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Optimized cutting parameter for minimizing the vibration

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Abstract - This research paper gives you the report on the for find out for optimum cutting combination of cutting parameters of milling like feed depth of cut spindle speed by perform the milling operation in certain combination of feed depth of cut and speed we can optimized the vibration and we found the optimum power required during cutting . This paper characterize that the comparison and analysis between two or three or many material but in this paper we gave the data of mild steel and experiment performed in BIT DURG college workshop. and we took different readings in various combination of feed depth of cut and spindle speed. output from this thesis would be the information Assemblage of cutting force, vibration, chip thickness, engagement energy, tool losing edge volume and machined surface on work piece. The main purpose of this study is to understand that set of input parameters by which we can get the optimum values of vibration and power as well as save the life of tool.

Key Words: Dynamometer, thermal camera, vibration meter, milling machine, NC, CNC, MS.

1. INTRODUCTION

Manufacturing processes can be grouping according to the type of energy used in the process itself, such as mechanical, chemical, electrochemical, electrical and laser processes. The milling process has been extensively applied in die components, aeronautical, astron automobile parts and other products in manufacturing industry. One of the most important parameters of the technological system is the rigidity. Not only on the accuracy of dimension sand shapes of machining surface depend from this parameter [1,2], but it also has a decisive influence on the vibration at the cutting. There is traditionally considered inherent rigidity – the rigidity of individual parts of the support system of a machine, and contact rigidity – rigidity of the connections between these parts [3,4]. However, it is important to note the arrangement of support system, the location of its parts, because this determines the position of the center and the axes of rigidity. Milling is the process of machining flat, curved or irregular surface by feeding the work piece against a rotating cutter containing a number of cutting edges. Milling process consists of a motor driven spindle, which mounts and revolves the milling cutter and a reciprocating adjustable worktable, which mounts and feeds the work piece. Milling machine is a machine tool that cuts metal with multiple-tooth cutting tool called a milling cutter.

Fig1. Experiment performed in this milling machine of BIT college Work shop

For the successful implementation of measuring and obtaining high-quality results, it is essential to choose suitable place of measuring which has to provide a detailed information about the measured. When selecting a measuring point it was mainly reflected the availability and sufficiently large flat surface for the sensor location. Before selecting measuring, point was performed the preliminary measurement to confirm the suitability of the choice of measuring point. Vibrations were measured in the Z-axis, because measured values in the other axes are negligible.

During the milling of the material the operating parameters -the spindle speed is recorded. The character of the vibration signal which arises during this machining process depends on this spindle speed.

1.1 PROBLEM IDENTIFICATION

A vast study and experiment has carried out for the milling tool by many researches and many aspect like properties of tool surface roughness edge radius cutting force vibration wear etc. but it is a continuous requirement to know the behavioral pattern of each tool and its mechanized forces in the milling operation. Some problems will also

occurring whenever we arrange the experimental setup. And due to some equipment and setup many kind of error will also be the problem. Machine setup means setup of rack angle, clearance angle, entrance angle, exit angle, radial depth, cut, feed per tooth, maximum chip thickness. Tool properties, specific properties like C, Cr, Mo, W, Co, V. The behavioral pattern in the tool involves.

1.2 MATERIAL AND PROCESS PARAMETERS

[A]. Material selected for milling operation

Actually we selected three materials but this report is on for only one material Mild Steel (MS) we also said it low carbon steel just because of it contain less carbon . And generally mild steel used mostly in manufacturing industrials .And mild steel have good mechanical properties the chemical composition of mild is Carbon 0.16 to 0.18% , Silicon 0.4%, Sulfur 0.04%, Manganese 0.7 to 0.9%,Phosphorous maximum 0.04, all this compositions gives different properties to mild steel like carbon make it ductile and malleable.

Fig2. Mild steel after cutting

1.3 SELECTION OF PROCESS PARAMETER

The process parameters is selected based on the literature reviews of various research paper. In the reviews papers we have seen that milling operations affected by various thinks but the major thinks is that Cutting speed of spindle, Depth of cut, and Feed so we selected those process parameters for study.

