International Journal of Engineering & Technology, 9 (3) (2020) 658-664

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Working process of TU 3a CNC frais machine using software system

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Abstract

This workpiece process is: to find out how to transfer images from Auto CAD software to the Q plus CELL Milling Cnc software, and to find out how to transfer programs from the CNC Milling QELL KELLER software to the TU 3A CNC milling machine. The making of this workpiece uses three main media, namely Auto CAD 2000 software, CNC Milling KELLER Q plus software, and TU 3A CNC milling machine. The process of making the workpiece starts from making the workpiece design in Auto CAD software which is then stored on the CDR via DFX data. The design of the workpiece contained in the CDR is then transferred to CNC Millling KELLER Q plus software via Geometry. in Geometry, the design of the workpiece is dimensioned. Completed from the Geometry the workpiece design is included in the Work plan to be processed so that it can be simulated to move to a CNC program to convert the graphical language into a numeric language so that it can be read by a CNC machine. The programming results from the CNC KELLER Q plus software are then recorded to be executed on the CNC TU 3A milling machine to obtain the workpiece in accordance with the design in AutoCAD. Programming results from CNC Milling KELLER Q plus software cannot be directly used on the TU 3A milling machine (EMCO), because the programming language used is different. Programming language in CNC Milling KELLER Q plus software uses the DIN 66025 standard, while the CNC TU 3A (EMCO) milling machine uses ISO standards, so it needs to be converted first.

Keywords: *Process; TU 3A CNC Milling Machine; AUTO CAD 2000; Software CNC Milling KELLER Q Plus.*

1. Introduction

in order to facilitate understanding and interpretation in this study, it is necessary to limit the problem. As is well known, there are many software related to CNC machines, including: CAD / CAM software, Master CAM, CNC KELLER Q plus and many others. Of the many software, the researcher limits only the use of CNC KELLER Q plus software. And the problem discussed here is only how to transfer images from AutoCAD software to the CNC KELLER Q plus software. And how to transfer the program from the CNC KELLER Q plus software to the TU 3A CNC freis machine.
Based on the explanation above, the problem in this research can be formulated, namely:

1) How to transfer images of objects work from AutoCAD software to software CNC KELLER Q plus?
2) How to transfer programs from Q plus CNC KELLER software to the machine freis CNC TU 3A?

2. Basic theory and hypotheses

2.1. Platform theory

1) TU 3A CNC milling machine

a) Understanding CNC machines

Machine C N C (Computer Numeriicall Controlled can be interpreted briefly a machine that is controlled by a computer using numeric language (command movement and stop with using numeric and letter codes (Select,2001: 1). For example: on the monitor machine we write M03, then the machine spindle will spinning, while if we write M05 then the spindle of the machine will die, and there are still many letter number code for various commands other machine work.With the presence of a machine CNC can reduce interference Operator while the machine is operating, making it easier and faster the work of a product. CNC machine has many advantages compared with similar conventional tooling machines.[1 - 3]
The advantages of CNC machines include:
(1) high productivity, (2) high workmanship accuracy, (3) faster production time, (4) cheaper manufacturing costs,(5) greater production capacity, (6) can be combined with other machines, in this case is a CAD / CAM machine with additional equipment so that the use of CNC machines will be more effective, and much more another advantage of CNC machines. (Wirawan S, 2003: 173)

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One of the drawbacks is the use of technology facilities such as C N C engines, especially at expensive prices. So that not all industries are able to buy these CNC machine tools. Whereas in the framework of efficiency and improving the quality of products in today's developed industries many have used it.[1] [4] [5]

b) CNC Milling machine

Broadly speaking, CNC milling machines can be classified into two, namely CNC Training Unit (TU) milling machines and Milling Production Unit (TU) machines. Both types are in principle the same only in different applications and uses. Frais machine

The CNC Training Union is used to practice the basics of CNC operations and programming equipped with EPS (External Programming System) and also to do light work. CNC Production Unit milling machines are used for mass production, so this machine is equipped with accessories and equipment that are more complex and expensive, such as automatic door opener systems, chuck systems with automatic systems, tatal disposal and others.[1] [6] [7]



Fig. 1: TU 3A CNC Milling Machine.

c) Working Principle of TU 3A CNC Milling Machine

The machine is controlled by a computer, so that all movements will run automatically according to the program commands given, so that with the same program the CCC machine can be instructed to repeat

the process of implementing the program continuously (continuous). This TU 3A CNC milling machine uses a foundation system with a base of Carthesius (clockwise) coordinates. The support system is shown in the picture below

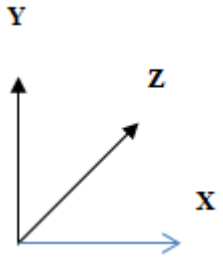


Fig. 2: Axis of the Milling Machine.

