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PLANNING OF PRODUCTION PLANTS

Peter Malega[1]

Abstract: *The aim of this paper is to analyse possibilities of planning of production plants. This process is very important for enterprises that are established in the market as well as for new enterprises, because the production plants are the basis of production company. This paper has four main sections which are about: production plants, planning of production plants, production plants planning systems and trends in the development of production plants planning.*

Keywords: Planning; Production; Planning Systems; Production plants.

1 INTRODUCTION

The rapidly developing society puts increasing demands on individual members as well as on production companies. The ever-increasing variety of production and customer demands, as well as the pressure on production companies to be ISO-certified, is pushing production companies to constantly review of their processes and continually improvement and development of these processes. [11]

Fortunately, there are plenty of options to improve product as well as production processes step by step. Whenever one can´t find anyone at first glance, who would be able to solve the problem and improve something, someone else will come up and improve it.

2 PRODUCTION PLANTS

Production plants have begun to build people for acceleration, globalization, respectively reducing production costs as well as for other reasons. Production plant is basically an enterprise that has its own production program (this can be adjusted according to market developments), a sufficient number of qualified operators and the necessary equipment. [5]

The main task of the production plant is the transformation of inputs to outputs, i.e. production, supported by other important activities advised on research, development, design, investment, logistics quality control, warehousing and others.

The basic prerequisite for production plants is profit generation. The production has to be economically efficient and this will be, if [1]:

- Produces a certain set of products with a decreasing amount of work.
- In the case of a fixed amount of work, the utility value increases.

This is aided by a system of continuous improvement, which is a condition for successful production plant. Functional units are the basic components of each production plant that have a limited range of activities that is given by their expertise. Each unit has to undertake its entire production target. Production plants are slightly similar to living organisms or technical systems. They are similar in the points shown in Fig. 1.

The main characteristics of the production facilities are:

- Harmonization of employees' personal goals and operations to a stable functioning.
- Organized linking of departments with various features and functions.

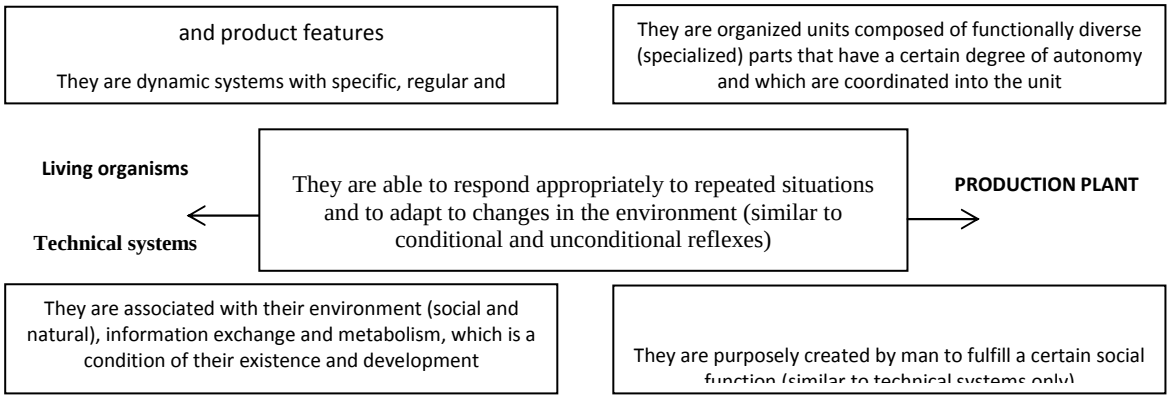

Fig. 1 Similarity of production plants with living organisms and technical systems [8]

3 PLANNING OF PRODUCTION PLANTS

The basic task in planning of production plants is to ask "what, how many, when to order, buy, produce and deliver to a customer". The fundamental planning functions of production plants can be understand as shown in Fig. 2.