2 METHODOLOGIES

For optimize of process parameter of milling machine we used Taguchi Method. Taguchi Method is the one of the most optimizing tool in minitab software generally Taguchi method preferred for optimizing process. The aim of this project is to find the optimum combination of process input parameter for optimum out put like force vibration and the method used for optimizing is Taguchi Method here a new function introduced is S/N ratio and we have to select lower S/N value because we have to minimize the parameters so lesser is better for our project

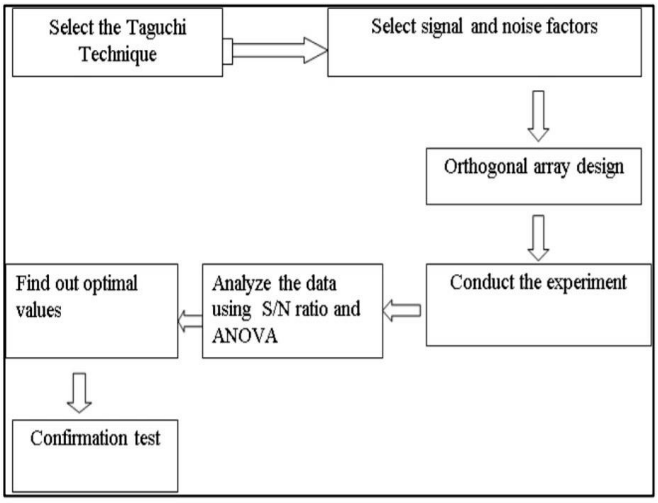

Fig. Taguchi Optimization Method

2.1 Data collection in workshop

	Speed (r.p.m)	Depth of cut (mm)	Feed (mm/min)	Force (Kgf)	Vibration (Hz)	
1	60	0.5	10	2.5	122.0	
2	60	0.6	18	4.5	369.0	
2	60	0.7	40	8.0	392.7	
4	90	0.5	18	3.0	129.0	
5	90	0.6	40	5.0	374.0	
6	90	0.7	10	6.0	382.0	
7	120	0.5	40	3.5	163.0	
8	120	0.6	10	4.0	178.3	
9	120	0.7	18	7.0	390.2	

From the above reading we apply Taguchi method in minitab and by the Taguchi Algorithm we get the S/N ratio and lesser value of SN value will better for our task. After apply optimization method we got 6th reading is optimum and on the basis of graph we have also one optimum reading.

3.0 RESULTS & DISCUSSION

Following conclusions have been reached from the study completed

a. Spindle speed significantly influenced the micro finish by increasing the spindle speed to 90 rpm.

b. The right hand cutter test experimentally confirmed the improved micro finish.

c. Increasing depth of cut affected parallelism and flatness readings as well as micro finish results negatively.

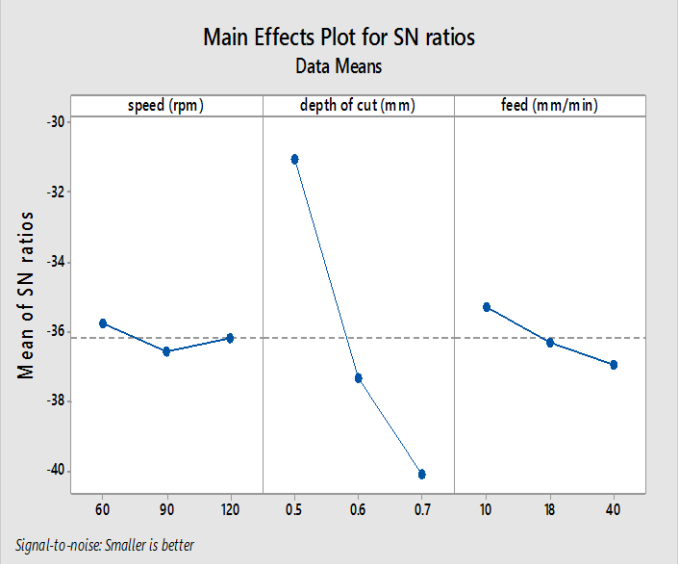

Fig3. S/N ratio

From the above graph we can conclude that for minimizing the vibration and for getting best optimized result we have to perform the cutting process in following input condition.

