STRUCTURAL REORGANIZATION OF A PRODUCTION WORKSHOP TO INCREASE PRODUCTIVITY

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Rezumat. *Îmbunătățirile tehnologice abordează cei doi factori cheie ai profitabilității: calitatea produsului și durata ciclului de producție. Calitatea ridicată și consecventă a produselor este evidentă și toți producătorii trebuie să livreze clienților materiale de înaltă calitate pentru a asigura calitatea și pentru a asigura comenzile la timp. Pe de altă parte, reducerea timpului ciclului de producție, chiar și cu câteva secunde și îmbunătățirea productivității vor duce direct la creșterea profitabilității și a randamentului investiției.*

Abstract. *Technological improvements address the two key factors of profitability: product quality and duration of the production cycle. The high and consistent quality of the products is obvious and all manufacturers have to deliver high quality materials to their buyers to ensure the quality to ensure timely orders. On the other hand, reducing the cycle time of production, even by a few seconds, and improving productivity will directly lead to increased profitability and return on investment.*

Keywords: Production, Productivity, Workshop, Injection molding machines

1. Introduction

Production is the first moment of the economic movement, in which, by combining factors, people produce material goods and services, being the use of scientific and technical knowledge, machines, equipment, soil, energy, manufacturing technologies, etc. In industry, agriculture, forestry, construction, transportation, communications, trade, education, science, culture, health, etc., through which goods and services are produced. Production is the starting point of economic activity, being called the engine of the economy, without production there are no necessary economic goods, there can be no circulation, no distribution and no consumption.

The production of material goods has undergone a continuous evolution over time. The increase of labor productivity has determined the transition from an artisanal industry, in which the decisive role is played by manual labor, to a manufacturing type, characterized by both manual labor and a subdivision of labor. Any production

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process has as its ultimate goal the production of goods and services designed to meet the needs. For classical economists, any production process can be carried out with the help of three factors of production: labor, nature (land) and capital. In the contemporary literature it has been found that in addition to the factors of production defined by the class, there are other factors such as: management, entrepreneur, technical progress, entrepreneur, etc. [1].

2. Production systems

Industrial production systems are those types of industrial production units or sections thereof (firms, sections, workshops, etc.) or such assemblies [2].
Industrial production systems, by integrating into their structure a factor of management, self-regulation, usually human in nature, become cybernetic systems. Approaching industrial companies, holding companies, groups of companies, industries as cybernetic systems, ensures optimal conditions for substantiating their management and organization on a scientific basis [3].
At present, worldwide, competition requires the production of new products in the shortest possible time, reducing the time between product demand and delivery to the market, which leads to the continuous modernization of production systems.
The behavior of the production system depends on its objectives, its structure and its relations with the external and social environment in which it evolves. This behavior is of three types:
• Anticipatory behavior - when the system adapts to changes in the external environment before it takes effect
• Active behavior - when the system manifests itself in parallel with external changes, it in turn has influences on the environment
• Passive behavior - when the system adapts slowly, over time, to changes in the environment [4].

2.1. The characteristics of the production system

The main characteristics of the production system are:
• Integrity - coherence of the elements of the system, their normal functioning can only be achieved within the whole of which they are part
• Hierarchy - aggregation of the system and of the component subsystems according to the existing relations of supra or subordination between them
• Dynamism - the change in time of the system variables and its connections with the environment

• The complexity-existence of multiple and diversified links between the component elements (human resources, means of production, objects of work), which are not constituted as simple passive components of the whole, but some of them act in appropriate ways to achieve their own objectives.
• Adaptability and stability - the ability to change their own operating parameters in order to continuously adapt to the environment, as well as to maintain these values within certain limits
• Probability - the action of the system is subject to the influence of random factors that tend to permanently disturb the balance of the whole
• Openness - engagement in relation to the environment, thus ensuring the dynamism of the system
• Ability to self-regulate and self-organize - making the necessary decisions to guide one's own activity based on information gathered from the system and its environment, processed and capitalized appropriately
• Finality - permanent orientation towards the achievement of a goal expressed through precise objectives to be achieved [5].

