprise, eliminating activities not-creating added value.

Implementation of IT systems is a next proposal to improve the manufacturing and logistics process, which may contribute to improve the implementation of many performed duties. It is proposed among others:

- WMS (Warehouse Management System), it is a solution that enables coordination of logistic works, it increases the storage efficiency, reduces costs through full support of logistic processes and elimination of errors in completion. Implementation of WMS system would contribute to faster receiving and issuing goods/products, it would enable to conduct analyses and simulation in order to estimate the optimal demand for materials.
- MES (Manufacturing Execution Systems), it is a source of reliable knowledge of the production lines. The MES system enables to track production processes, current production process, productivity of machines and devices, and the

quality. Application of MES system would contribute to the improvement of production capacity and timeliness of supply, as well as would increase the possibility to support operational events of the production process and production management in real time.

- SCADA (Supervisory Control And Data Acquisition), it provides discreet control and supervision of the production processes. Implementation of SCADA system would solve many functional problems in the enterprise, enabling immediate flow of information from technological lines, current inspection of technical condition of the machinery and devices, as well as graphical visualization of production process control in real time.

It is also proposed to apply RFID system (Radio Frequency Identification), which would allow for wide spectrum of activities, providing immediate and precise tracking information in real time, supporting the supervision of production process and products flow at the same time in logistic processes, eliminating temporal losses and costs associated costs.

There have been proposed many improvements of the manufacturing and logistics process in researched enterprise. In order to designate the order of implementation of the proposed solutions, functional problems were grouped into areas and then on the basis of matrix have been developed synergy objectives, table 2.

By analyzing the results in Table 2, there has been proposed enterprise development strategy, in which improvement tool of the production and logistics function, at the same time proposed to implement in the first place is an integrated ERP system. Next, it is proposed to apply the operation concept of Just in Time, MES and RFID. Other improvement solutions that could be applied in the improvement process are TPM, SMED, WMS, and SCADA.

It should be noted that proposed improvement tools don't constitute the final solution for researched company - the improvement process is a continuous process and requires continuity, i.e. planning, organizing, implementing and control. Therefore, implementation of each of these tools must be properly planned and organized, and verification analysis is required after the implementation, i.e. function control.

Today, the success of many enterprises on the market is continuous improvement of the processes in organization. It is necessary to remember that adaptation of the enterprises to variables market conditions is unusually difficult and laborious, and improvement of the manufacturing and logistics process requires thorough analysis, providing appropriate selection of solutions that enable to achieve higher level of the enterprises function.

Table 2

Matrix of synergy objectives — proposals for implementations stages of the improvement tools in researched enterprise. Source: Own elaboration

Areas requiring improvement	Proposed improvement solutions							
	ERP	Just in Time	TPM	SMED	WMS	MES	SCADA	RFID
Information flow	+	+	+		+	+		+
Materials and/or products flow and manipulation	+	+			+			+
Use of machinery and devices			+	+		+	+	
Order processing	+							
Automatic identification of products								+
Control of manufacturing process		+		+		+	+	
Verification of logistic processes	+							
TOTAL	4	3	2	2	2	3	2	3
IMPLEMENTATION STAGES	1	2	5	5	5	3	5	4

Zródło: Opracowanie własne na podstawie

Production and logistics in all enterprises are among the most strategic areas of the business. On them depends the production of finished products according to demand, i.e. on time, in required quantity and quality, as well as with the optimal costs.

Summing up, each of the following proposals to improve the manufacturing and logistics process in enterprise can bring many benefits. It is not recommended to implement all proposed solutions and improvements at the same time. Optimization of the manufacturing and logistics process in enterprise should be implemented in stages and gradually, and must be "custom-made" i.e. adapted and fitted to individual needs of the given enterprise - there is no single optimal development strategy for all companies. In determining the enterprise development strategy, it is also necessary to take into account the organization culture of the enterprise, i.e. human relations in the enterprise.

It is necessary also to remember that before any implementation of the optimization tools, a precisely analysis should be conducted of the production and logistics processes, and determine what activities will generate the best results (Trojanowska, Koliński, 2014, p. 225–240).

Activity of the enterprise and organization of the manufacturing and logistics process constitute the system of communicating tubes. The organization of manufacturing and logistics process should be based on regularities, interdependences in real production and logistic processes, as well as experiences that enable to determine appropriate tools and IT systems, which improve areas requiring changes (Staniewska, 2015, p. 721–727).

