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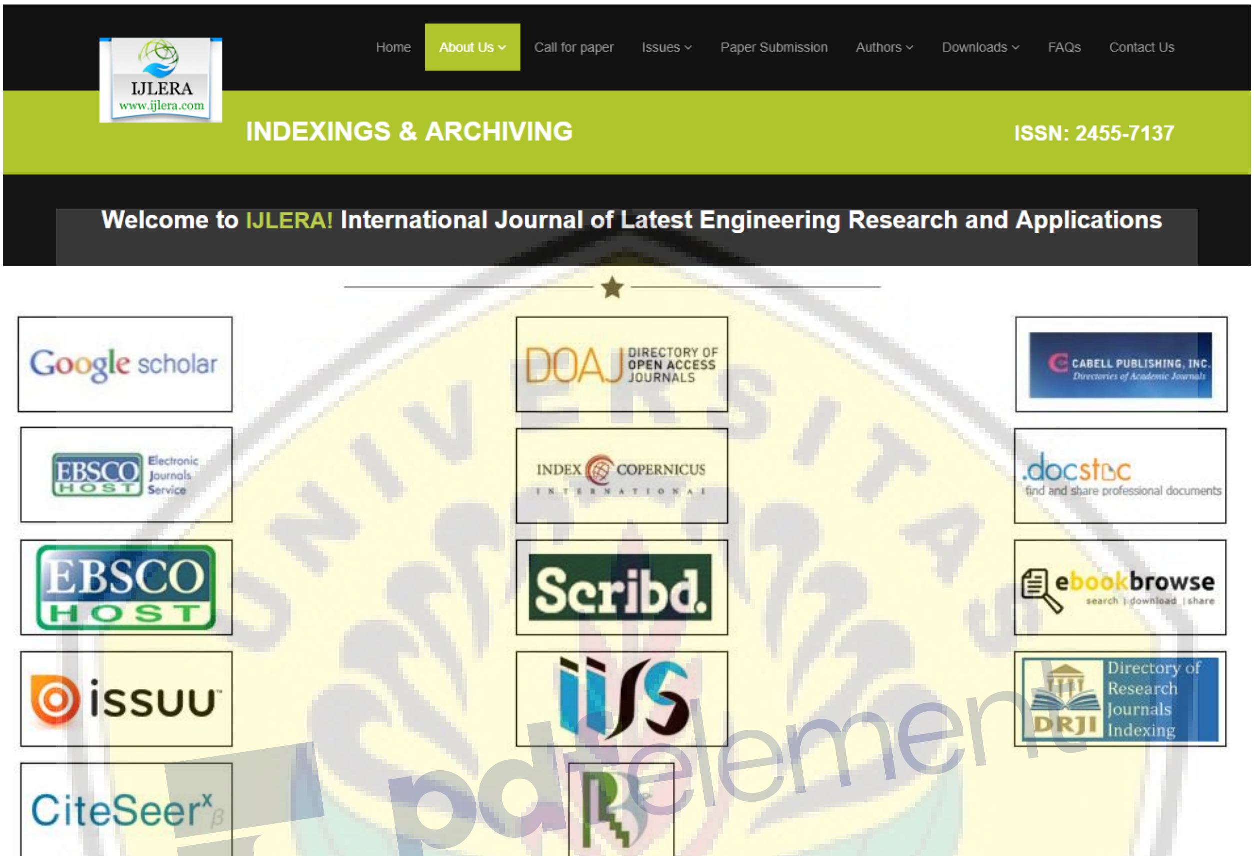

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Next I submitted my article entitled "Analysis of the effect of principal cutting angles to stability of tools vibration with sugar cane composite fiber damping".
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Yuni Hermawan
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Thanks & Welcome!!!

