AENSI Journals

Australian Journal of Basic and Applied Sciences

ISSN:1991-8178

Journal home page: www.ajbasweb.com

Investigation Study The Surface Finish of The Hole Quality Using Reaming Process

C.O.C. Mohamad, M. Mukhtar , S. Zainal Ariffin, A. Ahmad Faiz

Faculty of Manufacturing Engineering Technology TATI University College, 24000 Terengganu, Malaysia.

ARTICLE INFO

Article history:
Received 20 November 2013
Received in revised form 24 January 2014
Accepted 29 January 2014
Available online 5 April 2014

Keywords:
Surface finish, accuracy, Cold-work tool steel, feed,rate

ABSTRACT

This study is to investigate the surface finish of the holes quality using reaming process. The problem statement of this study to solve the machinist which is they quite difficult to select the good of hole quality surface and the accuracy of the hole, where as it can affect during the reaming process with combination of different material that is mild steel, brass and df-3 (Cold-work tool steel). This investigation was concerned with the amount of accuracy and surface finish in the holemaking operation. Surface finish and accuracy were the dependent variables with speed, feed, and tool diameter. For this study we were use three different material selection and the parameter was set constant, the cutting process can be perform the surface roughness and accuracy of the holes.

To Cite This Article: C.O.C. Mohamad, M. Mukhtar , S. Zainal Ariffin, A. Ahmad Faiz., Investigation Study The Surface Finish of The Hole Quality Using Reaming Process. ***Aust. J. Basic & Appl. Sci.,*** *8(4): 799-803, 2014*

INTRODUCTION

The general purpose of this work was to investigate study the surface finish of the holes quality using reaming process. Hole generation and its finishing has spurred interest among several investigators. Hole making is considered as restricted machining and is difficult when compared with free machining. Industry requires mass production of holes with good finish and geometrical accuracy, to satisfy the functional requirements. Drilling is a fundamental hole making operation, used to originate a hole (Haggerty, W. A. April, 19604); however this operation suffers from several disadvantages such as vibration and poor dimensional accuracy. The basic metal removal in drilling is due to the combination of extrusion & negative rake cutting (Haggerty, W. A. April, 1960). To counter the aforementioned disadvantages, drilling is always followed up by reaming. Reaming is an operation of finishing and sizing a hole. A Reaming is a machining process widely used in industry. Reaming tests belong to processes which are used as laboratory tests for cutting fluids efficiency evaluation. Among the most considerable performance criteria in reaming belong reaming torque, reaming thrust, hole diameter oversize, hole geometry and surface roughness (Gillespie, L. K., September 1974). There are many independent influence parameters in reaming processes, such as machine, cutting tool, workpiece, cutting conditions, cutting fluid and parameters connected to the operator, his experience in performing cutting, choosing the correct measuring strategy and final data processing and evaluation. Therefore, a complete control over these influence quantities is necessary (Severt, W., "Abschlußbericht 2003). In general, dimensional accuracy and surface finish of reamed holes are functions of all or some of the following factors: speed; feed; properties and diameter of both the reamer and the drill; body and point geometry of both the reamer and the drill; properties of the workpiece; depth of cut; type and application of the cutting fluid; type of cutting machine; security of setup; and thermal effects (Shaw, C.M. 19683). Some of these factors have been investigated either fully or partially and some researchers have conducted experiments on precision drilling. However, there has been no significant investigation into the expense factor of reaming relative to the increase in holes accuracy accompanied by reaming.

2. Experimental Set-up:

The main purpose of this study to evaluate the surface finish the holes quality and determine the accuracy of the hole size after reaming process. In this study, we must make the six holes at each difference material by using reaming process. We use the same diameter of the cutting tool like reaming of the holes. Measurements for the accuracy and surface finish checking, we were use the surface roughness tester and internal Micrometres (Mitutoyo). All the reaming tests were carried out using a Hermle Nc milling machine UWF 802 M. For this experimental, we need to prepare the differences material for the material selection there are mild steel, df-

