

THE USE OF VALUE STREAM MAPPING TO INTRODUCTION OF ORGANIZATIONAL INNOVATION IN INDUSTRY

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Organizational innovation is an important activity affecting the productivity of the organization. This paper presents a method of lean management – the method of value stream mapping. On the basis of the literature we show the main features of the method. For example, a sample of industrial companies is an example of applying this method in the field of organizational innovation. This paper presents the current state map and a map of the future by focusing on the effects of the method.

Key words: industry, stream mapping, innovation, method, Lean Manufacturing, production process

INTRODUCTION

In most industrial enterprises it is very important to introduce organisational innovations, the aim of which is to improve the organisation's functioning, increase the production and improve production processes on a continual basis. Such measures were already taken in the last century in a Japanese automotive plant – Toyota, in 1937. It is there where people formulated two concepts aimed at keeping the production lean, i.e. reducing the use of machines, equipment and human effort without decreasing the previous level of production [1-4].

The above mentioned concepts were as follows:

Jidoka – whenever a mistake is committed, the machines and lines are automatically stopped so as to avoid the production of trash and not to disturb the flow of stream

Just In Time – production of parts which are currently needed by means of a suction system [5-7].

This article presents benefits achieved owing to the use of Lean Management tools, such as value stream mapping to improve the functioning of one of the departments in the examined enterprise of heavy industry.

The practical aim of this study was to eliminate system defects, such as: overproduction, downtimes, superfluous transport as well as unnecessary warehouses by the workstations, by means of value stream mapping. This tool was used while taking into account the specific character of the examined enterprise.

VALUE STREAM MAPPING

Beside 5S and Kaizen, value stream is one of Lean tools used to optimize production processes in an enterprise.

According to the concept, the application of these tools is supposed to eliminate losses in a production process.

If this is done in an organisation, the following take place [8]:

- production costs and, in consequence, the costs of piece production are decreased,
- effectiveness will increase,
- the number of tasks assigned to employees will drop, as superfluous tasks will be removed,
- the time of product manufacturing will be shortened as unplanned repairs and downtimes will be eliminated,
- the costs of storage will decrease because there will be no so-called unnecessary stocks.

In a well-managed enterprise, before proceeding to use Lean tools, it is necessary to identify the enterprise, determine the company's position and point to the places where losses are generated.

According to literature premises [9-11], the implementation of Lean concept should start with creating a value stream map. The method of value stream mapping was used by Mike and Sohn Shook in Toyota plants. In Poland this method is applied by the Centre for Technology Transfer of Wrocław University of Technology [12].

A value stream map enables carrying out an analysis of processes which create losses in an enterprise. The main goal of value stream mapping is to show how and at which workstations a value in the production process is generated.

In the first stage a class of products for which a value stream map will be prepared is selected from among the products. It is also necessary to specify workstations in the production cycle that these products go through [13]. In the subsequent stage a value stream manager must be appointed. His tasks include supervision over a smooth flow of value stream and solving the problems,

if they appear. The person appointed to be the manager should know the whole process and have relevant qualifications [14]. The manager's tasks in the first stage of value stream mapping include collection of information about the process. The following information has to be collected: requirements of suppliers, types of production operations, duration of particular operations, availability of workstations, the number of machines and devices taking part in the process, the manner of production planning, stocks, ways of communication [15].

The subsequent stage is preparation of a current stream map, which consists in presenting all the measures and processes in a graphic form [16].

After preparing a value stream map, it is necessary to carry out an analysis and determine which of the measures and processes are superfluous and in what way the value stream in a particular enterprise can be kept lean [17].

After an analysis has been conducted, one can proceed to the main part, namely, development of a value stream map, i.e. determining the elimination of wastage in a graphic way. All the measures contained in the map should be implemented according to an established plan, tasks and goals should be specified and a schedule of implementation works should be prepared. After completing the whole process of value stream mapping and its implementation, it is necessary to make a summary containing an evaluation and specifying the benefits that the enterprise obtained owing to value stream mapping.

Value stream mapping is a tool which enables: building a whole system for process management, define the principles of enterprise functioning and create plans for the improvement of products and processes [18-21].

APPLICATION OF VALUE STREAM MAPPING IN INDUSTRY

In subject literature value stream mapping is included in methods which allow a more effective use of the production capabilities and an improvement of work organisation.

A basic operation to be undertaken before starting to introduce organisational changes in an enterprise is value stream mapping. As noticed by Womack and Jones, in organisations all over the world, including Poland, an analysis of value stream for products and processes was ignored in many analyses of the organisation's functioning. Very frequently selected elements of the system were improved immediately by taking improvement measures according to Kaizen. However, the application of Kaizen without an earlier thorough analysis of production processes organisation through the use of value stream mapping turns out to be ineffective.

In the first place, it is necessary to prepare a value stream map, which makes it possible to identify each process in the flow, take it out from the littered background of an organisation and build a whole value stream according to the principles of lean management.

It is a tool which should be used each time changes are introduced in the value stream.

In the first stage of investigations a diagram of value stream mapping for Electrical Engineering Department was prepared. Next, after preparing a value stream map, which clearly presents the manner of production organisation, it is necessary to propose changes in the organisation.

