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Analysis of the age and status of carbid with alumnium molding without RPM variations and power rapidity on lathe haas CNC machines at PT. XXX

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ABSTRACT

In everyday life we are not deprived of a technology, one example in the application of technology in the field of machining with the use of CNC machinery, CNC is that this machine is a machine used in the manufacturing process that usually uses computerized control and machine equipment. The most dominant advantage is the speed in the production process so it is suitable for mass production. The purpose of this study is to analyze the edge wear (VB) and determine the value of the n exponent and CT constant of the equation of Taylor's peak age for the peak life of the carbide with the aluminum material and to know the influence of the speed of rotation, feed speed, and cut depth on the machining process on the peaking life of carbide. In this study there are several parameters used namely with RPM 1000, 1800, and 2000. With the movement of 0.25 mm / rev, 0.15 mm /rev, and 0.05 mm / re with the data obtained which was later analyzed, this study can conclude, the life of the carbide in the process of cutting aluminum cylinders, obtain the exponent value n = 0.39 and the CT constant at a1 = 694.45, the constant CT at a2 = 659.66, the CT constante at a3 = 666.85. Then obtaining the aging age (T) will decrease, that aging at cutting speed (Vc1) = 81.64 m / min and n1 = 1000 rpm, i.e. 240,575 min. This study is influenced by the depth of the cutting (a1) = 1 mm, at the cut speed (vc2) = 141.3 m/ min. and N1 = 1800 rpm (t) = 51.75 min., and the shortest aging time occurring at a cutting velocity (Vc3) = 153,86 m / m. This research will also affect the age of its cutting at a certain depth (n)

Keywords: CNC, edge rigidity, cutting speed, CT constant, breaking age

1. INTRODUCTION

1.1 BACKGROUND OF THE STUDY

In our everyday life we are not independent of a technology, found events involving technology, one example in the use of technology in the field of machining with the utilization of CNC machines, CNC is the abbreviation of "Computer Numerical Control", The definition of CNC is that this machine is a machine used in the manufacturing process that usually uses computerized control and machine equipment. The most dominant advantage is the speed in production so it is suitable for use in mass production.

CNC machinery is a tool used in making products that are extremely difficult and have a high degree of rigidity. A CNC cutting machine is a machine in which a workpiece or part is cutting and rotated by the main spindle, while the cutting tool is used, mounted and moved in various axes (axis). A CNC blasting machine is generally used for the manufacturing process of various items, where the workpieces are cutting or rotating and cutting tools are positioned for the operating process of

OD (outer diameter) and ID (inner diameter), such as beams and pipes. Advantages of CNC machinery among others: High productivity, high machining precision, faster production time, cheaper manufacturing cost, larger production capacity, can be combined with other machines.

During the machining process, there is an interaction between the clay and the work object where the work item is cut while the workpiece undergoes friction. As a result of this friction, the bits suffered depletion. It's gonna grow to a certain extent. It's a long time to reach this deadline that's defined as the aging age. (tool life). It is also important to pay attention to the age of the straw in the process of machining, the criteria concerning the age or the time limit of use of straw, i.e. when straw can no longer be used or straw has been damaged. Therefore, on this practical work Analysis of edge (VB) and crater (KT) depletion against the age of carbide graft with aluminum material. Knowing the impact of rotation speed, feed speed, and cutting depth on the machining process on the carbide grain life.

1.2 CNC MACHINERY

CNC is an acronym for Computer Numerically Controlled or in Indonesian called as a machine whose system of oppression uses a computer based on numerical code. (perintah gerakan dengan menggunakan kode angka dan huruf). The machine itself was created with two axis or two axes, namely the x axis and the z axis. On the CNC machine there are three main command codes G, M, and A. These three codes have their own functions. With the presence of these CNC tools the resulting impact is the error rate and the defect of the workpiece decreases as everything is done using programming. According to the journal (Rochim, 1993) the main parts of CNC machines Lathe are generally the same even though different brands or manufactured factories, only sometimes the position of the handle or pulley, buttons, the indication table of the folding position is different. Here are the main parts of the CNC Lathe that are generally owned by such machines:

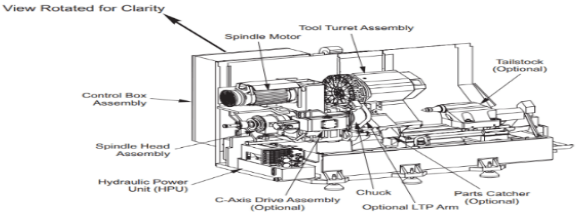

Figure 1. CNC Lathe Main Parts

CNC lathe machines themselves have the same basic motion principle as conventional pulp machines, which is horizontal and horizontal motion with the axis coordinates system X and Z. According to the journal (Rochim, 1993) the working principle of CNC latche machines is also the same as the conventional Pulp machines that are the work objects mounted on the moving axis while the cutting tool is still. For the direction of motion on the pulp machine are: Axis X for the direction for vertical cross-motion straight towards the rotating axis and Axis Z for the longitudinal direction of movement that is parallel to the rotation axis.