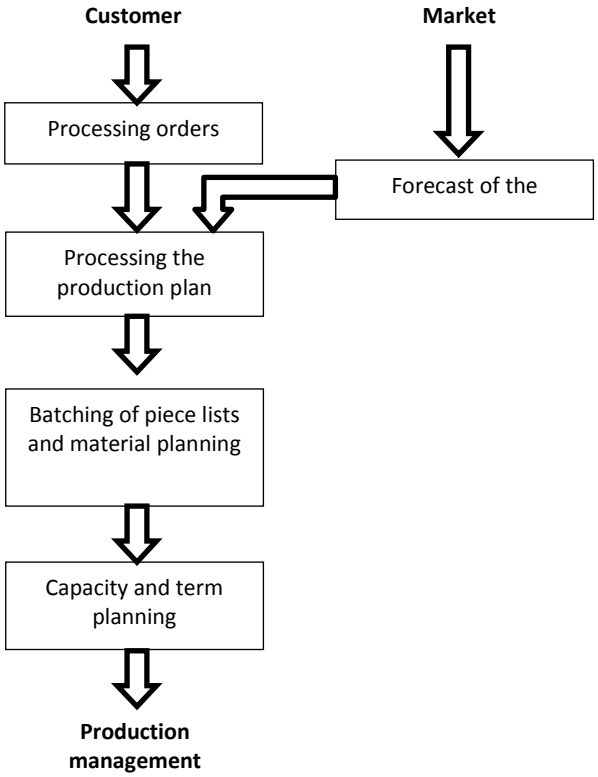

Fig. 2 Fundamental planning functions of production plants [6]

It is important to have two-channel information for planning of production plants. The first information channels are information from the customer (orders, requirements, etc.) and processed market information, respectively sales forecasts. [1]

The production plan shall be made immediately upon receipt of the order and the agreement of its terms. The production plan is the basis for fulfillment the delivery dates, maximizing the use of production resources and, above all, achieving the primary goal (profit). Each plan should contain three basic types of data [7]:

- What will we produce?
- When will we produce? (How long?)
- How much will we produce?

The next step is material planning. This is mostly based on a BOM that breaks down – each component is defined. The result is the determination of materials and their quantities to purchase and create production tasks for production.

After defining the necessary materials, starts comparing these data with the quantity in stock, purchasing planning, order processing, supplying and more.

Custom production planning is the next step that plans production tasks capacitive and timely. The first stage (higher level) is usually oriented on backward planning. This means that the deadlines for the start of production are recalculated from the required completion dates. In the second stage, which is part of the operational production management, we schedule production, which means that the production tasks are divided into operations on individual workplaces.

Production management is followed immediately after the stage, called the management of production inputs into production. There is often a problem with the implementation of production plans due to different conditions of the current situation compared to the original plan (machine failures, delays, missing operators, poor quality of semi-finished products and others). In addition, there are three parts of the operational production management – production management itself, the aggregation of new data providing control feedback and monitoring of the production process, which provides an overview of the production process progress and its correction.

Important steps for the proper production operation are [9]:

- Deliver materials and semi-finished products in time to the workplace, in the required quality and quantity.
- Provision of equipment necessary for production (production lines, tables, tools and other work equipment).
- fFow management of semi-finished products, parts, preparations, tools, gauges and other work equipment.
- From the capacity point of view, alignment of the number of contracts processed, use of production facilities and other activities that support organization of the production process.

This entire set of necessary activities is ensured by planning and production management. From the production planning and production management, therefore depends the efficiency of the whole process. Production planning and management processes a huge amount of data and information processed by computer technology. In terms of maintaining competitive advantage, the introduction of production planning and management systems into praxis is also essential for small and medium enterprises. [1]

4 PRODUCTION PLANTS PLANNING SYSTEMS

Methods, respectively systems of production planning and their management, various authors call with different names such as Production Management System (PMS), Production Planning and Control (PPC), Production Planning System (PPS) and Manufacturing Resource Planning (MRP).

All of these systems are synonymous with designing and implementing information flows in the enterprise and for functions and activities in the field of

production planning and production management. Today, activities and tasks related to production planning and management are supported by software and development companies that deliver support programs that use up to the present day common practice but also new solutions to planning and managing production. These systems should mainly assist in the activities contained in Fig. 3.

5 TRENDS IN THE DEVELOPMENT OF PRODUCTION PLANTS PLANNING

Today we can´t imagine a modern enterprise without the integration of CA systems. These systems are often solved in a modular way, which has the enormous advantage of extending new features as needed. The most known such systems are, for example, SAP or Adonix. The main modules of such systems are [8]:

- Technical preparation of production.
- Production and cost management.
- Planning of material requirements.
- Monitoring and production management.
- Planning capacity requirements,
- Purchase.
- Warehousing.
- Maintenance management.
- Management of customer orders.
- Executive of information system.
- Sales analysis.
- Financial management,
- Prediction of the future demand for products.
- Accounting.
- Interface for engineering data.
- Human resource management.
- Pre-calculations of production orders.

