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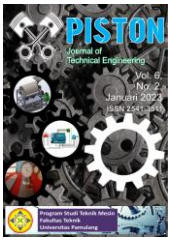

Measurement Of Aluminium Alloy 6061 Diameter Results Using Profile Projector

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Abstract: The writing of this study was conducted to measure the circle of variations of aluminum alloy 6061 with a diameter of 20mm, 25mm and 30mm, respectively the speed on the CNC frais engine is different, among others, low speed 500 Rpm, medium speed 700 Rpm and high speed of 1000 Rpm. In addition, the results of frais CNC 3 Axis machine are validated using Profile Projector measuring tool that has a higher accuracy rate compared to other measuring instruments.
The purpose of the study was to determine the effect of CNC engine speed with low, medium and high speeds on the dimensions of diameters of 20mm, 25mm and 30mm. and to find out the results of the deviation measure and accuracy of the hole work process by using frais CNC machine and Digital Caliper measuring instrument and Profile Projector. The result of this study was that the variation values of sample measurements using Varnier Caliper Digital and Profile Projector were heavily influenced by machine speed, and the result of the average deviation value was very pharmaceutical.

Keywords: Measurement of aluminum alloy diameter 6061, frais CNC machine Results 3 Axis with speeds of 500, 700, and 1000 Rpm, with Profile Projector measurement.

INTRODUCTION

Aluminum alloy is a light metal that has good corrosion resistance and good electrical conductivity. The use of aluminum in the world of machinery and industry to support the fabrication process has been widely applied by various material companies. Aluminum is used in a wide field, not only for household appliances but also used for aircraft, cars, ships and other construction products[6]. The higher the level of a component made means the higher the level of accuracy[5].

Characteristics of aluminum alloy 6061 Of the many potential metals, Metal Matrix Composites (MMCs) Al 6061 alloys (composed of Al, Mg, Si, Cr, Cu) have become the object of much research, especially because of their lightness, low cost and ease of fabrication [1]. Al 6061 has high corrosion resistance, because this metal is very reactive, because it forms a thin oxide layer on its surface, so that if it comes into contact with air and this layer peels off, a new layer will immediately form [2].

Al 6061 has a melting point (melting point) of 6600 C. tensile strength of 12.6 kgf/mm, density (density) 2.70 g/cm3, thermal expansion (linear coefficient of thermal) 13.1. 10-6 in/in/0F and thermal conductivity at 250C, 23 w/cm/0C [1].

Machine CNC (Computer Numerical Control) is a machine controlled by a computer with command data code numbers, letters and symbols, according to standard ISO[7]. Milling Machine CNC (Computer Numerical Control) is a type of milling machine tool that is controlled by a computer system with automatic motion controlled or programmed with a numeric language. It's the same with the cnc milling machine which basically changes the way of controlling the sledding and spindle rotation which is moved by turning by hand (manual) in place of numerical control.

The commonly used CNC machine parameters in the form of depth of cut, spindle speed and feed rate, affect the results in terms of roughness itself [3]. Some of the values used between others: spindle speed in the

range of 1500 Rpm, 1750 Rpm, and 2000 Rpm, feed rate 80 mm/min, 180 mm/min, and 280 mm/min, and depth of cut diameters of 0.1 mm, 0.2 mm, and 0.3 mm.

Profile projectors are also called optical comparators because in the process of enlarging the image, they use a lens to magnify the image of the workpiece being measured. The magnification that occurs depends on the lens used in the measurement process. On the profile screen this projector has a grid and can be rotated 360o. So that it can be aligned straight from the machine part to check or measure. This profile projector screen displays the magnification of the workpiece being measured using this profile projector. The size of the magnification depends on the type of lens used [4].

This author was carried out to measure the circle of variation of aluminum alloy 6061 with diameters of 20mm, 25mm and 30mm, each speed on a CNC milling machine is different, including low speed 500 rpm, medium speed 700 rpm and high speed 1000 rpm. In addition, the results of the cnc milling machine are validated using a Profile Projector measuring instrument which has a higher level of accuracy compared to other measuring tools.