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Reviewers Comments:
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Analysis of Effect Principal Cutting Angle to Stability of Tools Vibration with Cement-Sugar Cane Fiber Composite Damping

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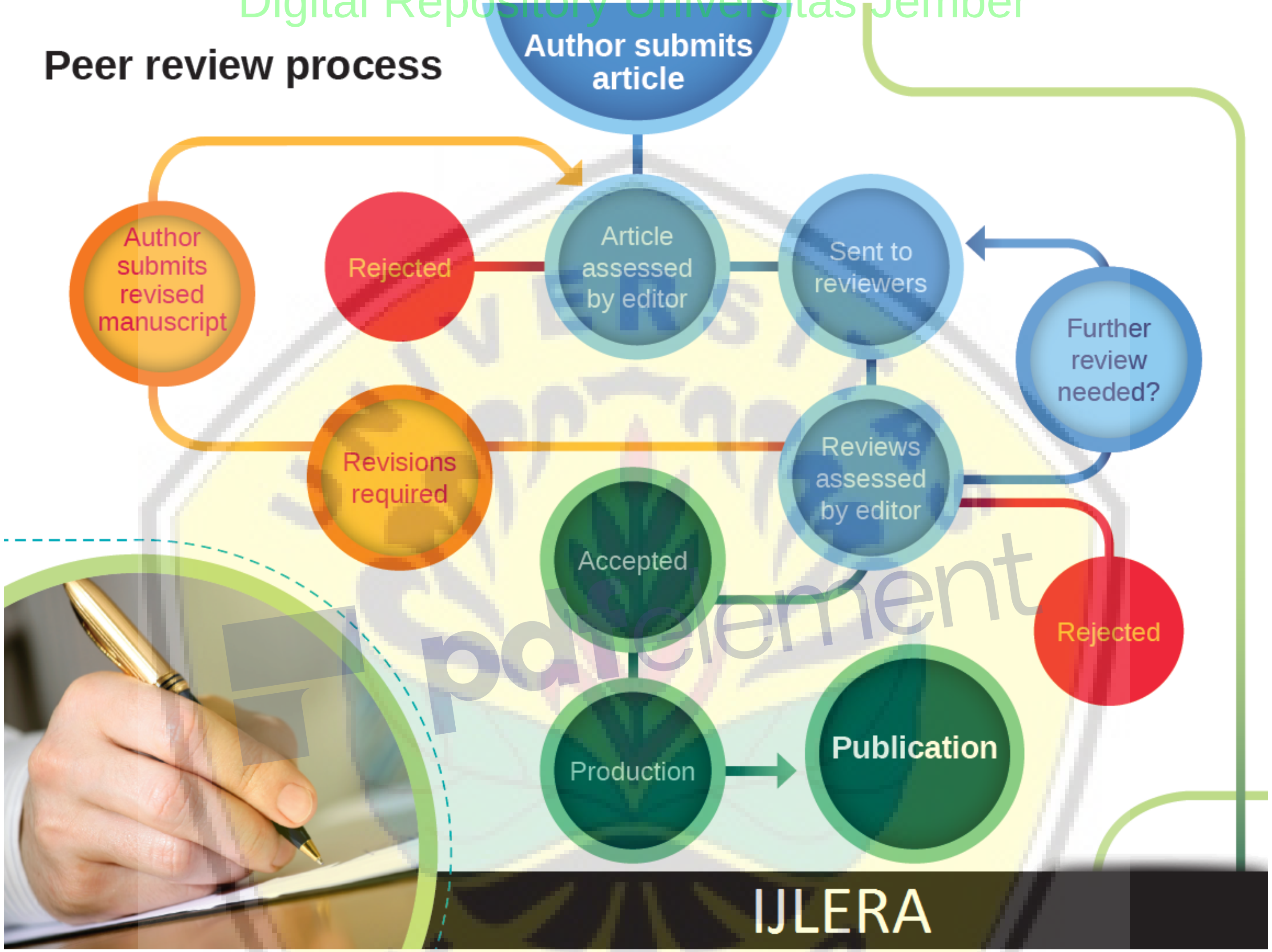

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Analysis of Effect Principal Cutting Angle to Stability of Tools Vibration with Cement-Sugar Cane Fiber Composite Damping

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Abstract: This study discusses the effect of the principal cutting angle, feeding and depth of cut on the tool vibration in the turning process. HSS turning tool are wrapped in a composite of cement-sugarcane fiber to reduce vibrations that occur during the machining process.The accelerometer vibration measuring instrument will record the vibration signals that occur during the machining process. The result: principal cutting angle, feeding and depth of cut are very influential on the occurrence of vibration in the turning process with a confidence level of 95.8%. The smallest vibration was obtained in the first experiment with the use of the principal cutting angle 60^o, feeding 0.05 mm/rev and the depth of cut 0.5 mm with a vibration value of 1.24 m/s^2.The greatest vibration is obtained when using the principal cutting angle of 90^o, 0.2 mm/rev feeding and 1 mm cutting depth with avibration value of 12.16 m/s^2.