The programming method used for operating CNC machines is an incriminatory and absolute method. The incriminational method is a method of programming in which the reference point is not fixed i.e. the targeted end point will be the initial point of reference for achieving the next goal. The definition of the component program for each CNC consists of the rotary movement and the change of speed on the spindel's RPM. It also contains additional command functions such as batch replacement, a command to turn on or off the coolant, or an external M code command. The movement of the instrument consists of fast positioning commands, the movement of instruments in a straight line at controlled speed, and movements along the bow. The Haas spindle machine has two (2) linear axes named X and Z. It's the X axis moving the cube device towards and away from the middle line of the spindel, whereas the Z axis moves the spinning tower along the spinder's axis. (Automation, Haas Programing Tolls, 2011)

Inkrimental programming is a programming method in which the reference point is not fixed, i.e. the targeted end point will be the initial reference to the next goal. where it is a motion based on where that machine is currently sitting. He's also called point to point programming. If necessary change the diameter is half an inch smaller on the machine than its current place is U- 0.5000 is put in it code. If a tool stream is making a stream it is located 3/4 behind A stream it's finished, W-.7500 is inserted

1.3 CNC LATHE MACHINE PARAMETERS

According to (Widarto, 2008) the speed of rotation is the distance traveled by a point in a meter on a knife cover in one minute. As for the cutting speed formula on the tool machine, which can be described below:

$$\boldsymbol{Vc = \frac{\pi . d . n}{1000} (mm/menit)} \quad [1]$$

The cut speed will be symbolized by Vc to determine the RPM or rotation speed of a machine. According to (Widarto, 2008) Feedrate symbolized by Vf will be more emphasized on the speed of the table feeding at the time of the process of fitting on the workpiece. The feeding speed can be expressed in millimeters per minute where the use requires adjustment with the number of cutting points used. The feeding speed of each blade cut knife or can be called Fz for each type of tool and material has been specified so it remains to choose as needed (Widarto, 2008).

$$\boldsymbol{Vf = f\,x\,n\,(mm/menit)} \quad [2]$$

The cutting depth is the value of the feed depth that is given at the time of the melting process. In the depth of the cut will also affect the exhaustion of the crust.

$$\boldsymbol{a = \frac{do+dm}{2}(mm)} \quad [3]$$

1.4 TAYLOR'S EQUATION AND FLANK WEAR AND CRATER WEAR

Some types of machining, such as the pulp process, the gradient process and others, must be selected as a process/series of processes used to make it. For a stage of the process, the objective measurement is determined and the scavenger must dispose of some of the material of the workpiece until it is reached. This can be done by determining the intersection of the torque. (sebelum terpotong). As shown in the picture below, debris can occur in the crater fields (Aγ) and/ or in the main field (Aα) of the crust, (Rochim, T, 2007) and the process of rupture, and exhaustion.

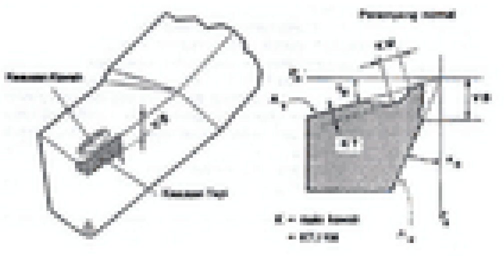

Figure 2. Flank Wear and Crater Wear

The aging age can be defined as the length of time it takes to reach a fixed aging limit. When the machining process is in progress that the straw has reached the prescribed durability limit (age) of the following criteria: There is an increase in the cutting style, the occurrence of vibration/chatter, the decrease in the smoothness of the surface result of machining, and/or a change in the dimensions/geometry of the product. to facilitate the calculation procedure according to the type of work performed. For the fixed price of the limits of the dimensions of the exhaust as well as the combination of a particular piece of work, then the relationship is as follows:

