International Journal on Recent Technologies in Mechanical and Electrical Engineering (IJRMEE) ISSN: 2349-7947
Volume: 2 Issue: 4 006 – 008

"Design and Fabrication of Multi operational Wood Working Machine"

Pratik P Bargode[1], Samir M Dhadve[2], Ajinkya K Gosavi[3], Harshal S Indulkar[4], Mangesh S Prabhavalkar

[1-4] *Students, Department Of Mechanical Engg, RMCET, Ambav (Devrukh), MH*

[5] *Assist. Prof., Department Of Mechanical Engg, RMCET, Ambav (Devrukh), MH*

Abstract- Simplification of engineering and precise control of manufacturing process can result in significant cost saving. The most cost effective way, which can pay big dividends in the long run, is flexible manufacturing. Manufacturing need not be high ended and to be sophisticated. By employing DFMA (design for manufacturing and assembly) technology we achieve most attractive results. It required conscious effort to identify areas where this technology can be implemented. Circular saw machines and grinding machines are used in wood working industry on a large scale in many countries. The scope based on the existing wood cutting machine and the appropriate of DFMA methodology. The machine designed and manufactured can perform multiple operations at the same time on wood with required speed and controlled or operated by motor. It can perform cutting, grinding and buffing operations. In this paper, the preliminary design, valuation of design requirements and the design results are described. We are sure that the information contained in this paper would certainly prove useful for better insight in the scope and dimension of this project in its true perspective.

Keywords- "wood cutting", "Grinding", "buffing", "DFMA", "manufacturing process".

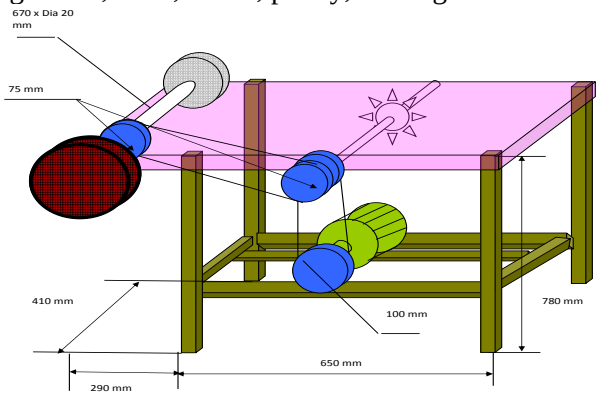
*****

I. INTRODUCTION

In the market there is no any machine facilitating for cutting, grinding & buffing operations at a time. So we tried to manufacture the same with all these operations. This equipment describes about the implementation of redesign. Our project being the special purpose equipment, specially meant for having facility to machine the material using abrasion process machine by using the application of Design for Manufacturing and Assembly methodology.

II. BLOCK DIAGRAM

The block diagram consists of Frame, cutter, grinding wheel, shaft, v-belt, pulley, bearing & motor.



III . SCOPE OF THE PROJECT

This equipment performs multiple operations at same time with required speed & this machine is automatic which control or operated by motor. From the study, the total number of parts, cost of existing design is reduced. Eventually, the improvement of redesign and integration of grinding and buffing operations with wood cutting finally will be able to meet user requirements and satisfactions.

IV . DESIGN

Considering various stress capacity of material selected for shaft and moment of inertia and bending moment we calculated diameter of shaft which is to be mounted with pulleys, grinding wheel and buffing wheel. at its The shaft rotates at 2800 rpm. From design diameter is 6 mm, but as grinding wheel's inner diameter is 20 mm; we selected shaft diameter as 20 mm.

The ball bearings selected for radial load of 20 kg during 90% of time & 80 kg load during remaining 10%. We determined the value of dynamic load rating for 5000hrs of operation with not more than 10% of failure. Then using reference table for static load bearing no 204 is selected.