An analysis of the value stream map presented in the above mentioned drawing allows identifying the following sources of the so-called „muda”, i.e. wastage:

Separation of material into bunches lasts too long – approximately 18 min per one piece – this prolongs the duration of the direct production process,

After the bunches have been tested, they are transported to the main warehouse, where they are placed on the shelves, according to their type. Next, the bunches are transported in industrial trucks to the vehicle assembly hall. Such a situation causes that they have to be stored for a few days before they are taken to the assembly hall. This prolongs the duration of the process by ca 8 – 10 days; at this time there is no processing of the product, which would increase its value for the customer. For this reason, from the point of view of value stream mapping, these activities can be considered superfluous.

Besides, there are numerous problems related to the organisation of production processes, the necessity to search for appropriate documentation, the lack of order in the production hall etc.

As a result of analyses conducted in the company, numerous changes in the organisation of production processes have been proposed, which will be described in the further part of the publication. They have been presented in a form of a diagram in Figure 1.

All the changes in the production process proposed as a result of applying the value stream mapping method in the examined enterprise are focused on three problems: a change of the company's organisation chart, the introduction of 5S and Kaizen.

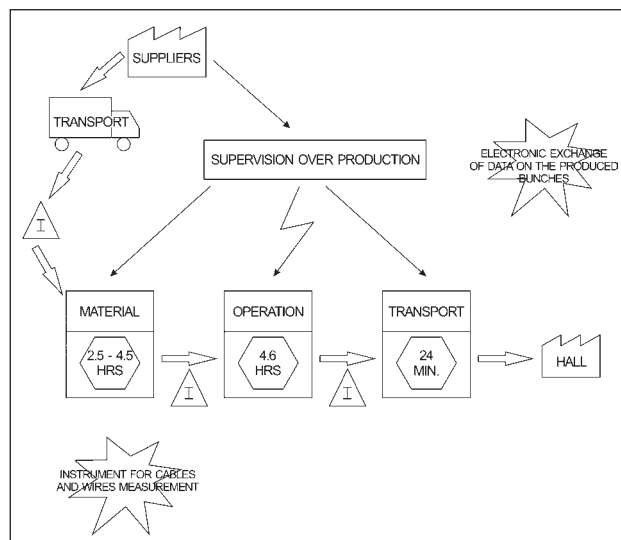


Figure 1 A value stream map – the future state

A change of the organisation chart consists in creating „four-person” teams. These measures will introduce a greater control over the team’s discipline, will improve supervision over training and the manufacturing of bunches. This will allow introducing a habit of looking after one’s tools as well as ensuring their ergonomic location, thanks to which fitters will not be dragged away from their work in search of the tools. It will contribute to the fair awarding of bonuses among the employees.

As a result of applying the 5S [21] method, all the objects were divided into:

- necessary,
- unnecessary.

Next, unnecessary objects were removed, while the objects whose usefulness in the production process was not clearly determined were marked with Red Label. In the subsequent stage the objects were sorted and organised at the workstation and the places of their storage were marked. The place of items storage was clearly labelled by means of coloured lines, signs and tool tables. Lists of tools were prepared for each workstation.

In order to maintain these standards, instructions describing a workstation, the principles of functioning, equipment, the scope of duties for the fitter were developed – they concerned not only the matters closely related to the production, but also issues related to e.g. order. Everything that has been achieved until present should be systematically controlled. Also important is daily observation of the system, checking whether the system is functioning properly and correcting things on a regular basis.

Introduction of Kaizen – should allow reaching a higher level of commitment and motivation of the employee interested in self-improvement. Thanks to such an employee, who is willing to share his/her observations and experiences, the process of bunches production can be shortened (at each stage), which enables saving the time and becoming increasingly competitive – cheaper.

A basic effect of introducing Kaizen in an organisation is generation of new solutions which streamline processes in this organisation. In the case of the discussed company the idea was to apply an instrument for measuring the length of cables.

Application of such a device will undoubtedly have a positive influence on a reduction of time for preparing (cutting) the wires or cables for the production of electric bunches. The device, owing to a possibility of adjustment 1 mm – 80 mm, depending on the type, can be applied for all wires and cables which are currently used in the Electrical Engineering Department. It will work well when mounted on cable spools on the shelves as well as if it is independently installed on a trolley.

The effect of introducing the device will be a reduction of time needed for the preparation (cutting) of wires or cables for the production of electric bunches. As a result of these measures, the time of material division

into bunches for each series containing 10 pcs will be shortened from 180 minutes to 30 minutes.

The second planned solution – an electronic exchange of data concerning the produced bunches will allow transporting the adjusted bunches directly to the hall, without their unnecessary storage. Owing to that, it will be possible to apply elements of just in time in the production processes and reduce the duration of the process from approximately 8 to 10 days.

CONCLUSIONS

The application of Lean Manufacturing tools, including Value Stream Mapping, allows streamlining the organisational processes, reducing the wastage and shortening their duration.

Visualisation of streams in a form of value stream mapping allows a better analysis of the process.

As a result of applying Process Stream Mapping the following were shortened:

- duration of the process from 179,36 – 137,36 h to 71,5 – 95,5 h,
- production time from 9,36 – 11,36 h to 7,5 – 9,5 h.

Changes made in the production process enable a better organization of work and, what is very important in contemporary economy, shortening of production cycles. This will allow improving the flow of half-products and finished products, a faster delivery of finished products to the customer and reducing the production costs (including in particular storage costs).

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