$$\boldsymbol{V.T^n = C_T} \quad [4]$$

The above equation is known as Taylor's Small Age Equation. The value of the constant CT and exponent n is obtained by doing the practice of cutting / machining the material of the workpiece. The smaller the price of the n exponent, the longer the crop life in question is heavily influenced by the cutting speed. According to the research carried out (Rochim, T, 2007), the influence of the change in machining variables on the change of aging, in order of the greatest of the influences are: Cutting speed, V; when changed +5%, T decreased 20%, Abrasion limit, V_B; when modified +5 %, T increased 10%, Thick drilling or feeding movement; when altered + 5%, T declined 5%, and Thickness of drilling, or cut depth; if changed +5, T dropped 2%.

2. METHODOLOGY

2.1 FLOW DIAGRAM

As far as the following is a flow diagram on the research this time is as follows.

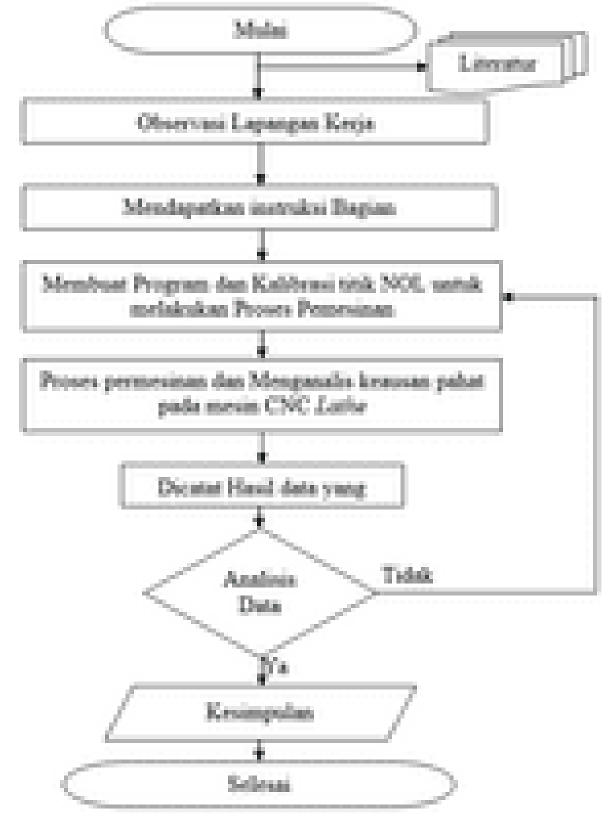

Figure 3. Research Flow Diagram

2.2 RESEARCH METHODS

This research method used is analytical, CNC lathe machine is a tool used in making products that are quite difficult and have high density figures. A CNC cutting machine is a machine in which a work object or part is cut and rotated by the main spindle, while the cutting tool is used, mounted and moved in various axes. (axis). To do the identification, it is necessary to know first what problems often occur on the machine, In order to be able to identify the problems that occur can be done by using a fishbone diagram. A fisbone or fishbone chart is a visual tool that is used for identifying and analyzing the causative factors or the root cause of a problem or problem.

In this experiment, one of the methods used by Taylor (1907) is the Variable Speed Machining Test. The research was done by variing the cutting speed (Vc) and cutting depth. Taylor's age equation is obtained from the value of the exponent n and the constant CT. The analysis of this test is done using the graphical method. Taylor's age equation is the parameters of a machine, spindle speed and feedrate. This time the cutting speed variation is done by choosing the levels for each region of low, medium and high cutting speeds. This way is enough to look at the influence of these factors by analyzing aging with Taylor's aging graphic method.

2.3 RESEARCH OBJECTS

In this practical work, you can find the research objects that the students at the Masindo Water Gema want to, namely: analyze the border (VB) and crater (KT) depletion of the carbides with aluminum material. and knowing the influence of the speed of rotation, feed speed, and cut depth on the process of machining on the carbide depleted life.