The working principle of the CNC TU 3A milling machine is a rotating blade, while the workpiece on the table moves horizontally or transversely. For the direction of the movement of fellowship, it is given a complementary goat as follows:

- X axis moves horizontally
- Y axis moves transversely
- Z axis moves vertically

d) Main Parts of the TU CNC Milling Machine 3a

2) The controller or controller section

The controller or controller is a CNC machine control box containing buttons and switches equipped with a monitor. Bok control is a direct service for dealing with operators. visually.

3) CNC Keller Q Plus software

CNC KELLER Q plus software is computer software published by KELLER containing programming simulations CNC machines that have been updated from previous generation software. These computer software are the help of Landesinstitut FurGerman Qualifizierung (LFQ) through UNNES Mechanical Engineering published by Keller with the name Q Plus; Q means that software is an update from previous generation software. There are two machine software namely the second CNC Lathe and CNC Freis in two versions, the English version and German. CNC Keller Q Plus software can be installed via a Pentium computer in general with a program memory capacity of around 120MB, 5GB Hard drive specifications and a minimum of 64MB RAM.[2][8]

The advantages of this software include:

1) The results of the CNC program can be executedfirst, if there is an error or program errors cannot be executed,
2) simulation of making workpieces can seen immediately the results, can be seen in 3-dimensional view,
3) transfer files from images AutoCAD to software, so that it makes you have made a CNC program,
4) the results of the CNC program from this soft ware can stored on diskette, and can be directly used in CNC machine tools by making adjustments (conversions) according to the CNC machine brand that is used right,
5) can be installed on the Pentium computer Generall.

The programming method commonly used in the Milling Keller Q Plus CNC Software is:

e) Milling Keller CNC Programming Software

Q Plus. The basis of the CNC Milling Q Plus CNC programming software, is not much different from the programming on the actual CNC milling machine. Programming is enough to be done on a computer, but the appearance in this software is almost the same as the display on the actual CNC machine monitor. This software can be directly used for a variety of machines including the FanucOT brand,

Gildmeister EPL2, Sinumerik 810T and Traub TX8D. can be used to make the programming cycle (PAL-Zyklus) according to the standard. The programming system can be either Absolute, Incremental, Polar, or a combination of all three. Absolute programming system, is a programming system where the reference point refers to the point fixed. In this system the data / information entry number of the tool path is always calculated from the tool starting point, X = 0, Y = 0, and Z = 0. The absolute method has high accuracy, but it will be difficult to create complicated workpieces. Incremental programming system , is a programming system where the point of reference is always changing, namely the end point that is intended to be used as a new benchmark for the next size (Chosen, 2001: 16). In this system data entry / numerical path information is always calculated from the end point of the previous tool path, X, Y, and Z change depending on the final position of the tool in the polar programming system using the reference path length and the angle of the path. The combination programming system is a system of combining absolute, incremental and polar system programming. The CNC Milling Q plus software display can be seen in the following figure:[1] [9] [10]

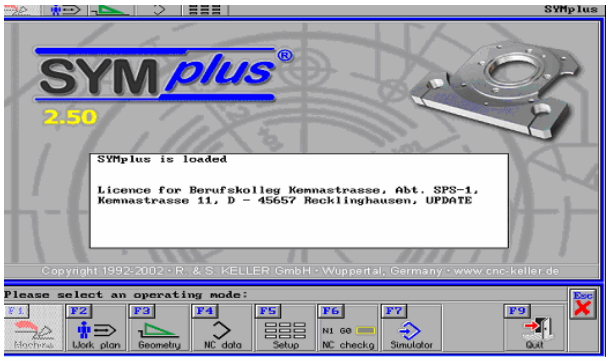


Fig. 3: Display Softwarecnc Milling Qplus[1].

1) Work Plan (Work Plan)

Display the type of cutting tool that will be used in execution, and show the trajectory of the cutting tool step by step

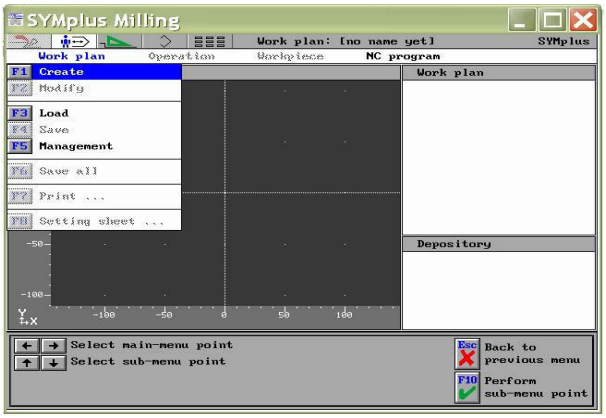


Fig. 4: Display of Work Plan Window (Work Plan).