We are requiring high speed for operation as these are finishing operations. For making the project compact transmission is done through v-belt. The v–belt is mostly used in m/c where a great amount of

power is to be transmitted from one pulley to a component when two pulleys are very near to each other. Two trapezoidal shape v-belts are selected and those made of fabric and cords, molded in rubber and covered with fabric and rubber.

As grinding is a high speed machining operation and it requires to run with speed 3000 to 4000 rpm. So diameter of arbor pulley calculated as 50 mm referring to design data book and corresponding calculations for diameter of motor pulley are carried out.

Due to the load of machine structure & load of trolley & balancing load, the angle may buckle in two planes at right angle to each other. For buckling in the vertical plane (i.e.in the plane of the angles), the angles are considered as hinged at the middle and for buckling in a plane perpendicular to the vertical plane, it is considered as fixed at the middle and both the ends. The standard angle available of 25 x 25 x5 mm and we selected the same which can bear the impact loading. The following are the components and their specifications drawn from extensive design.

Sr. No.	Name of the component	Specifications	Material & Type selected
1.	bearing	Basic dynamic load rating C = 18220 kg	Std Ball bearing SKF P204 is used
2.	bolts	M10 and M12, D = 6.72 mm, W = 300N	plain carbon steel
3.	shaft	T_{max} = 1.525 x 10^3 N-mm, T_2 = 53.167 N, T_1 = 112.98 N, Maximum Bending moment (Mmax) = 0.67 x 126, twisting moment on the shaft Te = 1527.33 N-mm, D = 20 mm	Bright steel
4.	pulley	N = 1920rpm, Angle of lap on the smaller pulley (θ) = 3.08 rad, D=50 mm	C.I.
5.	v-belt	power transmitted per belt = 1495.32 W, Number of V-Belts =2, length of belt= 725 mm	Fabric and cords molded in rubber and covered with fabric and rubber, A section
6.	Frame for foundation	780mm x 650 x 410mm	M.S. angle
7.	Electric motor	1440 rpm, 0.75 HP	Electric a.c.
8.	Grinding wheel	dia 180 mm	Al oxide abrasive
9.	Cutter wheel	20Φ x 140Φ x 4 mm thick	Tool steel.

III. EXPERIMENTAL SETUP

Setup consists of frame, wood cutter, grinding wheel, buffing wheel, shafts, bearings, v-belts, pulleys & motor as shown in fig.1. Initially frame is fabricated with help of M.S. angles keeping in mind the location of different parts to be mounted. According to design specifications and availability in market wood cutter, grinding wheel, and buffing wheel are brought and mounted on two different shafts. Then bearings and pulleys of desired specifications mounted on shaft. V-belts used to transmit the power form motor to pulley and one pulley to another. At the end electric a.c. motor is mounted on base of the frame. All assembly is completed and tested in working condition giving desired load and finally the results are analyzed.

Fig. 1: Experimental setup

IV. CONCLUSION

In this paper multipurpose machine having wood cutting, grinding and buffing wheels on single base is described. The practical measurement results have shown that the performance of this machine is better than the existing one. It requires less power for its operation. It is also

convenient to move from one place to another, due to its compact size and being installed on the single frame. It is easy for the maintenance with low maintenance cost and requires very less skill for its operation. This machine causes the increase of production capacity.

Thus this machine is better choice than machines performing those operations individually.

REFERENCE

[1] W A J Chapman, Workshop Technology (vol.1), 5th ed., Elsevier science, 1972.

[2] V.B. Bhandari**,** Machine design book, vol(5),ISBN-13:978-0-07-068179-8,pp330-333, 2011.

[3] PSG Design Data Book, (vol 5), Kalaikathir Achchagam – Coimbatore, May2010.

[4] Ozkan & S.Ayan "Design and application of circular saw machine" Journal of engineering research and applied science , vol(1), pp26-33, June 2012.

[5] Luis Cristovao "Machining properties of wood", vol(1),pp17-21, 2013.

[6] Hameed Shoripour **"**Development of automatic cutting system ",Journal of agriculture research, vol7(17),pp2683-2687, May 2012.