Table 1. Research Objects

n (*Spindel Speed)*	f (Gerak Makan)	*a* (Kedalaman Potong)
1000 RPM	0,25 (mm/rev)	1 (mm)
1800 RPM	0,15 (mm/rev)	0,5 (mm)
2000 RPM	0,05 (mm/rev)	0,02 (mm)

3. RESULTS AND DISCUSSION

3.1 THE EDGE WEAR (VB) AND THE TOOL LIFE (T),

The edge resistance (VB) and the Tool Life (T), against the steam press produced by the CNC machine. Adapted to the amount of data generated in which it is later used as material for research or case studies. This data can help with problems that occur in the company, as well as help in developing solutions or recommendations that can be applied in the future. Then this data also serves as material for the development of knowledge and skills. The following is a table of data used on the fat burning value of a CNC lathe machine with several cutting speeds, as follows:

Table 2. Calculation Result Data

Nilai	Satuan	Pengujian 1	2	3
Spindel Speed	RPM	1000	1800	2000
Gerak Makan	(mm/rev)	0,25	0,15	0,05
Kedalaman Potong	(mm)	1	0,5	0,02
Kecepatan potong	(m/menit)	81,64	141,3	153,86
Waktu pemotongan	(min)	0,114	0,105	0,285
Batas keausan pahat	(mm)	0,28	0,25	0,24
Umur pahat	(min)	240,575	51,75	42,78

After obtaining the data the student performs the calculation, makes a graph of the calculations, from the tests that have been carried out, obtained the cutting conditions that give the optimal lifespan of the carbide cuttings by variating the speed of cutting (Vc) to 3 levels. The cutting age is the total cutting time (tc) so that the fixed cutting limit (VB max = 0.3 mm) is reached. Growth of border depletion at different cutting speeds up to the critical limit of carbide degradation. From the calculation data, border displacement (VB) of the border can be seen as the occurrence of boundary deposition increases as the cutting rate increases for all cutting speed conditions (Vc). (tc). In the old age there is a diagram of the edge density (VB) ratio to the cutting speed (VC) as below:

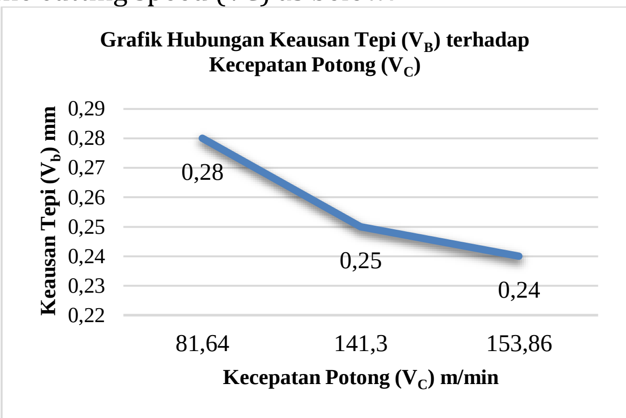

Figure 4. Graphic of the Relationship of Border Stretch (VB) to Cutting Speed (VC)

At cutting speed (Vc1) = 81.64 m/min and n1 = 1000 rpm, the value of edge cutting (VB) is 0.28 mm for cutting depth (a1) 1 mm, with a time (tc) of 0.114

minutes. This edge will decrease with the cutting thickness (a) given feed movement. In cutting deep (a2) = 0.5 mm, then the edge Cutting (vB2) is 0.25 mm with time (tc) 0.105 minutes, with cutting velocity (vc2) = 141.3 m/ min and n2 = 1800 rpm and on the third Data on cutting speeds (Vc3) = 153.86 m/ minute and n3 = 2000 rpm the price of edg cutting value (vb) appears at 0.24 mm for cut depths (a021) 0.02 mm, tc (time) 0.285 minutes.

Wherein in this study the criterion at the end of the life of the caterpillar (T) is at the price of the exhaustion of its edge (VB max = 0.3 mm), then with the expiration of a life of a citerpillar it is not recommended to use. At different cutting speeds it is very apparent that each crop has almost the same characteristics. At the time the crop begins to use the edge crop starts to grow relatively quickly then followed by relatively slow growth, tending to linear and the same VB value for some number of cuts and then rapid recurring crop growth occurs. On the calculation data it is very clear that this edge thickness will decrease with the cut depth (a) the feed movement given because the radius of the corner becomes smaller and will not come into direct contact with the material or there will be friction between the two metals, the size of the cutting style will give a large pressure on the rod so that the cut temperature increases because almost all the cut energy is converted into heat through the friction of the rod with the rod and between the rod to the workpiece.