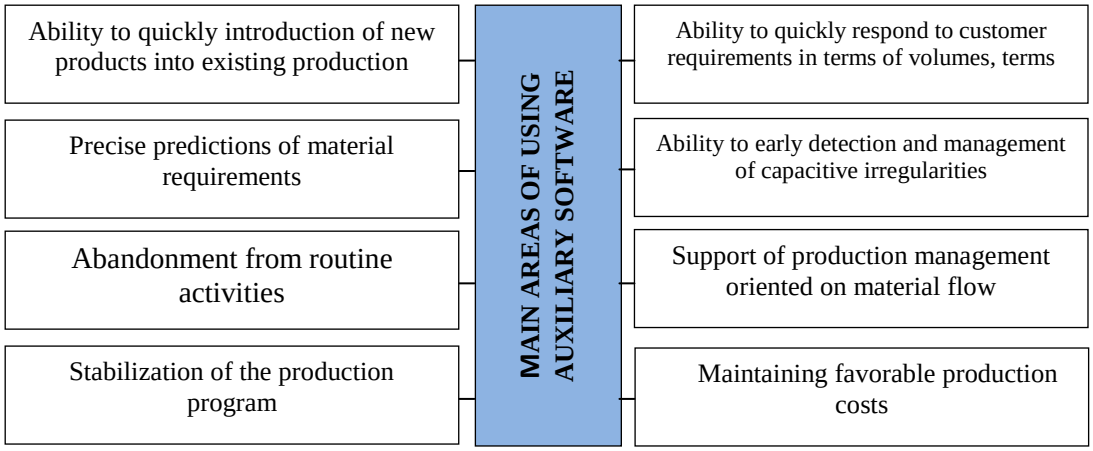

Fig. 3 Main areas of using auxiliary software [3]

For the planning of production plants, the standards are customer orders that have to be produced in the production system realized for a specified period of time. The plan determines the range and quantity of production orders to be prepared for production and at the same time their timing to available production facilities.

Production management coordinates production so that is at least deviated from the plan and meets the plan requirements. Production management also coordinates mutual interaction of the auxiliary processes in relation to the main processes.

Less important than planning data are actual information in real-time. It is important for the feedback of the production process, which ensures higher efficiency of the whole process. These systems should then provide the functions shown in Fig. 4.

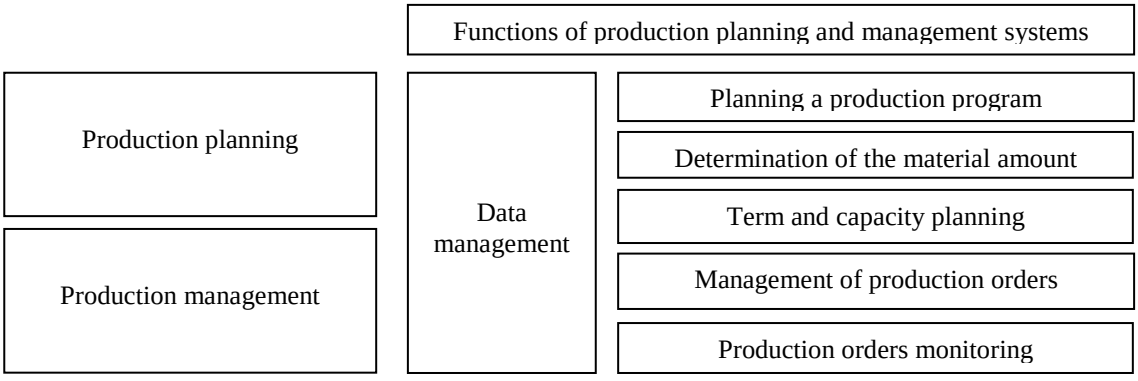

Fig. 4 Application area and function of production planning and management systems [4]

- Organization and management of the company's improvement system.
- Gross production scheduling.
- Wages.
- Capacity planning and scheduling.
- Analysis of production performance.

Operational planning is an important part of planning in modern factories. The specific methodology of operational planning determines mainly the type of production, the degree of production automation, the required flexibility of the production line and other factors. Operational planning regulates production according to three basic criteria, namely [10]:

- By linking the bindings of partial management areas that are crucially involved in plan construction, addressing the best resource utilization in a specific period to meet market requirements, maximizing production efficiency and ensuring the required quality.
- According to the activities involved in the preparation, but also on the production process itself, material provision of service and auxiliary activities.
- According to the process of constantly refining the operational plans in terms of time, space and material.

For the production of the production program, we can mention certain essential facts from the point of view of purchasing decision-making in relation to the production management. This is clearly summarized in Table 1. [1]

Table 1 Creation of production program in terms of purchase [5]

Price	Price is one of the key factors in purchasing decision-making where there is a choice between different alternatives, and where there is widespread consumption, the production program must also be seen in terms of the ability to secure production in a cost structure so that the resulting price of the product is competitive.
Quality	Quality has to be understood broadly than fulfilling any of the features defined by technical or other standards. Quality is the level of customer satisfaction.
Delivery time	The shortest delivery time and the observance of agreed terms are required. This criterion is also greatly influenced by how the purchasing process of the input material is taking place.
Flexibility	This is primarily about the ability to customize products to the customer's wishes.