Spindle speed should 90r.p.m, with depth of cut o.7mm and along with feed 40mm/min this combination of input process parameter will give the optimum cutting force means optimum power required and the major think is optimum value of the vibration.

4. REFERENCES

[1] Abukhshim, N.A., Mativenga, P.T. and Sheikh, M.A., "Heat generation and temperature prediction in metal cutting: A review and implications for high speed machining," International Journal of Machine Tools and Manufacture, 46(7-8), 2006, p782-800.

[2] Acchar, W., Gomes, U.U., Kaysser, W.A. and Goring, K., "Strength degradation of a tungsten carbide-cobalt composite at elevated temperatures," Materials Characterization, 43, 1999, p27-32.

[3] Alauddin, M., Baradie, M.A. and Hashmi, M.S.J., "Prediction of tool life in end milling by response surface methodology," Journal of Materials Processing Technology, 71, 1997, p456-465.

[4] Arsecularatne, J.A. and Oxley, P.L.B., "Prediction of cutting forces in machining with restricted contact tools," Machining Science and Technology, 1(1), 1997, p95-112.

[5] Arsecularatne, J.A., "On tool-chip interface stress distributions, ploughing force and size effect in machining," International Journal of Machine Tools and Manufacture, 37(7), 1997, p885-899.

[6]. Gaetano Massimo Pittalà, Michele Monno. A new approach to the analysis of high-speed. 2010, The International Journal of Advanced Manufacturing Technology, Vol. 47, pp. 325–335.

[7]. Fontaine M, Devillez A. Dudzinski D.,Analytical simulation of milling: Influence of tool design on cutting forces... Besançon (France) :s.n., 2007. 12th IFToMM World Congress.

[8]. Budak, Erhan. An analytical design method for milling cutters with non constant pitch to increase stability, part 2: Application. 2003, Journal of manufacturing science and engineering, Vol. 125, pp. 35-38.

[9]. Johns C., Prickett C P W. Detection of tooth breakage in end milling using machine tool axis control signals. 1999, Journal of Engineering Manufacture, Vol. 213, pp. 103-108 .

[10]. Wulfsberg J.P,BrudekG Detection of cutting forces in micro machining operations.. 2005. 5theuspen International Conference.

[11]. Nizami D Theoretical definition of making force of cutting force for shaped, fluting, cutting-off and groove tools of cutters at turning automatic processing. 2000. 13th International Conference on Machine Design and Production.

[12]. www.mathworks.com. [Online]

[13]. Grabon, Wieslaw. The automation of parameter PPQ identification process for profiles with functional properties.International book series of Information Science and Computing. pp.198-202.

[14]. Łukianowicz, Cz. KarpińskiT., Optical system for measurement of surface form and roughness..2001, Measurement Science Review, Vol. 1, pp. 151-154.

[15]. LiH.Z., Liu K., Li X.P., A new method for determining the undeformed chip thickness in milling. 1-3, 2001, Journal of Materials Processing Technology, Vol. 113, pp. 378-384.

[16] Š. Olejarova, R. Krehel, M. Pollak, M. Kocisko, Research on impacts ofmechanical vibrations on the production machine to its rate of change oftechnical state, Adv. Mech. Eng. 8 (7) (2016) 55778, http://dx.doi.org/10.1177/1687814016655778.

[17] R. Akhatov, A. Govorkov, A. Zhilyaev, Software solution designing of The analysis system of workability of industrial product during the production startup of aeronautical products, International Journal of Applied Engineering Research. 21 (2015) 42560–42562

[18] G. Bianchi, F. Paolucci, P .Van den Braembussche, H. Van Brussel, F. Jovane Towards, Virtual Engineering in Machine Tool Design, CIRPAnnals - Manufacturing Technology. 45 (1996) 381–384.

[19] K.N. Rudakov, FEMAP 10.2.0. Geometric and finite element modeling of construction, KPI, Kiev, 2011.

[20] P.S. Goncharov, I.A. Artamonov, T.F. Khalitov, S.V. Denisikhin, D.E Sotnik, NXAdvanced Simulation, Engineering analysis, DMK Press,Moscow, 2012.