2) This Geometry menu will display the form of work that has been programmed in 3-dimensional view, so that if there is a dimension error it can be known to be fixed immediately

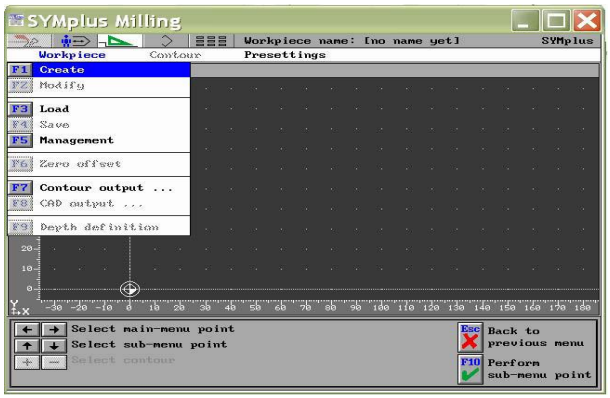


Fig. 5: Display of Geometry Window.

3) NC-Data, this menu displays the programming using the sentence according to the program sequence from N01, N02, and so on. NC-Data menu.

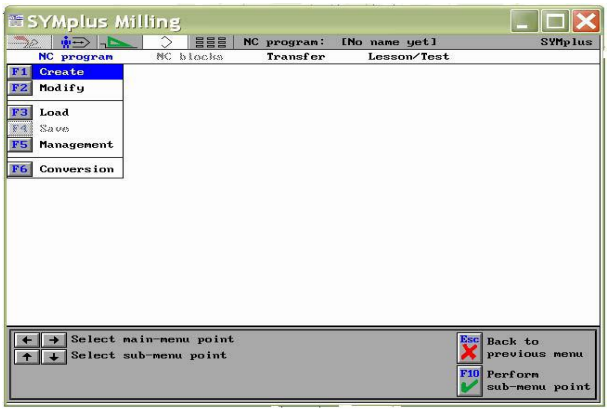


Fig. 6: Display of NC Data Window.

4) Setup, This menu is for planning the type of cutting tool as well as the material that will be used in . the process turning.

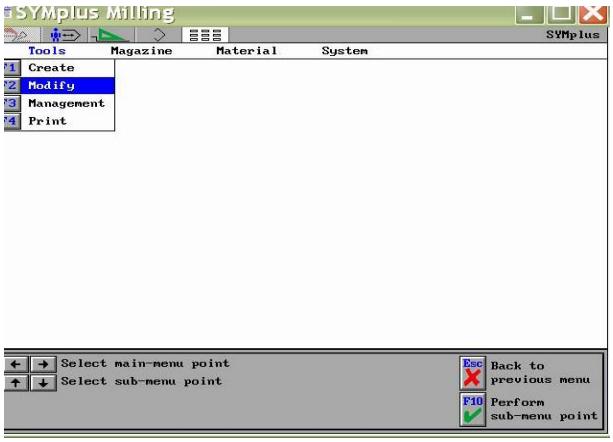


Fig. 7: Display Window Setup.

5) Simulator, this menu works for displays a workpiece simulation that will be made so that if there is a program error can be fixed

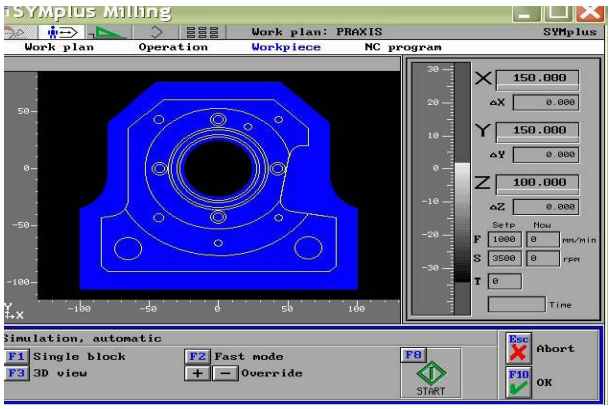


Fig. 8: Display of the simulator window.