Keywords: principal cutting angle, turning process and vibration.

I. Introduction

In the manufacturing industry, the results of the machining process are the main demands. One measure of the main demands is the quality of the machining process. For the turning process, the quality of machining results is surface roughness. Small surface roughness will make the machining product function properly. To produce a small surface roughness the main factor that needs to be taken into account is the vibration of the machine tool and machining parameters. Large and unstable tool vibration will result in large surface roughness. For parameter machining processes such as feeding and depth of cutting are very influential on the results of surface roughness, especially in the interaction between two factors that can cause stimulation of the onset of vibration [1].

Research on tool vibration on machine tools has been carried out, including: M.E.R. Bonifacio [2], Experimental research on AISI 4340 steel turning process on vibratory tools on turnings, the results of vibration are very well used to determine the amount of surface roughness. From this study, the greater the vibration, the greater the surface roughness. The use of carbide insert can reduce tool wear growth. Then RN Arnold [3], research about vibration on the turning tool at low speed. The result is that the vibration is not affected in the depth of the cut but depends more on changes in speed and increase in tool wear.

Whereas M. Xiao, K. Sato [4], Research on the effect of the nose radius on the amount of vibration and surface roughness, the result of using a large nose radius will stabilize the tool vibration, besides that it will also reduce surface roughness. O.B. Abouelatta, J. Mádl [5], Research on turning process without coolant to determine the effect of cutting parameters and tool vibration on surface roughness. The results of this study were processed with the help of Matlab and SPSS software to determine the mathematical equations used to predict the amount of surface roughness that occurs. P. W. Wallace, C. Andrew [6], Examining the effect of growl thickness and cutting force on tool vibration. The result is that the growl thickness is not very influential compared to cutting style, this is because the built up edge that appears during the machining process will make the vibration become unstable.

Of all the studies above [1-6] only discuss tool vibrations only from machining observations. The researchers above have not discussed the application of cement composites - sugarcane fiber for vibration dampening, especially in reducing tool vibration in the turning process. So the author enters the topic of the influence of the principal cutting angle and machining variables on the tool vibration in the turning process by using a composite vibration damper made from a mixture of portland cement and sugarcane fiber powder. The success of this new finding will contribute to the science of damping which so far only uses elastic materials such as rubber or compounds.

II. Material and Method

Experimental research was carried out on the Yamazaki lathe, with Aluminum 6061 material with a diameter of 40 mm and a cutting length of 150 mm. The turning tool used is High Speed Steel (HSS) wrapped in vibration dampers with cement composite material - sugar cane fiber powder. Longitudinal turning process by varying several variables that affect the magnitude of vibration, after this statistical analysis will be carried out between the independent variable and the dependent variable. The independent variables are:

a. Principal cutting angle (Kr): 60^o, 75^odan 90^o
b. Dept of cut (a): 0.5 mm, 0.8 mm dan 1 mm
c. Feeding (f): 0,05 mm/rev, 0,1 mm/rev, dan 0,2 mm/rev