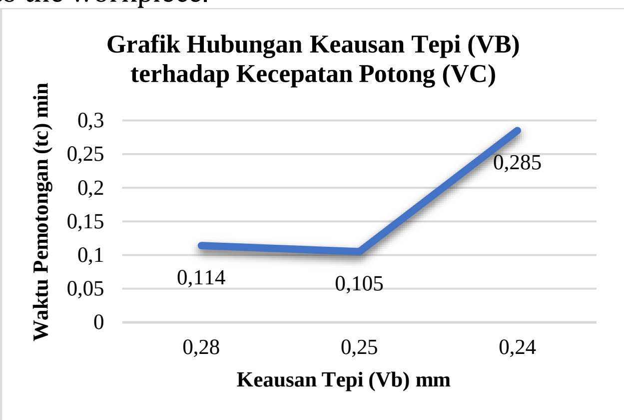

Figure 5. Graphic edge wear (T) against Cutting Speed (VC)

Based on the Chart of Cutting Time Relationship (tc) versus Border Smoothness (VB), it can be seen that in this analysis with increased cutting time (Tc), that the shortest cut time occurs at a small cutting speed at (Vc2) = 141.3 m/min, i.e. 0.104 minutes in this study is influenced by the cutting depth (a1) = 0.5 mm, and the long cut time happens at a high cutting rate (vc3) = 153.86 m/ min i. e. 0.285 minutes In this study the influence on cutting conditions is the size of the cut depth(a3) = 0.02 mm.

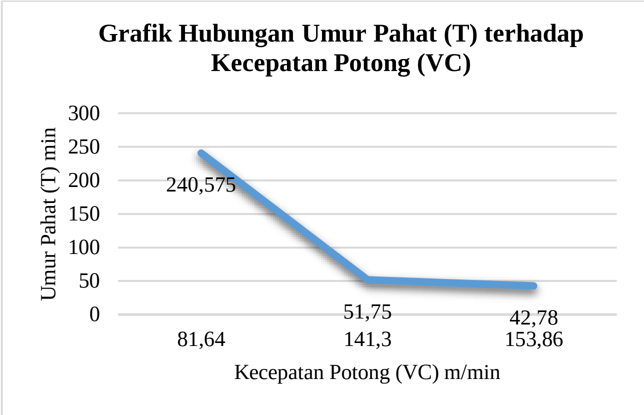

Figure 6. Graphic Tool Life (T) against Cutting Speed (VC)

You can see the picture above. The age of the beetle is determined by Taylor's formula. It can also be estimated by graphical methods, i.e. by plotting the test data on a double logarithmic scale. Age can also be determined by empirical analysis using the age equation of Taylor's age, in addition it can be estimated by graphical approach analysis. Based on the graph of the Relationship of Phat Age (T) to Cutting Speed (VC), it can be seen that as the cutting speed (Vc) increases, the weariness of the cuttings will increase as well and the wear life will decrease. So the more the test results chart slides, the longer the test life will be, and the sharper the test result chart, the shorter the life of the test. The age of the cuttings can be determined by the speed of cutting. From the graph it is determined that the greater the cutting speed, the shorter the life of cuts. At the crude age to determine the price of the exponent n is the specific price of a crude combination with a workpiece, and the CT constant is influenced by crude geometry, the condition of the workpieces, the conditions of cutting and the limit of maximum wear. (Lesmono, 2013).

The exponent value n and the CT constant of the test results can also be obtained by plotting data on the graph using a logarithmic double scale where the exponents value n is derived from the inclination of the graph where n = tan α or the comparison of the value of y/x. And a CT constant can be derived by extrapolating n at T = 1 minute which is an extension of the linear line n. From such analysis will be obtaining the price of exponens n and CT constant. At cutting speed (Vc1) = 81.64 m/min and n1 = 1000 rpm, i.e. (T) 240,575 minutes, in this study is influenced by cutting depth (a1) = 1 mm, at cutting velocity (Vc2) = 141.3 m/ min and N1 = 1800 rpm (i.e., T) 51.75 min, and the shortest cutting life occurs at a cut speed (vc3) = 153.86 m/Min and n3 = 2000 rpm, i. e. (tc) 41.38 minutes or in this research that influences the cutting conditions is the size of cutting deep (a3) = 0.02 mm

3.2 ANALYSIS PHOTO RESULT PAHAT

From the results of the analysis on the age and thirst of carbide grains with aluminum material with RPM variations and cutting speed,

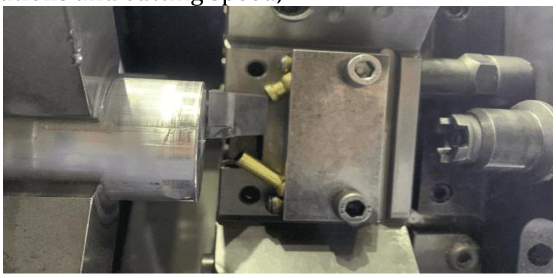

Figure 7. Scoring Results on Test 1

where at Vc 81.64 mm/min, the drained drainage is caused by a drained process due to the influence of friction between the drain with the draining field as well as the main drained field. This abrasive process continues to grow either in the main field of the clay or in the clam field. The impact continues to be long bitter will face the depletion signalled by the surface of the cut workpiece rising abruptly, at the time of the continuing cutting great increases signaled by a noise on the machine rising loudly. The thickness of this abrasive process will continue to grow until it reaches the critical limits of the abrasion.