Significant benefits possible to obtain by implementation of proposed improvement solutions

Notable benefits, which the enterprise could achieve by applying proposed optimization solutions to improve the manufacturing and logistics process, is an increase of efficiency of the manufacturing and logistics process in enterprise, as well as reduced costs and delays resulting from inefficient information flow. Further benefits include integrated it system of erp that enables fast and simple access to the information in real time. Next significant benefits after implementation of proposed systems type tpm, smed, mes is rational use of resources, more efficient supervision of machinery and device function, more efficient management of equipment, machines and devices, recognizing and eliminating errors and increasing the productivity. The rfid technology would enable to gain benefits in a form of clear picture of products and information flow in the enterprise, as well as would help in elimination of errors in individual processes. Implementation of just in time technique would provide benefits in a form of supplies directly to the production line (supply of parts and components at the right time and place), it would also reduce costs associated with the storage of stocks and eliminate the causes of losses resulting from overproduction. The wms system would provide benefits in a form of efficiency increase in warehouse operations, automatic stowage of goods, reduced logistics costs, optimized distribution processes, supervised logistics chain and elimination of errors in the completion and reduce delivery time. Implementation of scada would contribute to gain benefits in a form of establishing

parameters of the manufacturing process and their analysis, and by comprehensive collection, archiving, processing and use of production data, the enterprise would get an easy presentation of data on the current and historical (trends), as well as reporting (daily and seasonal), generating informational messages, warning and alarming, as well as exchange of data with other applications.

Conclusion

An aim of the study was to present proposals to improve the manufacturing and logistics process in enterprise, through identification of functional problems, as well as to present relevant, possible to obtain benefits arising from the use of tools, systems and techniques to optimize production and logistics areas in the organization.

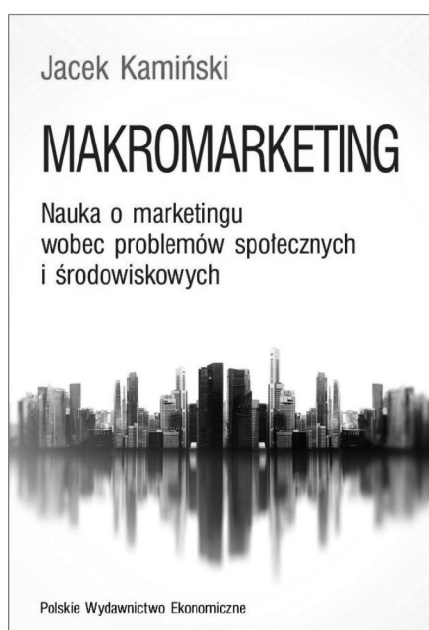
An analysis has shown a variety of functional problems related to production and logistics process. Analysis results indicated also the functional problems in the entire management of enterprise. There has been proposed a variety of development solutions in order to improve the function of individual areas, which could largely streamline the enormity of actions and activities that occur in individual processes of the enterprise. These improvement proposals are not the final solutions in terms of optimizing tools. Application of proposed solutions will certainly contribute to achieve notable benefits for the enterprise and will be fundamental for proper and efficient enterprise function.

Summing up, in each enterprise, even in the best prospering, the manufacturing and logistics process requires constant improvement that does not end with achieving the deliberate objective. It is necessary to constantly raise the bar by increasing the company standards and processes.

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PWE poleca



Makromarketing jest obszarem nauki o marketingu, który bardziej niż marketingiem jako funkcją zarządzania i narzędziem menedżera jest zainteresowany społeczną i środowiskową rolą marketingu. Traktuje on marketing jako proces społeczny, główny akcent zainteresowania kładąc na oddziaływanie marketingu na społeczeństwo oraz społeczeństwa na marketing.

Książka jest jednym z nielicznych i pierwszym na polskim rynku wydawniczym opracowaniem z zakresu teorii marketingu oraz historii myśli marketingowej poświęconym makromarketingowi. Jej głównym celem jest przedstawienie istoty, historii, przedmiotu i zakresu makromarketingu jako części nauki o marketingu oraz ukazanie roli, jaką spełnia on w jej rozwoju, a także szans, jakie w związku z rozwojem problematyki makromarketingowej stają przed nauką o marketingu.

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