2.2. AutoCAD 2000

Auto CAD comes from the word Automatic Computer Aided Design, which means Auto CAD is a computer program as a tool in the design or design process (Wahana Komputer, 2002: 2).Auto CAD 2000 is the development of several drawing facilities from previous versions of AutoCAD. The Auto Desk released a CAD program starting with a Micro CAD program, which was later developed inWindows versions, namely Auto CAD versions 10, 11, 12, 13, and 14. then continued to Auto CAD 2000. AutoCAD software can be installed via a minimal computerpentium 1 with a program memory capacity of around 120MB, 5GB Hard drive specifications and 32MB RAM (64MB recommended). Auto CAD 2000 software can be installed on Windows 98, Windows Millennium Edition (ME) and Windows 2000. When activating the Auto CAD 2000 program, the monitor

Auto CAD 2000 menu will appear accompanied by the appearance of the Startup dialog box. In the Start up dialog box there are several tools that have their respective functions, to start according to their functions. After selecting one of the tools, then OK to continue running the Auto CAD 2000 program. The AutoCAD 2000 Startup dialog appears as shown in the picture below.

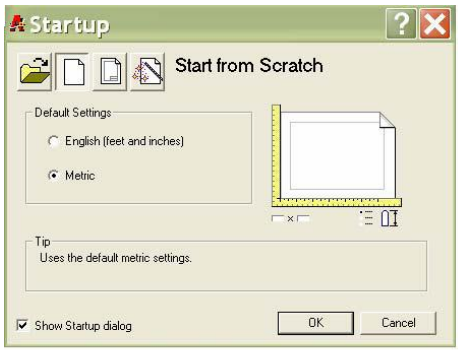


Fig. 9: AutoCAD 2000 Startup Display.

After viewing the Startup dialog, the AutoCAD 2000 window will appear and be ready to draw. Display worksheets Auto CAD 2000 as shown in the picture below.

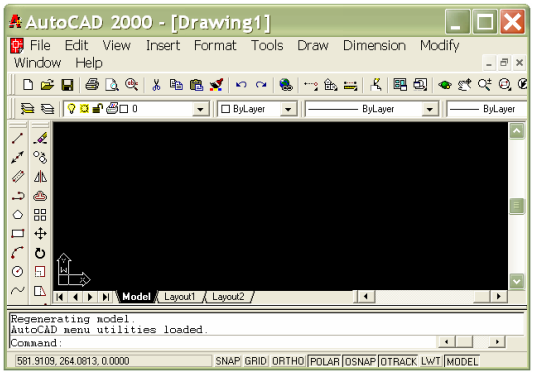


Fig. 10: Display of the AutoCAD 2000 Window.

AutoCAD 2000 provides or displays several new facilities and capabilities, most of which are developmentFacilities - facilities that exist in previous versions. The new facilities and capabilities include:

a) Adding several commands and sub new command.
b) Adding new buttons to Standard Toolbar and new commands and the Pull Down menu.
c) Use of the Window view on some previous commands use input via Command Line.
d) Automation of the use of several facilities depictions, such as dimensions, text and block.
e) Development of facilities for drawing in groups through internet media.

There are additional facilities from the versions previously Auto CAD 2000 was expected become one of the computer programs for good design and design. The way to activate a Windows program is by double-clicking on the icon at Deskstop, or by selecting it from the Start menu on the Taksbar.

2.3. Hypothesis

CNC KELLER Q software is a computer software that contains CNC machine programming simulations. This software has many advantages, one of which is that you can transfer files from Auto CAD software to this software and from CNCKELLER Q plus software to CNC machines. With the advantage or advantage this is expected to alleviate or assist CNC machine programmers in making workpieces, which has been done conventionally so far. The description of the flow of transferring files from Auto CAD 2000 software to CNC KELLER Q plus software and from Q plus CNC KELLER software to CNC machines is as follows:[11][12][13]

a) Make design drawings of workpieces on Auto CAD software.
b) The design of the image that has been made is saved via DXF data in a diskette.
c) Open the Geometry menu on the software CNC KELLER Q plus.
d) On the Geometry menu we open CAD input, then we take the picture design that has been saved.
e) In the design image geometry We make it, processed it to move it on the menuWork plan.
f) In this Work plan menu, the picture is Already in the process so that the bias can be simulated (seen in the process of making the workpiece).
g) After the workpiece has been simulated, we open NC data to see results workpiece work program (G code and Ncode).
h) Workpiece program results on NC data in save on a diskette for use the creation of a real workpiece on TU 3A CNC machines.
i) Make workpieces on FraisCNC machines TU 3A from the program that has been made based on Auto CAD 2000 images making a workpiece is needed a little conversion according to the CNC machine brand used.