Figure 8 Scoring Results on Test 2

At this Vc of 141.3 mm/min, the drainage caused by the abrasive process is generated faster and larger so that the speed that lasts faster reaches the critical limit. At this speed the size of the edge drain formed is signaled by the surface of the main field of the graft more rough. This friction is caused by friction between the material flow of the workpiece in the storm field as well as the main field of the gravel.

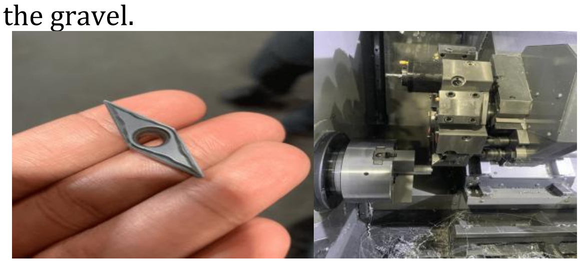

Figure 8 Scoring Results on Test 3

At Vc 153.86 mm/min this continuous drainage is caused by abrasive, adhesive and chemical processes. At first, the cutting of the blade seemed to be kind of burning and produced a loud noise on the machine. This cutting process is highly chemically active where the material of the newly cut workpiece is directly attached to the blast field and the main blast area is close to the cut eye. This mechanism occurs due to plastic deformation of the crater due to pressure loads as well as deformations due to large sliding loads on the crust fields leading to the formation of crustaceans. This is due to the simultaneous increase in cutting time as well as the increase in the cutting temperature so that the strength of the cuttings decreases so that they have a short lifetime.

4. CONCLUSION

After testing and analysing, here are some of the conclusions that have been drawn.

1. At cutting speed (Vc1) = 81.64 m/min and n1 = 1000 rpm, the value of edge cutting (VB) is 0.28 mm for cutting depth (a1) 1 mm, with a time (tc) of 0.114 minutes. This edge will decrease with the cut depth of (a) the given feed movement. In cutting deepness (a2) = 0.5 mm, then the edge binding (vb2) is 0.25 mm with the time (c) 0.105 minutes, with the cutting velocity (vc2) = 141.3 m/ min and n2 = 1800 rpm. And on the third data at cutting speeds (Vc3) = 153.86 m/ minute and n3 = 2000 rpm the price of cutting to the bottom (Vb) appears at 0.24 mm for the cuting depth(a1) 0.02 mm, and at the time(c) 0,285 minutes. and the CT constant can be obtained by extrapolating n on T = 1 minute, which is a linear line extension n. From this analysis will obtain the value of the exponent n and the constant CT. The result of the carbide aging test in the process of aluminum cylindrical cylinder blade, obtain an exponential price n = 0,39 and a CT constant on a1 = 694,45, CT constant at a2 = 659,66, CT constant in a3 = 666,85. Then obtaining the aging age (T) will decrease, that aging life At cutting speed (Vc1) = 81,64 m/min and n1 = 1000 rpm.
2. At a certain feeding movement with an increase in the cutting speed also results in increased cutting edge cutting so that cutting life will decrease at an increase of cutting velocity (Vc) will accelerate cutting border cutting (VB), so cutting lifespan will be decreased. And at the same cutting rate cutting cutting growth cutting time will increase. The longer we use the grate, the more rough the surface of the workpiece is being cut, the greater the style of cutting that occurs. At the cutting of the eyebrows, the spruce seemed to be kind of burning and producing a loud noise on the machine. This

cutting process is highly chemically active where the material of the newly cut workpiece is directly attached to the dirt field as well as the main dirt area close to the cutting eye. This mechanism occurs due to plastic deformation of the crater due to pressure loads as well as deformations due to large sliding loads on the crust fields leading to the formation of crustaceans. This is caused simultaneously by increased cutting time as well as an increase in cutting temperature so that the grinding strength decreases.

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