Corresponding Author: C.O.C. Mohamad, Department of Tool and Die Making, Faculty of Manufacturing Engineering Technology, TATI University College, 24000 Terengganu, Malaysia
E-mail: muhammad@tatiuc.edu.my

Australian Journal of Basic and Applied Sciences, 8(4) Special 2014, Pages: 799-803

3(cold-work tool steel) and brass.The cutting tool used for this project is drill Ø9.7mm and HSS Reamer size Ø10mm H7. Drill used to drill the six holes for each material selection. Then use the reamer for the secondary process as a finishing tool after predrilling. After the parameter was set, the cutting process can be perform with using different material for this experimental and the below items will be recorded the accuracy of the hole after reaming and surface roughness shown asTable 1.
Reamer diameter: 10 mm
Depth of cut: 0.3 mm

Table 1: Table of experimental plan reaming test.

Parameter	Unit	Reaming operation		
		Material		
		Df3	Brass	M.Steel
Cutting Speed	f/min	15	30	15
Revolution/Rpm	rev/min	300	300	300
Feed rate	mm/min	0.5	0.5	0.5
Reverse feed rate	-	rapid	rapid	rapid

Fig. 1: Drilling Process.

Fig. 2: Reaming process.

Use the drill Ø9.7mm for drilling process as shown Fig.1and 2 to make six holes at each material selection there are brass, mild steel and df-3.Then use the HSS Reamer size Ø10mm H7 for the secondary process as a finishing tool after pre-drilling. The experiment will be made by using difference material there are df-3 (cold-work tool steel), brass and mild steel. This experimental also need to measure as shown Fig. 3 and Fig. 4 the material in term of surface finish and the accuracy of hole quality by analyse, collect the data and accuracy checking with using tool measurements

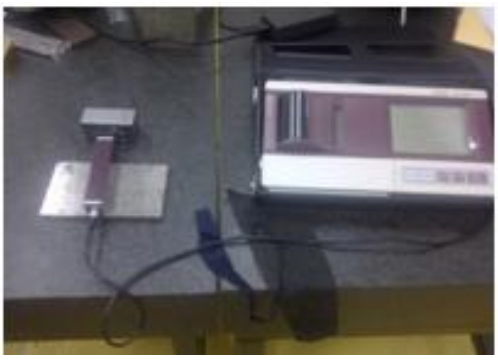

Fig. 3: Check surface roughness.

Fig. 4: Check accuracy

Result:

The experimental plan and results for the series of reaming test are presented in this section. The three cutting parameters that were used are cutting speed, feed rate and depth of cut that were set all constant. The machining responses that were investigated were accuracy of the hole and surface roughness during a reaming process. Table below shown the details of data result accuracy and surface roughness of the holes using reaming

process with differential material selection after were measured with the surface roughness tester and internal micrometer (mitutoyo). The result from the experiment were analyzed and studied.

Accuracy of reamed holes against to the different material:

The result was obtained as shown at Fig.5 to show the influenced between accuracy of reamed holes with the different material selection.

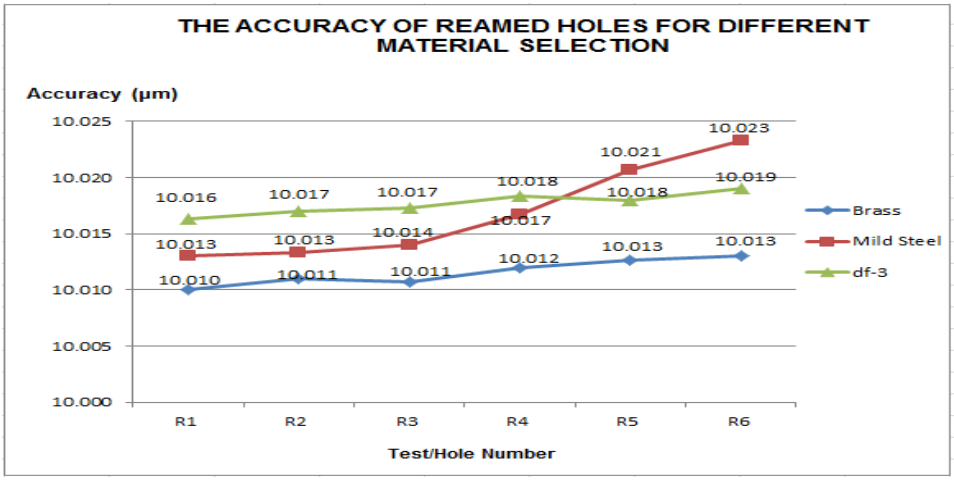

Fig. 5:The accuracy of reamed holes.

