Processing of wooden windows on CNC machine center

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Summary
Tradicionalan način izrade proizvoda od drveta izgubio je tržišnu utakmicu usljed velikog udjela ručnog rada te visoke cijene koštanja gotovog proizvoda. Pored navedenog ovakav način proizvodnje teško može osigurati velike serije. Zasebna uporaba tradicionalnih stolarskih mašina poput kružnih pila, glodalica, bušilica, tokarilica postali su zastarjeli načini obrade. Takve mašine se i dalje upotrebljavaju, ali tržišno konkurentna proizvodnja proizvoda od drveta zahtjeva veću efikasnost i uštedu na vremenu te se to može postići pomoću CNC mašina. Preciznost, brzina obrade, kvaliteta obrade te obrada složenih oblika samo su neke od odlika CNC mašina koji se danas primjenjuju. Izrada drvenih prozora je kompleksan proces, te je ubrzanje procesa proizvodnje,ušteda utrošenog materijala od velikog značaja kako u ekonomskom tako i ekološkom smislu a korištenjem CNC mašina to je moguće postići.
Ključne riječi: Drvna industrija; Drvo za građu; Tehnologija obrade; CNC mašine; Drveni prozori

Summary
The traditional way of making wood products lost market competition due to the large proportion of manual labor and high cost of the finished product. In addition, this method of production can be difficult to provide large series. Individual use of traditional woodworking machines such as circular saws, milling machines, drilling machines, lathes have become outdated methods of processing. These machines are still used, but a competitive production of wood products requires greater efficiency and timesaving and this can be achieved by using CNC machines. The accuracy, processing speed, processing quality and processing of complex shapes are just some of the features of CNC machine which are used nowadays. Production of wooden windows is a complex process, and the acceleration of the production process and saving of used material is of great importance both in economic and environmental terms, and the use of CNC machines can achieve that.
Keywords: Wood industry; Timber; Processing technology; CNC machines; Wooden windows

1. Introduction

Modern industrial production focused on the quality and quantity is inconceivable without machines that are controled by computers instead of people. Numerically controlled machines generally use the same technology material processing as classic machines, the essential difference is in the addition of a monitoring control unit and servo or stepper drive motors on the axles of all the moving parts of the machine spindle.
By investing in CNC machines the company invests in the competitiveness and survival in the increasingly demanding global market. The development of microelectronics follows the development of more accurate, faster and more secure machine tools, uniting CNC machines with different treatment technologies in the so-called machining centers can process objects of different geometric complexity with automatic tools.
Modern CNC machine works on the principle of loading thousands of bits of information stored in the program memory of the computer.In order to memorize information, programmer creates a series of instructions that a computer can understand. Scrambled commands are the most common way of programming CNC machine tools. The development of computers has enabled the manufacturers of machine tools development of so-called. "Linguistic programming" where the instructions are in the form of ordinary words. This type of programming allows a faster startup and less work for the programmer.
Modern production in the timber industry today is hardly imaginable without CNC machining centers. They are far more efficient, but also more popular than drill and milling machine mainly due to its flexibility. Their main advantage is that you have the ability to group several different operations executed in sequential series with only one fixing of the workpiece in the machine without the tormenting revisions and adjustments. Flexibility is increased by automatically changing the tools, minimal idle, using rotary motion with additional axes and a number of other possibilities.

2. Possible processing operations on CNC machines

CNC machining centers can be equipped with a special program that controls the speed and quantity of separate shavings, as in the case with wood processing, lifetime working tools, automation in the process of calibration and other improvements in production. Tools on these machines are commonly used in many types of processing, for example: a specific cutter can be used to process the table legs as well as processing of the chair. Generally, these CNC machines can be easily adapted to the desired processing. Some of the processing on CNC machines are:

- Rectilinear and curvilinear milling
- Nesting - 'optimization of workpieces'
- Drilling
- Filing
- Profiling
- 3D Processing

Methods of programming on machining centers are:

- Manual programming
- Manual programming directly on the machine
- Computer programming
- Automatic programming

2.1 Processing of wooden windows on CNC machine center

To make the manufacturing process with CNC machining functioning it requires four basic elements:

- CAD,
- CAM,
- control,
- processing.

To start with CNC Configuration must have a plan of development. It is important if we want on CNC machine to do some form based on photos or drawings of the design, then the drawing must be changed in the vector image using various programs. Each output starts from technical drawing as shown on the following scheme.