A possible structuring of a production system is detailed in the Figure 1.

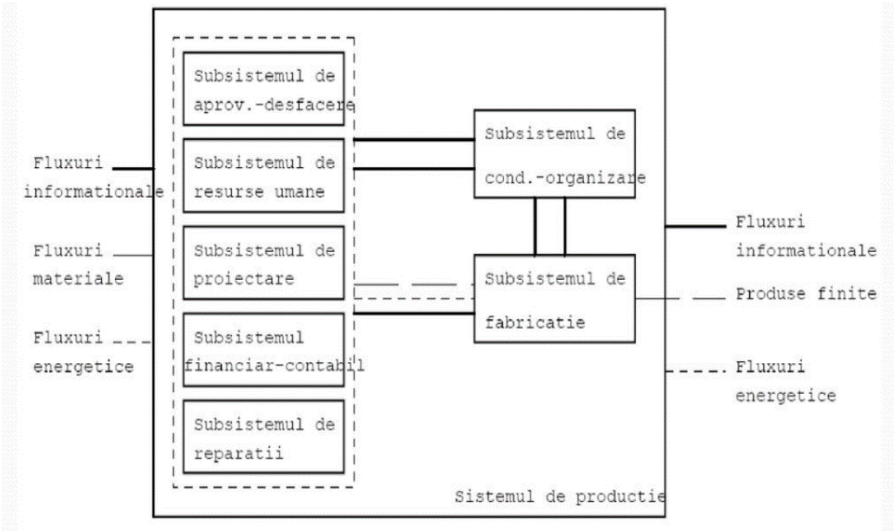

Fig. 1. Simplified structure of a production system [6]**.**

One of the essential functions of the production enterprise is the organizational function, which determines the distribution and implementation of activities by compartments and jobs in a structure that best corresponds to the proposed objectives and goals. The organizational function of the enterprise is materialized

in organizational structures, through which its human, material and financial components are ordered and combined.

The organizational structure represents the totality of the employees, of the functional compartments and of the production links and conception of the relations that are established between them, in order to achieve the pre-established objectives of the industrial enterprise.

The basic elements of the production structure are:

• Production sections

• Production workshops

• Control and research laboratories

• Jobs

3. Production workshops

The production workshop operates as a production subunit of a production section or independently, when it differs from the production section only by the volume of activity carried out within it. The production plant brings together several jobs that either perform the same technological operation or perform all the technological operations necessary to obtain a product. Depending on their profile, the workshops can be: production, assembly, service and also can be specialized on the principle of homogeneity of the manufactured object or on the principle of homogeneity of the technological process [7].

In the plastics production workshop, injection molding machines with a simple design are used, being systematically improved from a technical point of view for a high level of performance and low energy consumption, while covering a wide range of production. Engel and Krauss Maffei injection molding machine parts are used in the production workshop (Fig. 2, Fig.3).

Fig. 2. Engel injection machine [8].
Fig. 3. Krauss Maffei injection molding machine [9].

Injection of plastics is a process of manufacturing parts, obtained by injection of molten plastic into a mold. Plastic injection technology is used to produce a wide variety of plastic parts, from the smallest to the door panels, bars and curbs for cars.

In the production workshop, car dashboard, rear bumper and front bumper are produced (Fig. 4, Fig. 6).

Fig.4. Car board [10].

Fig. 5. Rear bar

Fig .6. Front bar

4. Project design

Project management refers to the definition and planning, then to the monitoring, control and completion of a project. Even before you start, it must be admitted that all projects require a certain level of project management. The larger and more complex the project, the greater the need for a formalized, standardized and structured process. A project in which two people work for 200 hours could be mentally developed. But a project that employs five people for 1,000 hours cannot be run in the same way. A project in which ten people work for 5,000 hours requires a more formalized management, not to mention a project in which 20 people work for 20,000 hours. Obviously, the effort required by the project management also has a cost. We must ensure that we apply the appropriate level of rigor to project management so that the value gained exceeds the cost incurred.