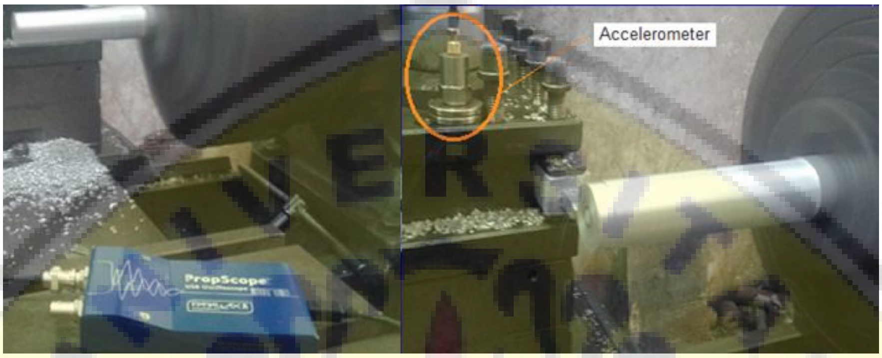

Figure 1. Aluminum 6061 machining vibration data retrieval

To find the relationship between the independent variable and the dependent variable, multiple regression analysis is used to get the equation. Then to find out whether the regression equation model obtained is really valid (the regression equation model with its coefficients can already be considered representing the data obtained through research), then the regression model is tested such as factorial analysis, test the suitability of the model, check the mean square residual, check the model utility, check the size of the model adequacy, unusual observation check, correlation analysis, regression modeling, and residual normality test. To facilitate the search for equations and test regression models, the SPSS 14.0 software is used, which is a special software for processing statistical data. By using this SPSS software, the data that will be obtained at the time of research will be processed quickly and accurately.

Retrieval of vibration data

The vibration measuring instrument used is PropScope and PropScope parallax software with the procedure: prepare the tools used for vibration gauges, among others, vibration detection sensors or accelerometer, charge amplifier, ADC and computer; Install the vibration sensor (accelerometer) on the tool post, this tool functions as a signal amplitude vibration sensor during the turning process. Connect the vibration sensor to the charge amplifier, so that vibration levels can be amplified so that they can be displayed. Connect the amplifier charge to the ADC (Analog to Digital Converter), so that the signal that used to be analog can be converted to digital and can appear on the computer. After the ADC is then connected to the computer to display vibration test data;

III. Results and Discussion

Experiment Result Data

After obtaining large vibration data, an analysis of the relationship between predictor and response variables was carried out. In this study vibration was the response variable and the predictor variables were, spindle rotation, depth of cut and feeding, then the data obtained would be processed statistically. The data obtained are as follows.

Table 1.Vibration tool data after testing

No	Testing Parameters			Tool vibration (m/s²)
	Principal cutting angle (°)	Dept of cut (mm)	Feeding (mm/rev)	
1	60	0.5	0.05	1.24
2	60	0.5	0.1	1.87
3	60	0.5	0.2	2.12
4	60	0.8	0.05	3.27
5	60	0.8	0.1	3.81
6	60	0.8	0.2	4.68
7	60	1	0.05	5`64
8	60	1	0.1	6.50
9	60	1	0.2	7.82
10	75	0.5	0.05	2.62
11	75	0.5	0.1	3.54
12	75	0.5	0.2	4.12
13	75	0.8	0.05	4.86
14	75	0.8	0.1	5.25
15	75	0.8	0.2	6`51
16	75	1	0.05	7.33
17	75	1	0.1	8.54
18	75	1	0.2	9.14
19	90	0.5	0.05	4.24
20	90	0.5	0.1	5.32
21	90	0.5	0.2	6.07
22	90	0.8	0.05	6.53
23	90	0.8	0.1	7.27
24	90	0.8	0.2	8.15
25	90	1	0.05	9.23
26	90	1	0.1	10.92
27	90	1	0.2	12.16

Vibration Data Analysis

This data analysis aims to determine the relationship and how strong the relationship is between the response variables namely vibration and predictor variables namely the principal cutting angle (Kr), feeding (f) and the depth of cut (a). Based on the data obtained, the regression analysis is obtained as follows:

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.979[a]	.958	.953	.59761	.958	175.214	3	23	.000	.777

a. Predictors: (Constant), a, f, Kr   b. Dependent Variable: As

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	-12.255	.860		-14.250	.000	-14.035	-10.476		
	Kr	.122	.009	.555	12.992	.000	.103	.141	1.000	1.000
	f	10.005	.560	.763	17.875	.000	8.847	11.163	1.000	1.000
	a	11.268	1.844	.261	6.110	.000	7.453	15.083	1.000	1.000

a. Dependent Variable: As

Figure 2. Multiple regression analysis output

The output of multiple regression analysis using SPSS 14.0 has two parts. The first part is a table of correlation values and the second table is a table of regression models.