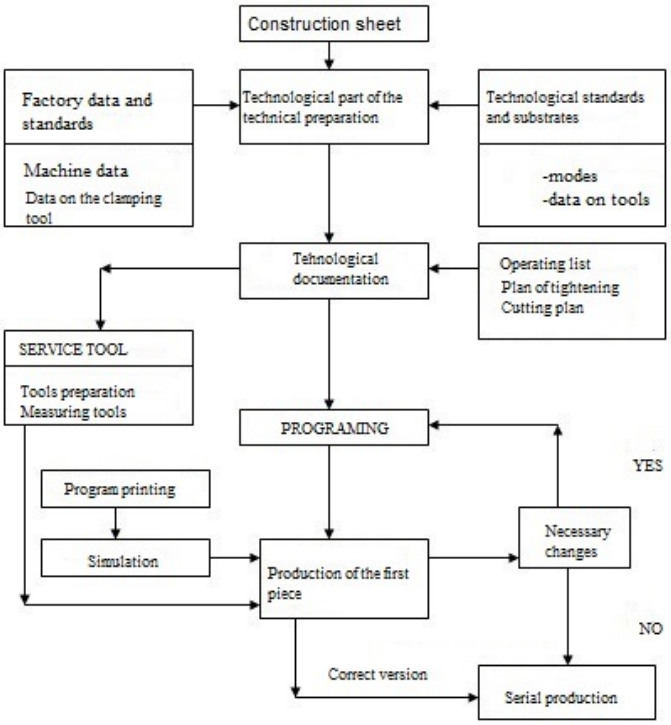

Figure 1. Scheme of production proces

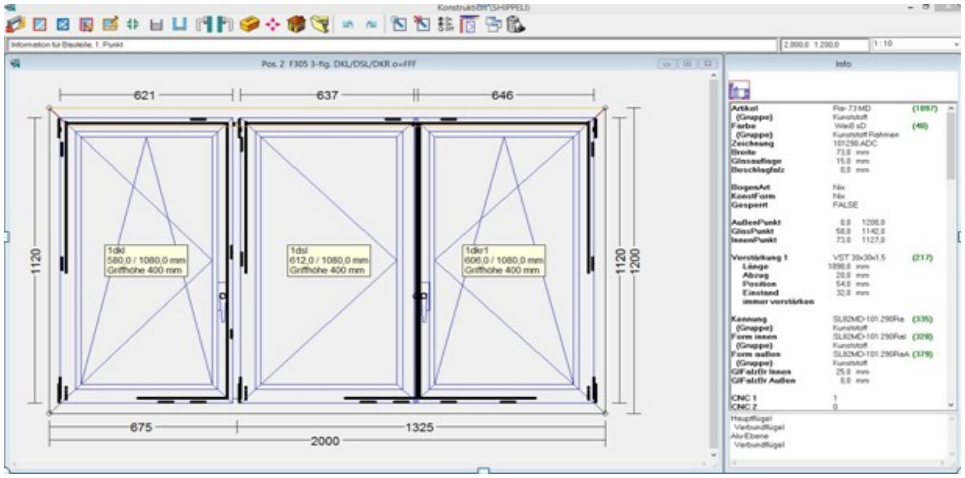

Figure 2. Winged window defined in the program Adulo

The first step in making the window sash is based on CAD applications to create a structure that all drawings with dimensions in the program ADULO in which are entered all the required data and it defines the drawing, and based on that, we proceed to the next step. The following figure 2. explains a draft of windows in ADULO.

3. Preparation, programming and process implementation

Programming represents implementation and assembly of program management, which is in the form of a series of commands applied to the holders of information.
In the CNC programming prevails the use of so-called G-code of program structure. The program consists of lines that define one of the operations, each row is made up of words that define the individual actions within the operation, and each word is made up of characters and a series of numbers with prefix. The values of the coordinates X, Y, Z are entered in inches or millimeters.
Although, today programming of CNC machining centers is mainly running CAD / CAM system, for good skills and easy identification of program activities and their execution sequence given in a language they understand CNC machines (machine language). The first, which should be dealt with in the process of programming are tools.
Commands of tools (T-codes / T-Word_tool functions) are created for the preparation and selection of the appropriate tool from the storage.

3.1 G-code

Preparatory commands are G-code commands which determine the type of activity that the machine will carry out. G-code is a synonym for linguistic programming of CNC machines.
General G-codes tell the machine the position, direction and amount of movement of tools eg. A shift to a distance in the direction of the X axis or quickly move to another location.
It should be noted that while the G-code is standardized, certain codes have different meanings defined depending on the CAM software packages and the manufacturers of CNC machines.

3.2 M-code

M-codes are an integral part of the programming language of CNC machines including each program individually. They are various commands that control the working components and operations of the machine. They activate and deactivate the flow of cooling fluid, the rotation of the spindle, the direction of rotation and other similar operation.

4. Conclusion

Today's era of modern technology and globalization, brings rapid change in all aspects of human life. Every day we get new information, and general development continuously requires new knowledge and skills. In order to be successful on modern market every well-organized company should focus on certain aspects of its development. With conventional knowledge and outdated technique breakthroughs can’t be made to conquer the international market.
Factories must be trained to produce a wider range of products, high complexity and quality, in the shortest possible time and with minimal costs. When we talk about a broader range of products, we refer to a flexible production that can successfully respond to the turbulent market. In the next few years, the survival of many production-business systems will depend on how much they are able to revitalize the introduction of productive technologies and automated manufacturing systems. Automated production systems next to

the technological advantages that are not in question, shall have for the introduction and economic reasons, that is to increase productivity and product quality, save energy and materials and market demand. The implementation of advanced technologies in the technology and production processes are achieving multiple benefits from shortening the cycle of production, increase quality and reduce costs as the primary basis for achievement of competitive advantage, modern and profitable production.

5. Literature

[1] Blažević,Z.: Programiranje CNC tokarilice I glodalice, Zagreb, 2004
[2] Jurković, M.: Reinžinjering proizvodnje, Univerzitet u Bihaću, Tehnički fakultet
[3] Mijović, B.: Konstruisanje pomoću računala (CAD), Univerzitet u Sarajevu, Mašinski fakultet u Zenici, Zenica 1996

Internet sites:

http://www.weinigusa.com/products/moulders/unimat/utooling_popup.htm (tools)