

THE ANALYSIS OF TECHNOLOGICAL PROCESS IN MANUFACTURING FACILITY "SANI GLOBAL" AND PROPOSED MEASURES TO IMPROVE THE PROCESS

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Abstract: Technological process is not constant, it is subjected to constant improvement and continuous innovation. Dynamics of the technological process is necessarily not only because of technological level of production and production time, but also for the competitiveness of product on the market and for the existence of given production system. In this paper, for the given production system which produces beech plywoods, massive beech panels, stair treads etc., technological process of the massive panels production has been analyzed and appropriate measures of its improvement along with the measures to increase the production competitiveness has been proposed.

Keywords: Analysis, technological process, production, product, CNC machine, production system

INTRODUCTION

The term technological process means the prescriptive sequence of processing operations that are needed to be performed in order to obtain a geometrical shape of given dimensions, accuracy, processing quality and other properties. The most significant objective of production are final products that give new value called added value that is obtained by transformation of the lower-cost raw materials into a higher-cost finished product, and performing of manufacturing services which is becoming increasingly important.

Each manufacturing facility uses experience, knowledge and skills of workers, where human resources of knowledge together with technology, technological processes and processing systems are the basis for the successful production. If modern methods of production preparation, organization and management are used, then we can say that it is a production that has all the prerequisites to be profitable.

THE METHODOLOGY OF ANALYSIS OF THE EXISTING SITUATION IN PRODUCTION SYSTEM

The analysis of technological process as well as the complete reengineering includes, if that is necessarily, all the resources, for example new and modern technologies, modern production systems, knowledge management, innovations etc. The analysis of process is carried out in several main stages, as shown in Figure 1.

Production program contains the following:

- » Production of beech plywood,
- » Special beech panels and massive beech panels,
- » Planed elements and stair treads.

Defining the type of production system depends on the assortment or the program structure. If it is assumed production system of production assortment (structure) with n types of products: $p_1, p_2, p_3, \dots, p_i, \dots, p_n$ and quantity of n products: $q_1, q_2, q_3, \dots, q_i, \dots, q_n$, along with assumption that is: $q_1 > q_2 > q_3 \dots > q_i \dots q_n$, then by increasing the width of assortment

the number of specific products will be reduced and vice versa, as shown in Figure 2.

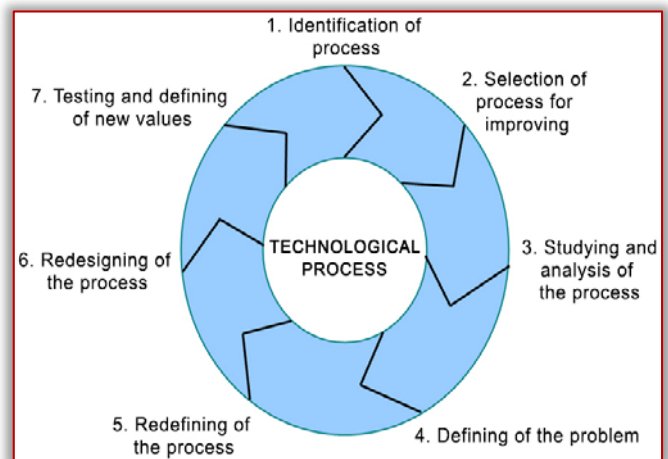


Figure 1. Stages in analysis of the technological process

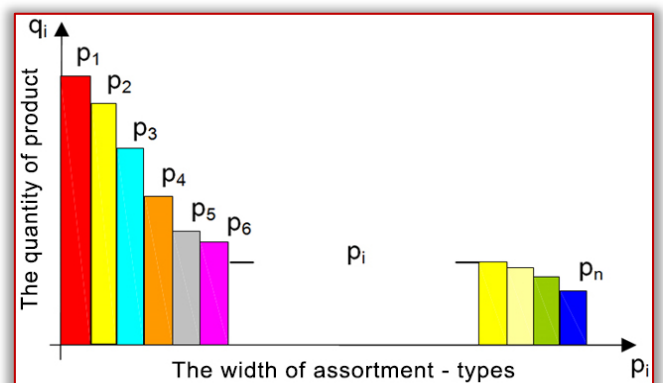


Figure 2. The correlation between quantity of product and assortment

According to type, massive panels are divided into width-connected panels and length-width connected panels. Material for making of the width connected panels is beech (gently steamed). The panels are made in thickness of 40 to 45 mm while the standard width is 650 mm. The lengths are

in range of 800 to 2000 mm (sometimes even more than 2000 mm). Width connected panels are intended primarily for the making of treads. The length-width connected panels are made primarily of beech (gently steamed). According to the requirements of purchasers, for making of the length-width connected panels, black and European walnut, oak, ash tree and cherry are used.

The thickness of panels is from 18 to 50 mm while the widths can be in the range of 1200 mm. Maximal length is 5000 mm. The use of length-width connected panels is various, primarily they are used for production of furniture, stair treads and so on. According to quality (category), massive panels are divided into the following: A/B, B/B, B/C, KERN and RUSTIK. The Figure 3 shows the massive panels.



Figure 3. Massive panels

THE EXISTING TECHNOLOGICAL PROCESS FOR PRODUCTION OF MASSIVE PANELS

The existing production process in "Sani Global" company consists of the following operations which are performed to obtain final product.

▣ Fine shortening

After an operation on planing machine has been performed the next operation is fine shortening, by which the workpiece gets its final length. This operation is performed using a circular saw for fine shortening. By circular saw it is determined the final length of workpiece, it is obtained clean measures and it is created the conditions for further processing of workpiece (gluing).