This is the background for the author to conduct this research so that it can find out the comparison of engine speed on the parameters used so that It can be seen which sample has the lowest deviation value by measuring using a profile projector.

METHODOLOGY

The research method in this research follows the flow chart as shown in the figure.

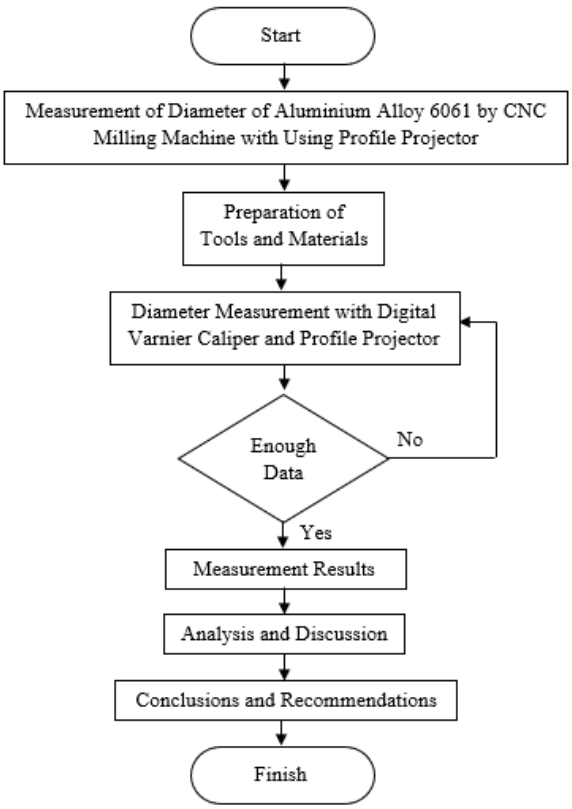

Figure 1. Research Method Flowchart

Table 1. Specification of Test Material with Low Rpm 500 Rpm,700 Rpm, 1000 Rpm

Material	Alloy 6061
Machine Speed	500 Rpm
Diameter	20, 25, dan 30 mm

Mesin CNC	3A – 3 Aksis	
Material	Alloy 6061	
Machine Speed	700 Rpm	
Diameter	20, 25, dan 30 mm	
Mesin CNC	3A – 3 Aksis	
Material	*Alloy 6061*	
Machine Speed	1000 Rpm	
Diameter	20, 25, dan 30mm	
Mesin CNC	3A – 3 Aksis	

Table 2. Measurement Results Using Profile Projector

Profile Projector Measurement Table								
RPM	**Diameter**	**Notasi**	**1**	**2**	**3**	**4**	**5**	**Rata-Rata**
500	20	2	19.954	19.998	19.989	19.909	19.988	19.968
		1	19.997	20.001	19.988	19.567	19.982	19.907
		3	19.945	19.956	19.789	19.878	20.045	19.923
	25	2	24.998	25.003	24.889	24.909	24.935	24.947
		1	25.002	24.909	25.024	24.948	24.98	24.973
		3	24.992	24.988	25.014	24.988	25.099	25.016
	30	2	30.123	30.109	30.128	30.199	30.009	30.114
		1	30.129	30.088	30.098	30.039	30.145	30.100
		3	30.122	30.045	30.022	30.012	30.104	30.061
700	20	2	20.02	20.005	19.989	19.909	19.954	19.975
		1	20.023	20.018	19.988	19.567	19.997	19.919
		3	20.012	20.933	19.789	19.878	19.945	20.111
	25	2	24.978	24.889	24.909	24.935	24.998	24.942
		1	25.02	25.024	24.948	24.98	25.002	24.995
		3	25.028	25.014	24.988	25.099	24.992	25.024
	30	2	30.004	30.123	30.109	30.113	30.199	30.110
		1	30.011	30.129	30.088	30.108	30.039	30.075
		3	30.059	30.122	30.045	30.098	30.012	30.067
1000	20	2	20.005	19.989	19.909	19.988	19.954	19.969
		1	20.018	19.988	19.567	19.982	19.997	19.910
		3	20.933	19.789	19.878	20.045	19.945	20.118
	25	2	25.015	24.998	24.889	24.909	24.935	24.949
		1	25.011	25.002	25.024	24.948	24.98	24.993
		3	24.999	24.992	25.014	24.988	25.099	25.018
	30	2	30.113	30.009	30.004	30.123	30.109	30.072
		1	30.108	30.145	30.011	30.129	30.088	30.096
		3	30.098	30.104	30.059	30.122	30.045	30.086