From the graph shown as Fig. 5 that, the result diameter holes accuracy at the differential material that were measured diameters of the holes always bigger than the nominal value of 10mm. At the first to last holes reamed on brass material shown that increasing by uniform value of the accuracy there are 10.010 to10.013 mm as shown above, however the accuracy value at mild steel material was archived the highest value than the brass .The value shown that increasing the accuracy at last holes reamed as above from 10.013 to 10.023 mm. At the df-3 material shown that accuracy value was increasing from 10.016 to 10.019mm and it will show this accuracy of reamed holes for df-3 material was archived the highest value than mild steel material however at sixth hole reamed was decreased that is 10.019mm as shown above. From description at this graph above, it will show the out of tolerance at fifth and sixth hole reamed of mild steel material while for the df-3 material is at the sixth hole. For the standard reamed hole tolerance range for diameter 10mm is from 0 to 0.018 µm.

Surface roughness of reamed holes against to the different material:

The result was obtained as shown at Fig. 6 to show the influenced between surface roughness of reamed holes with the different material selection.

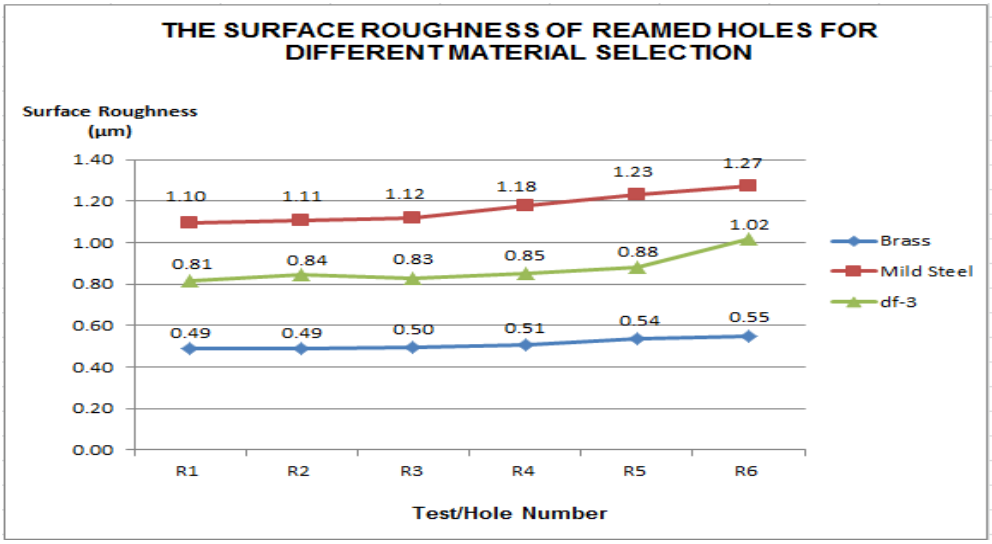

Fig. 6: The accuracy of reamed holes.

Discussion:

According to the results obtained from the accuracy of reamed holes experiment, it will show that brass material provide a good result. At the first to last holes reamed shown that increasing by uniform value of the accuracy there are 10.010 to10.013 mm which is the size of hole diameter is an accurate than with df-3 and mild steel material. The tolerances grade of holes diameter is ranging from 10.010 to 10.018mm are still in tolerance. So as we can see above, the size of reamed hole for mild steel and df-3 are still in tolerances but at the last hole for both materials shown that the size is out of tolerance there are range from 10.019 to 10.023mm. In this experiment, we can get the conclusion to prove that the soft of material will get the accurate size of reamed holes than hard material. Table 2 show the material properties of material selection that use in this experiment.