▣ The gluing

As binders, in production of massive wooden panels the glues are used. The glues are substances that have ability of transformation from the liquid into the solid state by what the monolithization of connected elements is achieved. Monolithization is done by adhesiveness of glue to contacting wood surfaces and during that, cohesion of materials that are participating in the process of bonding remains unchanged. In "Sani Global" company, for production of massive panels glue DIN EN 204 | D3 is used, and it satisfies the following requirements:

- » strength through the time,
- » resistance to chemical influences,

- » strength of connected part that is at least the same as the shear strength of wood parallel to the fibers and perpendicular to the fibers,
- » resistance to organic and inorganic materials (agents),
- » water resistance,
- » it dries at temperature within 25 °C.

Width-gluing of wood (extension) - Equipments for width joining of the wood elements are various tools and machines. It is necessarily that glue has hardened while press machine performs one complete revolution.

Length-gluing of wood (elongation) - Equipments for length joining of the wood panels are apparatuses for applying the glue and apparatuses for achieving the frontal and vertical pressure that are perpendicular to the connecting panel dowel.

▣ Surface treatment of wood

Surface treatment of wood is processing of wood surface with objective to improve the quality, appearance or to protect wood surface from being affected by different agents.

The grinding - Grinding is the technological operation in final processing by which wood surface is grinded with objective to achieve the adequate quality of smoothness of grinded surface. Grinding of workpieces is performed through three phases: rough, medium and fine grinding. Technological operation is performed on grinding machine.

The varnishing - By varnishing the properties of wood are to be highlighted, hidden or changed. As an agent for surface treatment of wood, different types of lacquers, paints, and other chemical agents are used, which also have some specific physical-mechanical properties. There are several ways to apply these agents: manual by the brush, gun spraying, pulling the element through the curtain of liquid material, immersing the element in the paint, roller varnishing in which the elements pulls through the rollers.

▣ Quality control

Quality is a feature that defines and classifies the product or other articles. It is a basic specification of product. Quality is defined by standards, by which are also defined all characteristics and properties of products, processes or services which should have possibility to satisfy specific or indirect needs.

The term quality is not only used to express the perfection in comparative sense for technical evaluation but also it is used in quantitative sense for technical evaluation. System elements of quality are defined by Recommendations of international institutions for standardization ISO 9000 and EN 29000.

THE OVERVIEW OF TECHNICAL-TECHNOLOGICAL MEASURES FOR IMPROVING PRODUCTION PROCESS

Improvement in "Sani Global" company can be achieved if some of the following requirements are satisfied:

- » The introduction of new technologies – increase of productivity, increase of production time and decrease of working time on machine per product unit,

- » Replacement of technologically old machines – by exploitation of machine, technological and total imperfectness of machine increase with time,
- » Replacement of old parts of machines – it is always good to have spare parts of machine especially when we have possibility to change old parts right after they stop working,
- » Expanding the capacities of existing production facility – manufacturing facility "Sani Global" builds one more hall with area of 1000 m². This new hall is of great importance for improving the production process. The hall will also be supplied with new machines and new workers will work in it so more jobs will be opened.

Without CNC processing centers, modern production in wood industry is hard to imagine. They are far more effective than grinding and milling machines. CNC machines can be combined in flexible processing group that can work and produce more than one individual machine.

The comparison between conventional and CNC technology is given in Table 1.

Table 1. Comparison between some characteristics of conventional and CNC technology

Characteristics	Conventional technology in the factory (d.o.o. Sani Global)	Proposed improvements (CNC technology)
Performing more than one operation with one machine	Each operation is performed one by one but preparation of machine is multiplex	Combining of more operations of one machine or combining the operations using more machines with one preparation of CNC machine
Preparation for work	During the preparation, machine can't perform production	The preparation is done in the office so that machine can simultaneously produce other products
The first processing	Making of templates and adjusting the machine	Program simulation trial
Repeated processing	Complete adjusting	Self-connecting of program
Required drawings	It is required to have dimensioned drawings or sketches	For CNC machine, paper drawing is not often required
Required working space	It is required working space for each machine with belonging manipulative space for every machine	It is only required space for one machine with belonging manipulative space

Table 1. Comparison between some characteristics of conventional and CNC technology (continuing)

Characteristics	Conventional technology in the factory (d.o.o. Sani Global)	Proposed improvements (CNC technology)
Number of workers /duration of processing	Higher number of workers or longer duration of processing with lower number of workers	Most often it only one worker with low duration of processing is required
Worker competence	Knowledge in carpentry	Carpentry knowledge, general and technical knowledge
Required support from machine producer	Support is sufficient mainly when specific spare parts are ordered	Support is permanent and depends on service of machine producer
Investments	Cheaper machines, cheap maintenance and spare parts, more expensive working space	Expensive machine requires office computer. Technical software's (programs), worker training, maintenance are also expensive.

CONCLUSIONS

For high quality product it is required quality raw material – wood (trunk of beech or oak which are among the most significant raw materials for producing the massive panels). For successful production none of the process may be considered as less important than other, but all parts of process must be integrated and performed by technological standards.

The best solution to increase the production is the introduction of CNC machines which would allow flexible production. Although the mentioned machine is very expensive, by flexible production costs that was spented for machine would quickly be refunded. In addition, with using CNC machine it is possible to achieve automatization of work with reduced number of workers and so that the cost have less values. At the end, it can be concluded that the best measures to improve the production process in "Sani Global" company are installing one CNC machine and building new production hall.

Note

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