Regression Modeling

In Figure 2 the equations that can be obtained through multiple linear regression analysis are:

$$\text{Tool vibration} = -12{,}26 + 0{,}12\ \text{Kr} + 10{,}01\ \text{f} + 11{,}26\ \text{a}$$

Variance influence factors (VIF) are used to identify the presence of multicollinearism in the model. Muticolinearism is a condition where there is a very close relationship between predictor variables. In regression, if there is a correlation between predictor variables, there will be a model mismatch that has been made. To overcome this, special regression methods are needed that can handle multicollinearity cases. Among them are stepwise regression, best subset, backward elimination, forward selection, and others. Figure 2 shows that the variance inflation factors are 1.0. This shows that there is no multicollinearity or very close relationship between independent variables and the model used is appropriate. If VIF> 1, it means there is a correlation between independent variables so that there is a model mismatch. There is also literature which states that if VIF is more than 5 or 10, the estimated parameters are not good.

Check Mean Square Residual

In the regression model, there is an assumption that the residual distribution follows the normal distribution with the average and standard deviation as small as possible. The smaller the residual standard deviation means that the estimated value of the model is closer to its true value.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	187.726	3	62.575	175.214	.000[a]
	Residual	8.214	23	.357		
	Total	195.940	26			

a. Predictors: (Constant), a, f, Kr   b. Dependent Variable: As

Figure 3. ANOVA table

In regression, there is the term mean square error (MSE) which is a residual variant (S^2). The residual variant is the square of the standard deviation. Figure 3 shows the MSE value for the model that has been made is 0.357. So the standard deviation value of the model is:

$$s = \sqrt{0.357} = 0{,}6$$

Adequacy Model Test

To measure the adequacy of the regression model, it can be seen by looking at the determinant cost (r^2). The coefficient of determination explains the magnitude of the response variation that can be explained by the predictor. In Figure 2 shows that the coefficient of determination of the model is 97.9%. The correlation coefficient (r) which is the root of the determination coefficient states the linear relationship between the response variable and the predictor variable. R values range from 0 to 1, where getting closer to one means the relationship between variables is getting stronger. In this model, the correlation coefficient is:

$$r = \sqrt{0{,}958} = 0{,}979$$

The coefficient shows that there is a strong linear relationship between response variables and predictor variables.

Residual Normality Test

To prove that the residual multiple linear regression model made has followed the desired normal distribution in accordance with the assumption of the regression model, it is necessary to test the residual normality of the model. This residual normality test uses the Kolmogorov-Smirnov normality test. With the hypothesis:

H_0 = Residual is normally distributed

H_1 = Residual is not normally distributed

Figure 4 shows that the residual points produced are close to a straight line determined based on residual data, so the residual can be said to have followed the normal distribution. From the SPSS calculation results obtained an average value of 4.37×10^{-15}, the standard deviation of 0.60 and the number of observations (n) = 27. And for the p-value for normal test the residual chart exceeds 15 %. So the conclusion is to accept the initial hypothesis which means that the residuals are normally distributed. The assumption of residual normality in a regression model has been fulfilled by the linear regression model so that the regression model that has been made can be used.

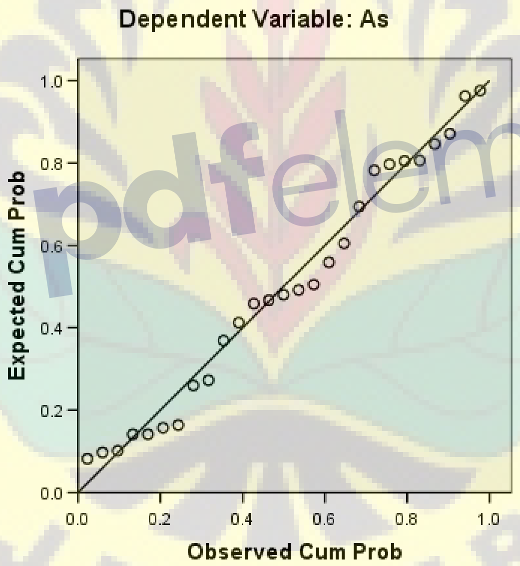

Figure 4. Normal distribution test plot

Discussion

After analyzing the experimental data using the regression method, a statistical equation is obtained which shows that all the predictor variables are the principal cutting angle (Kr), feed motion (f) and the depth of cut (a) affect the response variable, namely vibration (As). The smallest vibration is obtained at the use of the principal cutting angle 60°, feeding 0.05 mm/rev and the depth of cut is 0.5 mm and the largest value is obtained at the use of the principal cutting angle 90°, feed motion 0.2 mm/rev and the depth of cut 1 mm is produced equation as follows:

$$\text{Tool Vibration} = -12{,}26 + 0{,}12\ \text{Kr} + 10{,}01\ \text{f} + 11{,}26\ \text{a}$$