For more details, you canseen in the following chart:

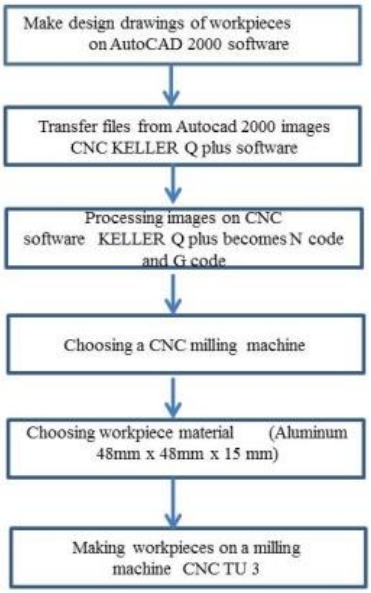


Chart 1: Flow of Making Workpieces.

3. Research methods

3.1. Research approach

The type of research used in this study is an experimental approach, which is a way to find a causal relationship between two or more factors by reducing other factors that
can interfere with the consequences of the treatment (Arikunto, 1998: 90). Furthermore, in this research will be known how to design drawings of workpieces at Auto CAD 2000, the process of transferring files from Auto CAD 2000 to CNC KELLER Q software plus and transfer from CNC KELLER software Q plus to the TU 3A CNC milling machine.

3.2. Subject and object of research

The subjects in this study were the manufacture of workpieces on the TU 3A CNC Frais machine. While the object in this study is CNC Milling Keller Q Plus Software and AutoCAD 2000 Software.[14]

3.3. Place and time of research

This research was carried out at the Computer Laboratory of Medan Harapan Engineering ST and Production Process Laboratory of Mechanical Engineering Department, Medan BLPT and Medan BLKI.

3.4. Data collection techniques

The data collection used in this study is observation which directly observes the experimental results and then summarizes and determines the results of the research.

1) Materials and Tools

a) Material

In this study the material used to make this workpiece is Aluminum with a length of 150 mm, width 150 mm and 20 mm thick.

b) Tools

In this study the tools used among others:

a) Computer set
b) TU 3A CNC Milling Machine
c) Milling Keller Q Plus CNC Software
d) AutoCAD 2000 software

2) Research Procedure

A scientific research in its implementation must be guided by scientific procedures as well. Procedures must be arranged in a sequential, planned and systematic manner. Basically, research procedures that are generally used are therethree main steps, namely: research preparation, implementation of research and evaluation of research results Research preparation includes all matters relating to the process of conducting research, including preparation selection of materials, planning of making work pieces, making workpieces, the place of execution of the manufacture of workpieces and the tools used during testing.

4. Conclusion

Based on the process of making the workpiece on the TU 3A CNC Frais machine using the Cnc Milling KELLER Q plus software based on Auto CAD 2000 software which includes the transferring stage from AutoCAD 2000 images to CNC Milling KELLER Q plus software, then simulating it, and the process of making work pieces on the Milling machine CNC TU 3A, obtained the following conclusions:

1) Making workpieces on a milling machine CNC TU 3A uses CNC software Keller Q plus AutoCAD software2000 uses three media, namely:

Auto CAD 2000 software to makeworkpiece design, CNCMilling software KELLER Q plus to change language graphics from Auto CAD to language numerical, and TU 3A CNC milling machine to execute the
creation program work piece from CNC Milling software KELLER Q plus becomes a work piece.

2) The process of making the workpiece starts from design workpieces in software Auto CAD which is then stored on floppy disk via FX data. Workpiece design the one on the disk is then transferred to the CNC Millling KELLER Q plus software through Geometry. in Geometry, the design of the workpiece is arranged dimensions. Finish from Geometry design Work piece is entered in the Work plan to be processed so that it can be simulated and seen in three-dimensional form, then saved. From Work plan design objects work on moving to NC program for change graphics language into language numeric so that it can be read by the machine CNC. In NC this program is generated programming codes for manufacturing Work Unit. Programming results fromCNC KELLER software Q plus laterrecorded for execution on a milling machine CNC TU 3A to obtain workpieces according to the design in AutoCAD.
3) Programming languages in CNC software Milling KELLER Q plus using standard DIN 66025, while on milling machines CNC TU 3A uses ISO standards, so it must be converted first.
4) Programming results from CNC software Milling KELLER Q plus can not be directly used in the TU 3A CNC milling machine, but can be used on machines made in Germany which is compatible with CNC KELLER Q plus software.

5. Suggestions

Based on the limitations that exist in the software, then given some suggestions that are useful for the development, improvement and perfection in the manufacture of workpieces on CNC machines. These suggestions include:

1) Before planning the manufacture of workpieces need to know first the size, material and the tool to be used, so make it easier in making workpieces.
2) Before starting to make objects on CNC machines must be known especially formerly the standard programming language used.

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