RESULT AND DISCUSSION

After taking data on the sample using a digital caliper varnier, then the next step is to collect data on the sample using a profile projector. And obtained the measurement results as shown in Table 3 below.

Table 3. Measurement Results Using A Profile Projector

Profile Projector Measurement Value Table					
RPM	**Diameter**	**Notasi**	**Rata-Rata Total**	**Nilai Varian**	**Std Dev**
1000	25	1	24.993	0.001	0.030
700	25	1	24.995	0.001	0.031
1000	30	3	30.086	0.001	0.032
500	20	2	19.968	0.001	0.037
1000	20	2	19.969	0.001	0.038
500	30	1	30.100	0.002	0.041
700	30	3	30.067	0.002	0.043
700	20	2	19.975	0.002	0.044
700	25	3	25.024	0.002	0.045
500	25	1	24.973	0.002	0.045
700	25	2	24.942	0.002	0.046
1000	25	3	25.018	0.002	0.046
500	25	3	25.016	0.002	0.048
700	30	1	30.075	0.002	0.049
500	30	3	30.061	0.002	0.049
500	25	2	24.947	0.003	0.052
1000	30	1	30.096	0.003	0.052
1000	25	2	24.949	0.003	0.055
1000	30	2	30.072	0.004	0.060
500	30	2	30.114	0.005	0.068
700	30	2	30.110	0.005	0.070
500	20	3	19.923	0.009	0.095
500	20	1	19.907	0.036	0.190
1000	20	1	19.910	0.037	0.192
700	20	1	19.919	0.039	0.197
1000	20	3	20.118	0.216	0.465
700	20	3	20.111	0.218	0.467

