PROJECT OF RATIONALIZATION IN THE INVENTORY MANAGMENT OF MANUFACTURING ENTERPRISE

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Abstract: *The article presents the project of rationalization in the process of inventory management in the manufacturing enterprise. The project runs in two phases. The first phase presents the transition of management of the PUSH to PULL system, setting up Kanban stock management system. Problems are revealed in the process of inventory management whose solution provides the second phase of the project. Creating the model of stocks management there are applied: ABC analysis, XYZ analysis, management of stocks systems Kanban, Order levels, Random acquisition.*

Key words: *ABC analysis, XYZ analysis, Method of operative levels, PUSH system, PULL system*

1   INTRODUCTION

The dynamic and constantly changing in the market environment in conditions of competition in the worldwide basis requires of the companies to improve and streamline their processes constantly. Many companies have problems to survive. Ignorance of the trends in management, lack of know-how leads to their ending. The rescue brings methods of management based on the PULL system and building a lean company in order to reduce costs and increase profits.
The design of an effective system of inventory management and consequently its implementation reflects the managerial skills of top management as well as the efforts of the company to integrate itself into the structure of modern companies. [1]

The stocks are undesirable elements in the logistics chain. We have to manipulate with every supply in the storage area, it is necessary to heat, light, keep records, to have the dead capital in them, etc.
Streamlining of the organization and management of stocks in the company is one of the most important tools reducing overall costs. Rationalization means to form the most suitable and the best conditions for realization of the planning, transport, storage, etc. [2]

For maintaining the competitiveness of businesses are forced to draw attention to the processes of inventory management. In order to reduce the stocks, they implement the inventory control systems (Kanban, JIT).

2 THE   ORIGINAL PROCESS   OF INVENTORY MANAGEMENT IN MANUFACTURING ENTERPRISE

The company deals with the production of the components in the electrical industry. The company is divided into three productive departments aimed to the types of manufacturing components. Two departments produce the final products and the third department is their internal supplier of plastic components.

For coverage of varied range of manufactured products there are over four thousand items of material in the company. The stocks in the production process are located in production cells.

Materials for each department were managed by the logistician of the department using MRP in business information systems.

Structure of stocks in the company according to the position in the logistics chain:
- stocks of input materials
- semi-finished stock and work in process
- stocks of finished products
- other auxiliary supplies and indirect material

Structure of stocks by way of acquisition:
- internal parts
- external parts

For the material requirements planning was used ABC analysis. It defined the strategy for achieving the target, inventory turns. Updating took place twice a year. According to these rules, logistician recalculated manually the ordering level and quantity which was set up in the information system for each material. The ordering of stocks ran in the PUSH system in the business information systems. After placing the order into the system the needs for the material were generated according to the bill of material and created in the reservation system for material. When the state of stocks in the system fell to the ordering level, the system generated a request to purchase the material. This management did not take account of material availability, capacity, or other factors which might affect the requirements of production. It planed only material resources generated by the delivery time and the requirements of production.

The inventory management by PUSH system worked only in the information system. It means that it worked with data setting in the system and they were seen only by a logistician. In practice it often led to discrepancies in the physical state of stocks, which can led to the loss of material. It could be the reason for the late ordering of material or vice versa, to over stockpiling.

The entrance of company into the international corporation, the company took the duty to implement tools of continuous improvement into the management. The management of the company was transferred to PULL management system. Management strategy for the company was formulated on the basis of "Toyota Production System" (TPS). It was the

complete system for achieving, maintaining and maximizing of the business success of the company. It was based on detailed knowledge of customer requirements, disciplined using facts and objective data, statistical analysis and continuous efforts for effective business processes. The basic tools of this system were:

- 5S - basic rules to ensure purity, productivity, quality and comfort in the workplace,
- standard layout – the organization of the manufacturing cells in a U-shape in order of work operation, definition of labour standards,
- material process - the introduction of Kanban management of stocks,
- SMED (Single Minute Exchange of Die) is a systematic process for minimization of downtime,
- And others... [2]

TPS tools were putting into each production through Kaizen events. Visual tools made it easier to monitor the improvement of productivity and the customer service as well as the reduction of stocks.

3 PROJECT OF RATIONALIATION IN THE PROCESS OF STOCKS IN THE MANUFAKTURING ENTERPRISE

Rationalization means to form the most suitable and the best conditions for realization of the processes. In the management of stocks system PULL according to TPS presented mainly the implementation of Kanban management system. The aim of Kanban system was to ensure that material circulated constantly the whole enterprise at a lower total cost of production.

The first phase of the project was made by the implementation of Kanban system gradually into each production cell in the production departments of the enterprise. By Kaizen events were ensured the participation of workers who worked directly in the production with Kanban system (responsible logistician, operators, technicians, warehouses and others). This method ensured thorough familiarity with the system functioning, training as well as the first obtaining practical experience.

The realization took place in the following steps:
1. **the creation of a database for input material** (identification code, name of material, supplier, delivery time, location of storage, usage, ABC analysis…),
2. **the calculation of the amount of pull signals for each product** (the number of Kanban cards in the loop), calculated by the formula calculator Kanban in database,
3. **Kanban system integration with enterprise information system** – check-date,
4. **creating Kanban cards** – pull signals – visual signals,
5. **setting up a central warehouse in the production cell, material marking by the method 5S,**
6. **the implementation of Kanban cards to materials**, creation of Kanban board – the creation of a visual management,
7. **the definition of Kanban rules** – to ensure the functioning of the system.