Another possibility to create a production program is to obtain specific orders from the customer. This method has advantages besides the fact that it is not necessary to find out the sales; there is no risk of poor estimation, as well as disadvantages such as faster flexibility of competition, more favorable prices of competition and others.

In this case, the delivery times are the determining factor of the plan, while before the final decision we have to analyze all the segments that are contained in Fig. 5.

The essence of the operational production planning consists of the creation of a whole production plan from the order receipt to the dispatch of the goods, and the plan is continuously updated on the basis of the production situation. The plan can be modified according to the capacities of the workers, machines and other parameters. Thus, the task is to ensure the defined performance in a given quantity, of sufficient quality and in the planned time.

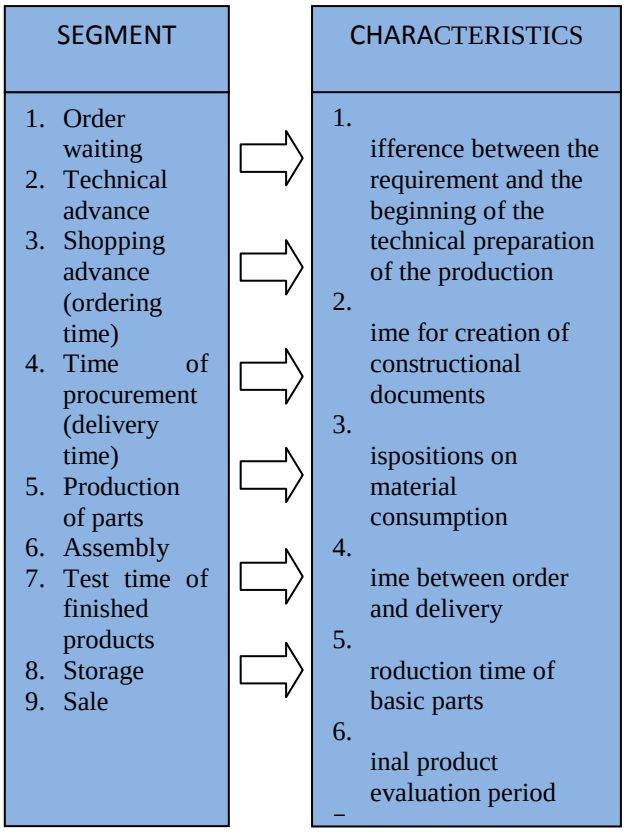

Fig. 5 Analysis of segments within delivery time [13]

Operational planning poses high demands, particularly in complex production and multi-stage production. In such cases there is an alternate use of productive production parts for individual products. In general, these are the tasks shown in Fig. 6.

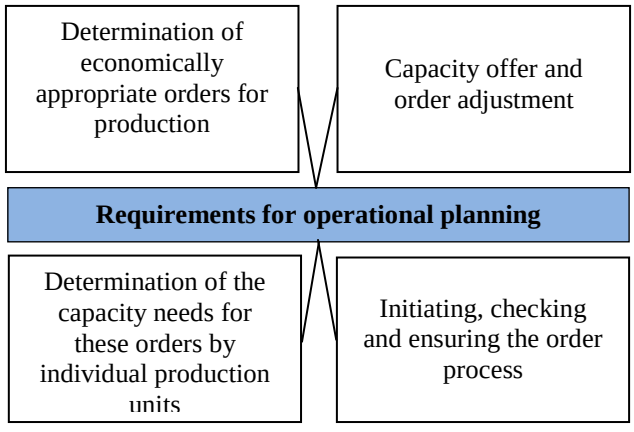

Fig. 6 Requirements for operational planning [6]

6 CONCLUSION

Production companies in the 21st century will face unpredictable, high-frequency market changes driven by global competition. To stay competitive, these companies have to possess new types of production systems that are cost-effective and very responsive to all these market changes. [12]

Re-configurability, an engineering technology that deals with cost-effective, quick reaction to market changes, is needed.

The industrialized world is faced with the challenge of maintaining its high quality of life and welfare despite global economic competition. A competitive production industry is required to keep jobs and generate new ones directly, and, through induced services indirectly. To contribute to sustainability, the production industry has to move towards a closed and optimized lifecycle of products and related processes. This, in turn, should evolve following the change in economic, social and technological context, thus achieving sustainability.

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AUTHORS ADDRESSES

[1] Ing. Peter Malega, PhD.

Technical University of Kosice, Faculty of Mechanical Engineering, Institute of Management, Industrial and Digital Engineering, Park Komenskeho 9, 042 00 Kosice, Slovak Republic

E-mail: peter.malega@tuke.sk