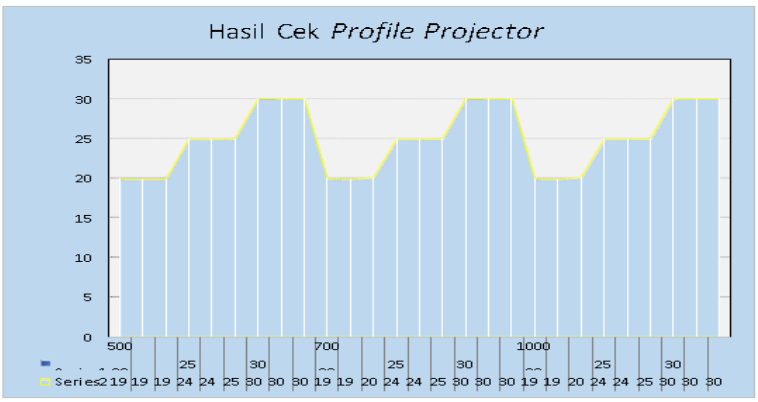

Figure 2. Measurement Results with Profile Projector

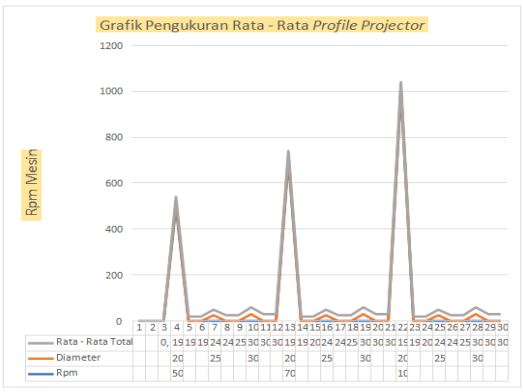

Figure 3. Calculation Result of Average Score from Profile Projector

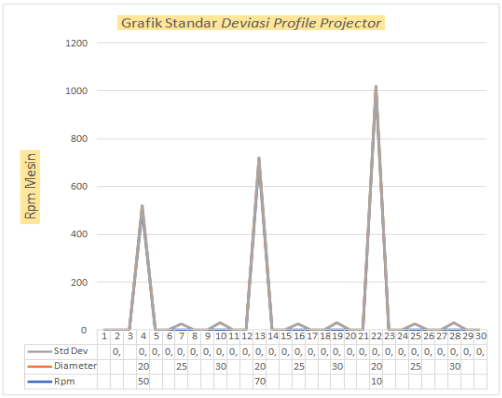

Figure 4. Calculation Result of Standard Deviation Value from Profile Projector

CONCLUSIONS

The conclusions obtained by the authors in this study are as follows:

1. From the results of the measurement of the circle of variation using a digital varnier caliper and using aprofile projector, in each sample the average value, variance (variance), is in the engine speed sample of 500 rpm, 700 rpm, and 1000 rpm. each measurement is carried out 5 times in each sample hole, and produces an average value with a range of.

   A. Digital caliper varnier measurement results

      a. Diameter 20, with range from 19,967 – 20,028
      b. Diameter 25, with range from 24,937 – 25,013
      c. Diameter 30, with range from 30,074 – 30,096

   From these data it can be seen that the smallest and largest average values are in all samples, namely samples of engine speed of 1000 rpm and 500 rpm

   B. Measurement results of profile projector

      a. Diameter 20, with a range of 19,907 – 20,118
      b. Diameter 25, with range from 24,942 – 25,024
      c. Diameter 30, with range from 30,061 – 30,114

   From these data it can be seen that the smallest and largest average values are in all samples, namely samples of engine speed of 1000 rpm and 500 rpm.

2. From the results of measuring the diameter of the sample using a digital varnier caliper and profile projector each has a standard deviation value (standard deviation). That is, in each sample and at all engine speeds, each has its own deviation value, which is carried out at each hole with five measurements.

   A. The results of the standard deviation of the digital varnier caliper measurement, the measurement of the diameter of the circle on the sample that produces the lowest standard deviation of 0.072 mm, with an engine speed of 500 rpm and the measurement notation for the third hole with a diameter of 30 mm. While the largest standard deviation value is 0.154 mm, with an engine speed of 1000 rpm and the third measurement notation with a diameter of 20 mm.
   B. The results of the standard deviation of the measurement of the profile projector, the measurement of the diameter of the circle on the sample that produces the lowest standard deviation of 0.030 mm, with an engine speed of 1000 rpm and the first hole measurement notation at a diameter of 25 mm. While the largest standard deviation value is 0.467 mm, with an engine speed of 1000 rpm and the third measurement notation at a diameter of 20 mm.

3. It can be concluded that the results of the measurement test on the sample, which used a digital varnier caliper and a profiler projector, showed that the engine speed was 500 rpm, 700 rpm, and 1000 rpm. greatly affect the level of roughness of the surface of the test object. The higher the engine speed, the lower the roughness level.

SUGGESTIONS

The suggestions that the author wants to convey from this research are:

1. Further research was conducted for the measurement process several times in the sample using a profile projector.
2. Expand testing on other materials, such as brass, copper, bronze and others.
3. Before making the sample, try to use a new cutting knife, so that there is no high enough roughness value.
4. Before taking measurements, periodically calibrate the measuring instrument first. So that the measuring instrument used functions properly, and avoids deviations from the measuring instrument

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