Table. 2: Properties of material selections.

Material	Hardness	Density (g/cc)
Df-3	449	7.70
Mild Steel	324	7.85
Brass	80	8.20

Reason from this conclusion is because the soft material will use less force in making holes reamed or another process. In this case, we can get the accuracy of the reamed holes quality. However for the hard material will use high force in making holes reamed and will cause the vibration of machine or tool use. At the same time, the reamer also may be wear and can make effect on size of the hole reamed and also size will be not an accurate.

From the results obtained to the surface roughness of reamed holes experiment, it will show the brass material was archived the lowest Ra that is from 0.49 µm to 0.55 µm and it will show that result for brass material was increasing by uniform value. It is also shown that Ra result value for brass material is good surface because the lowest Ra shown that better surface than highest Ra. However the mild steel material shown that the Ra value is lowest than Df-3 and it will show the mild steel is better surface than Df-3 material. According to this description, we can conclude that the brass show that the highest density and it will shown that the material has a good surface than df-3 and mild steel. However the mild steel is lowest density and will show the poor surface in this differential of material. Fig. 7 above show the materials of properties to prove that this discussion. The reason is when use the material with highest density may be can make the good surface in term of smooth movement tool during cutting process. Graph below show the properties of material influenced between density and hardness.

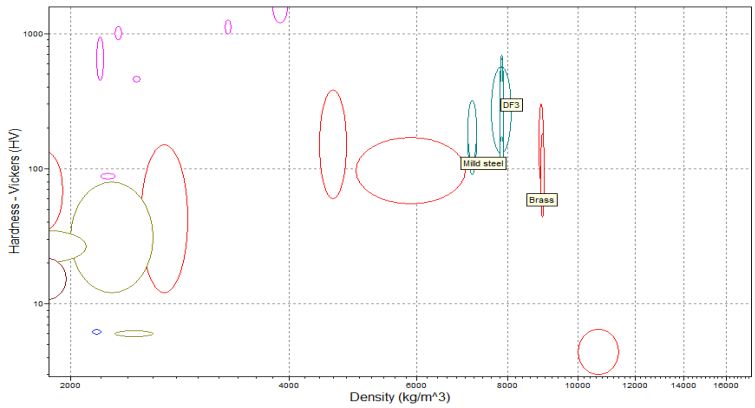

Fig.7: Properties of material (hardness vs. density) by CES EduPack 2005

Other than that, unsatisfactory surface roughness also is usually the result of vibration arising from poor rigidity in the machining set-up. The reamer may be excessively too long, held in poor quality tool holder or tool position that the cutting data may be incorrect for the application or the initial penetration into poor surfaces. Some other factors are that the chip is in not in good control, whereby chip evacuation is irregular.

Conclusion:

Reaming is a machining process widely used in industry. Industry requires mass production of holes with good finish and geometrical accuracy, to satisfy the functional requirements. Function of reaming process is as the secondary process after drilling that called finishing process to resize the hole and to make size the hole is accurate. The findings on investigation study the surface finish of the holes quality using reaming process. The problem statement of this study to solve the machinist quite difficult to select the good of hole quality surface, the accuracy of the hole, the geometry of the cutting tool and other parameters where as it can affect during the reaming process. In this study, df-3(tool steel), brass and mild steel are selected material and response to the

surface finish and the accuracy of the holes. In this, the objective are archive on investigation study the surface finish of the holes quality using reaming process. Now, the machinist can selected a good surface and the accurate of the holes reamed using any material selection in term properties of material.

REFERENCES

Gillespie, L.K., 1974. "The Effects of Reaming Variables on Burr Properties", Topical Report PDO 6984405 of Department 822 at Bendix.

Haggerty, W.A., 1960. "The Effect of Drill Symmetry on Performance," ASTME Technical Paper, 254: 60, Book 1.

Severt, W., 2003. "Abschlußbericht: Gratminimierung bei der Fräs- und Bohrbearbeitung Unterschiedlicher

Shaw, C.M., 1968. "Metal Cutting Principles. The M.I.T. Press, Massachusetts Institute of Technology, Cambridge, Mass., 3rd ed.