In this study the variable with the smallest effect is the principal cutting angle then gradually rises when the principal cutting angle increases. This is because the vibration has not passed its personal frequency, if the spindle rotation is added with a very high rotation until it passes through its personal frequency, the vibration will be more stable/small. Previous research states that the higher the spindle rotation is very sensitive to the occurrence of vibrations [1]. In addition to the principal cutting angle the depth of the cut also affects the occurrence of vibration in the turning process, this is due to the cutting force that occurs when the chisel cuts the workpiece so that it causes vibration in the turning process and automatically gets deeper in the cutter. Sugondo [7] conducted a Study of influence depth influence on vibration by using CY 800 GfChienYeh lathe, the result is that at a cutting of depth 0.5 mm, the vibration generated is the smallest and it can be concluded that the vibration will be even greater if the tangential force required for cutting is greater.

From the statistical equation that resulted in the greatest influence is the feeding, after adding the feeding the vibration also increases, this is due to the presence of the longitudinal force in the event of a feeding, thus causing the vibration to increase in each additional motion value. In previous studies, the feeding was made constant, this was intended to minimize the occurrence of vibration so that it could maximize the results of the material that had been turned or could also use a small feeding.

IV. Conclusion

Based on the results of the study of vibration damping machining using a cement-fiber powder composite damping, it can be concluded as follows:

1. The principal cutting angle, feeding and depth of cut are very influential on the occurrence of vibration in the turning process. Predictor variables have an effect of 95.8% on the response variable. This is indicated by the R-square value = 95.8% at the output of multiple regression analysis using SPSS 14.0 software, the depth of the cut has the greatest effect on the magnitude of the vibration in the turning process.
2. The smallest vibration is obtained in the first experiment with the use of the principal cutting angle 60^o, feeding 0.05 mm/rev and the depth of cut 0.5 mm. The greatest vibration was obtained on the 27th experiment with the use of the principal cutting angle of 90^o, feed motion 0.2 mm/rev and the depth of cut of 1 mm.
3. In this study, the variable with the greatest effect is the depth of cut, this is because with the greater the depth of the cut, the force required will be greater, so that the presence of a large cutting force causes vibration in the turning process. Feeding effect affects vibration, this is due to the presence of the longitudinal force in the event of a feeding which causes the vibration to increase in each addition to the motion value.

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References

[1]. Suhardjono, 2004. Effect of Cutting Speed and Chips Width on Vibrations in the Turning Process for Gripping Workpieces with Chuck without Tail Stock. Faculty of Industrial Engineering, ITS – Surabaya.

[2]. M.E.R.Bonifacio, A.E.Diniz, 1994, “Correlating tool wear, tool life, surface roughness and tool vibration in finish turning with coated carbide tools”, Wear, Volume 173, Issues 1–2, April 1994, Pages 137-144.

[3]. RN Arnold, 1996, “Cutting Tools Research: Report of Subcommittee on Carbide Tools: The Mechanism of Tool Vibration in the Cutting of Steel”, Journal of institusional of mechanical engineering” Vol 154 Issue 1.

[4]. M. Xiao, K. Sato, 2003, “The effect of tool nose radius in ultrasonic vibration cutting of hard metal International Journal of Machine Tools and Manufacture”, Volume 43, Issue 13, October 2003, Pages 1375-1382.

[5]. O.B .Abouelatta, J.Mádl, 2001, “Surface roughness prediction based on cutting parameters and tool vibrations in turning operations”, Journal of Materials Processing Technology, Volume 118, Issues 1–3, 3 December 2001, Pages 269-277.

[6]. P. W. Wallace, C. Andrew, 1965, “Machining Forces: Some Effects of Tool Vibration”, Journal of Mechanical Engineering Science, June 1965.

[7]. Sugondo, I.H. Siahaan, 2008, “Study of Influence Depth Influence on Vibration by using CY 800 GfChienYeh Lathe”, Mechanical engineering conference, October 2008.