In the design / initiation phase of the project, the manager, project team members and project stakeholders or stakeholders meet to confirm that the implementation of such a project will solve an existing problem, which has been identified, laying the groundwork for the project process. planning.

The characteristics of a project are:

• It has a time limit (well-established start and end dates) and a well-defined location in space. Projects can take several days / months / years depending on their complexity. In the case of large-scale projects, these will be divided into easier-to-coordinate components, called sub-projects.

• It has certain well-defined objectives and a goal that must be met in response to a problem that we set out to solve.

• It has an approved budget within which it must meet

• Goes through several phases (design, planning, execution, evaluation, completion)

• Consumes resources (human, material, time, money, which are known from the beginning of activities)

• It is a complex activity, which involves specific risks

• Has a project manager and the responsibilities of each member of the project team are well defined.

• It has a certain degree of risk that must be well managed for the project to continue

• Creates a new value - product / service / idea / structure - unique and with a high degree of novelty

• Requires interdisciplinary collaboration within a special organizational structure [11].

4.1. Problem identification

At the current stage, in the plastics production workshop there are two aspects that can streamline the production process. The first is to reduce the load level of cars that produce curbs, front bumper and rear bumper. The second is to reduce the time allotted for changing molds on machines to increase the time allotted for parts production.

The proposed solution to increase efficiency is to buy a new injection molding machine.

4.2 Main activities for the project:

• Evaluation stage

- Study and budget allocation
- Workshop layout completed

• Vendor bid launch stage

- New car purchase offer
- Offer car moving suppliers
- Offer connected water machines
- Offer electrically connected cars

• Vendor order placement stage

- Placed the new car order
- Placed car removal order
- Placed order connected water machine
- Placed order electrically connected machines

• Machine moving step

- Moved scrap area
- Moved cars to new position
- New car introduced
- New car installed
- Moved conveyors
- Leveling machines

• Stage powered machine utilities and mounted auxiliaries

- Connected water machines
- Electrically connected cars
- Mounted machine water thermoregulators
- Machine material supply system installed
- Powered by cars

• Project completion stage
- Carried out machine operation tests
- Trained operators
- Project delivery

4.3 Time spent on project activities

Project presentation using Microsoft Project

4	Offer moving machine suppliers	08.07.20	15.07.20
5	Offer connected water machines	09.07.20	15.07.20
6	Offer electrically connected cars	11.07.20	18.07.20
7	Placed orders the new car	19.07.20	19.07.20
8	Placed car move command	20.07.20	20.07.20
9	Placed control connected water machine	20.07.20	20.07.20
10	Placed control connected electrically machines	20.07.20	20.07.20
11	Moved junk area	01.08.20	04.08.20
12	Moved cars to new position	05.08.20	16.08.20
13	New car introduced	07.08.20	09.08.20
14	New car installed	17.08.20	20.08.20
15	Moved conveyors	17.08.20	20.08.20
16	Leveling cars	17.08.20	20.08.20
17	Connected water machines	17.08.20	21.08.20
18	Electrically connected cars	17.08.20	21.08.20
19	Mounted car water heaters	21.08.20	23.08.20
20	Mounted machine material supply system	23.08.20	25.08.20
21	Air powered cars	24.08.20	26.08.20
22	Performed machine operation tests	26.08.20	28.08.20
23	Trained operators	28.08.20	30.08.20
24	Project delivery	31.08.20	31.08.20