The functioning of Kanban management of stocks system meant that management and ordering of materials were made by the operators directly in the production on the basis of visual management. In the enterprise were used Kanban cards with the barcodes. Each order quantity had one Kanban card. An empty place was a signal for new ordering of the material. Each material in the warehouse had only one location to ensure the transparency of storage

reserves and eliminate surplus stocks. The required amount of stocks had precisely defined and market area according to the size and ordering quantities.

The change of the control to PULL system had many positives. The achievements of using Kanban system were:
- decrease in the stock level,
- reduction of ordering quantities,
- decreasing delivery time,
- elimination of waste material – the material was stored only on one place,
- ordering of material by Kanban cards – made the ordering material at the time of actual consumption,
- delegation of inventory management directly into production – each production cell controlled its own stock.

Kanban calculator calculated the number of required Kanban signal and average inventory levels to which the stock declined which quantified the potential of stock cutting. The calculation was based on the entered data such as order quality, delivery time and material usage. Changing some of parameters the calculation of signal could change. Decentralised implementation of production cells caused the formation of many databases with Kanban calculators. Updating of Kanban signals settings, especially when the usage changed very often, it was difficult and impossible.

To date the information system did not support re-calculation of Kanban formulas. The other possibilities for improving the process of inventory management were opened.

The second phase of the project

The amount of storage reserves was one of the key indicators of the company, which was annually included into the action plan of the firm. Therefore it was devoted constant attention to this one. The high value of the potential for reducing the inventories (difference between actual an average inventory level) was still running high. The company was forced to implement further steps to rationalize the process of inventory management.

The team of logisticians and hoppers was made up in each production departments. It was led by the project coordinator who was responsible to a manager of logistics and marketing.

The realization of the second phase of the rationalization of the inventory management took place in the following steps:

1. The creation of a database of materials for the whole enterprise
Necessity for solving was information. The database contained data of all materials in the enterprise:
 - *identification data:* ID code, material name, production department, production cell, supplier, the logistician in charge, ...
- *material parameters*: quantity in package, ordered quantity, delivery time, consumption, ABC and XYZ analysis, method of management in action, Kanban set up – nr. of Kanban cards, ...
- *Kanban calculator* – the patterns for calculation of Kanban cards,
- *stock levels* – actual stock level, design stock level, difference actual vs. design.

Database in the form of a chart ensured:

- clarity of data (it divided the data according to categories, enabled to add more categories),
- simplicity and speed of calculations for stock management (order point, nr. of Kanban cards needed),
- calculation update after every change of parameters,
- simplification of work for logisticians,
- quick access to the data for checking and evaluation of changes in stock level.

2. Kanban audit
As a part of the system performance was delegated to the production, training and discipline of the workers following the rules belongs to the maintenance of an efficient system. This was to be ensured by continuous inspections by the means of audits.

3. Purchasing policy definition
For a wide variety of product portfolio, kinds of material needed and variety of their needs, it was not appropriate to use just one type of stock management, which might have had a negative effect on low-turnover and irregularly used materials. However these can cause long-term negative impact on the stock levels.
To evaluate the regularity of the material consumption a XYZ analysis was carried out. Expansion of stock level division enabled making the purchasing policy more efficient and to define the most economical means of acquisition.

Means of acquisition
From the results of ABC and XYZ analysis it was clear that the most significant items for making the processes more efficient were the ones with regular X and Y consumption. For economical effect it was A and B items. Based on this, following purchasing policy was specified according to the chart 1:
- **Acquisition on stock** – The A, B and the regularly used C parts were purchased on stock. It refers to supplying the production in constant dimensions. Ordering was ensured by Kanban system mostly. The items that were for technological or any other reason not possible to manage by Kanban were ordered by PUSH information system by means of the method of ordering levels,
- **random acquisition** refers mostly to C parts with seldom used. The material supply was managed immediately after the need had occurred.

Material class	A	B	C
X	Kanban	Kanban	Stock
Y		Stock	
Z	individual purchases	individual purchases	random aquisition

Fig. 1 *ABC vs XYZ in Purchasing Strategies for Material Classes Source: [Reinwald, 1991] [3]*

4. Observing, measurement and supervision of stock levels
Supervision was a key to successful management. When managing supplies, stock levels were observed:
- **stock value** – measurement on daily bases,
- **average stock value** – average stock value that was supposed to be reached while following the system of management, it was updated after any calculation of the system,

- **actual vs. average** – the difference between the actual and average value of the stock, which represented a potential for decreasing the stock level. Evaluation and countermeasures were analysed on monthly basis. It ensured discipline while following the rules of management system and continuous work on decreasing and improving management of stock.

To create an opportunity for further improvements of management it was necessary to work out central management of stock. Creating a multiple database an internal information system for the company was made. It provided simplification of work for both the logisticians and the purchasers. As a means of supervision it revealed issues in stock management that were to be eliminated.

4 CONSLUSION

Creating of a thin company means an infinite journey of continuous improvement of its processes.

All the methods described in literature so far were based on the description of systems working in the companies. However copying and implementation of the methods brings some issues with their efficiency. To make them efficient it is necessary to adapt them to the conditions of particular company.

Introduction of Kanban system into the stock management has brought more efficient process of stock management as well as improved economical indicators.

Turbulent market changes in demand require prompt reactions. Creating the central management of stock enabled to follow these changes, increased the latency and saved total production costs.

To increase the profit it is necessary for companies to continuously search for solutions to decrease the costs. Rationalisation of the process of stock management is also a way to make it faster. An investment into information technologies can be the way.

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