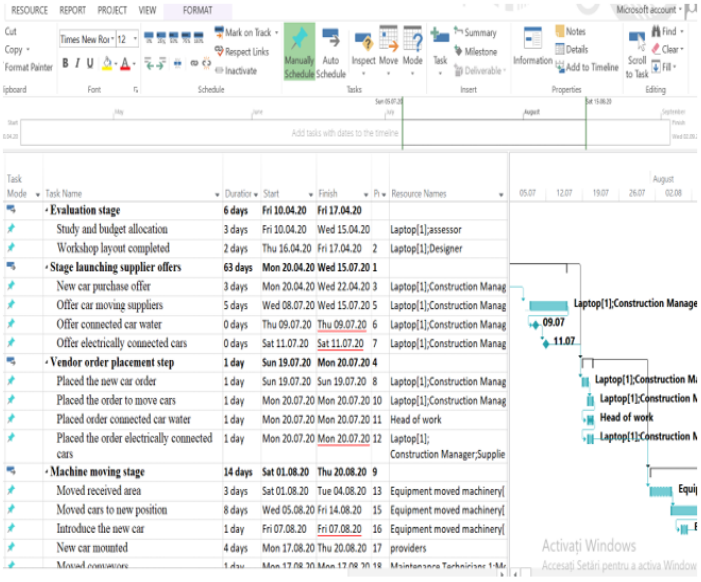

Fig. 7. Project development stages [12]

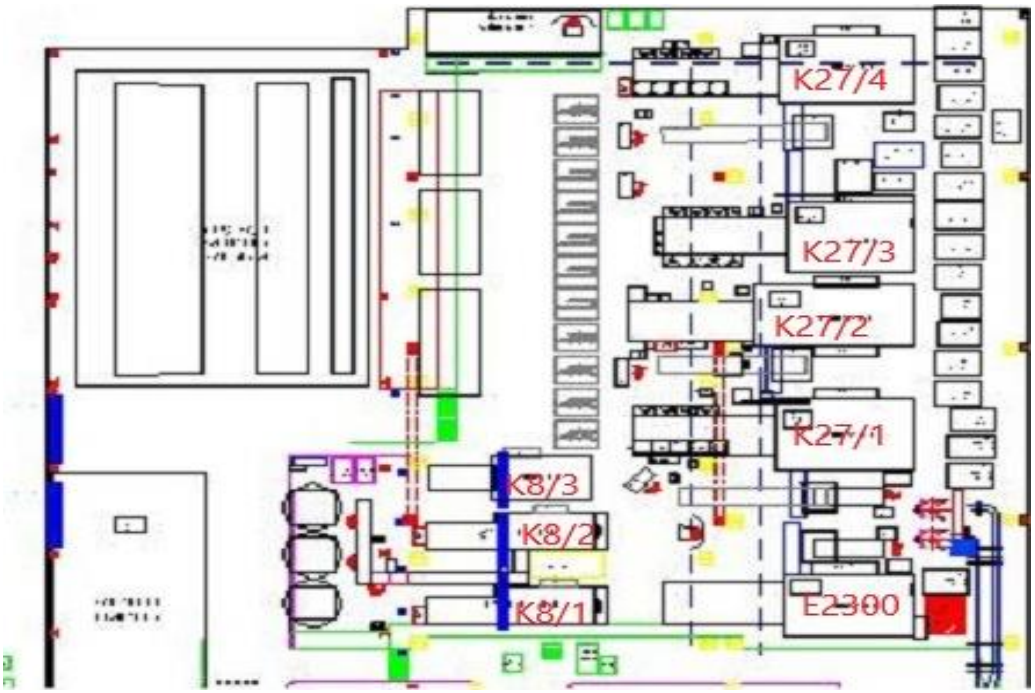

Fig. 8. Current production workshop layout [13]

5. Conclusions

The work process initially established benefited from a rapid increase in the volume of parts produced, which led to the decision to purchase an Engel 2700 injection molding machine. In order to integrate the injection molding machine into the production flow, the workshop must be reorganized by modifying the place of four injection machines, conveyors and workstations required for production in new positions.

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