

DESIGN & FABRICATION OF MULTI-PURPOSE MACHINE

Jyoti¹, Surendra Gupta², Vaibhav Dwivedi³, Vikash⁴

⁽¹⁾Assistant professor, Dept. of Mechanical Engineering,

Buddha Institute of Technology, GIDA, Gorakhpur, U.P. (India)

^(2,3,4) Undergraduate Students, Dept. of Mechanical Engineering,

Buddha Institute of Technology, GIDA, Gorakhpur, U.P. (India)

ABSTRACT

In this paper presents the concept of Multi-Purpose Machine which is mainly carried out for production based industries. We have developed a conceptual model of a machine which would be capable of performing different operations simultaneously like drilling, cutting and grinding and it should be economically efficient. This machine performs multiple operations at the same time with desired speed. Multi-Purpose machine is automatic which is operated by motor and it is running with the help of current. It is based on the method of power transmission through gears and pulleys on the same shaft. It is designed as a portable one which can be used for cutting in various places. It can be used for operating on materials like thin metals, wood and PVC (Poly Vinyl Chloride). This machine can be used in remote places and workshops. It is designed as a portable one which can be used for various machining operations like. Since this machine uses very less human effort and it is cheap.

Keywords :- Cutting, Drilling, Economical, Grinding, Multi-Purpose, PVC.

INTRODUCTION

The main aim of all Industries, Production of useful goods and services at low inventory cost, low machine cost and low production cost. This project work subject is one in which actually we are learning theoretical concepts in practical view. In an industry a considerable portion of investment is being made for machinery installation. So in this paper we have proposed a machine which can perform operations like drilling, cutting, grinding and some lathe operations at different working centers simultaneously which implies that industrialist have not to pay for machine performing above tasks individually for operating operation simultaneously.

Economics of manufacturing: According to some economists, manufacturing is a wealth-producing sector of an economy, whereas a service sector tends to be wealth-consuming. Emerging technologies have provided some new growth in advanced manufacturing employment opportunities. Manufacturing provides important material support for national infrastructure and for National Defense.

AIM AND OBJECTIVE OF WORK

The aim of our project is the design and fabrication of MULTI-PURPOSE MACHINE, a structure, which is used for performing MULTIPLE OPERATION's like

1. Drilling
2. Cutting
3. Grinding

PROBLEM STATEMENT

1. Current machines are very costly.
2. Traditional machines require large space.
3. The unit is operated by means of electricity which has limited applications in the rural areas.
4. Traditional machines are uni-functional.

II.LITERATURE REVIEW

Before starting our work we have undergone through many research papers which indicates that for a production based industries machine installation is a tricky task as many factor being associated with it such as power consumption (electricity bill per machine), maintenance cost, no. of units produced per machine i.e. capacity of machine, time consumption and many more.

Some research papers which have led us to approach to the idea of a machine which may give solution to all these factors are as follows:

Machine tools nowadays have to be veritable "jack of all trades", able to handle all kinds of materials, to manage without any process materials as far as possible, and be capable of adapting to new job profiles with maximized flexibility. Two highly respected experts on machining and forming from Dortmund and Chemnitz report on what's in store for machine tool manufacturers and users[1].

Heinrich Arnold¹ et al. (2001), In his research rather long re-investment cycles of about 15 years have created the notion that innovation in the machine tool industry happens incrementally. But looking at its recent history, the integration of digital controls technology and computers into machine tools has hit the industry in three waves of technology shocks. Most companies underestimated the impact of this new technology. This article gives an overview of the history of the machine tool industry since numerical controls were invented and introduced and analyzes the disruptive character of this new technology on the market. The study establishes a connection between radical technological change, industry structure, and competitive environment. It reveals a number of important occurrences and interrelations that have so far gone unnoticed[2].

Dr. Toshimichi Moriwaki et al. (2006), According to this review high speed and high performance machine tools are main aim the machine tool technologies. In recent trends we are also focused on combined multifunctional machine tools, ultra precision machine tools and advanced control technologies[3][4].

Frankfurt-am Main et al. (2011), The crisis is over, but selling machinery remains a tough business. Different machines have different working principles to operate different functions[5].

Multi-purpose machines are the declarations of independence. The trend towards the kind of multi-purpose machining centers that are able to cost efficiently handle a broad portfolio of products with small batch sizes accelerated significantly during the crisis. “With a multi-purpose machine, you’re less dependent on particular products and sectors”, explains Biermann.

III. PROPOSED METHODOLOGY

In this project we will generally give the power supply to the motor to operate the shaft on which four pulley are mounted parallelly, and the first pulley is connected to second pulley with a belt drive to operate grinding wheel. At one end of the shaft, gear box is connected with pulley 4 to operate cutting operation with hacksaw blade. The gear box converts rotational motion of shaft into translatory motion. The fifth pulley is connected with motor with pulley belt to operate the shaft. The third pulley is connected to the drilling center pulley with a belt drive to perform the drilling operation.

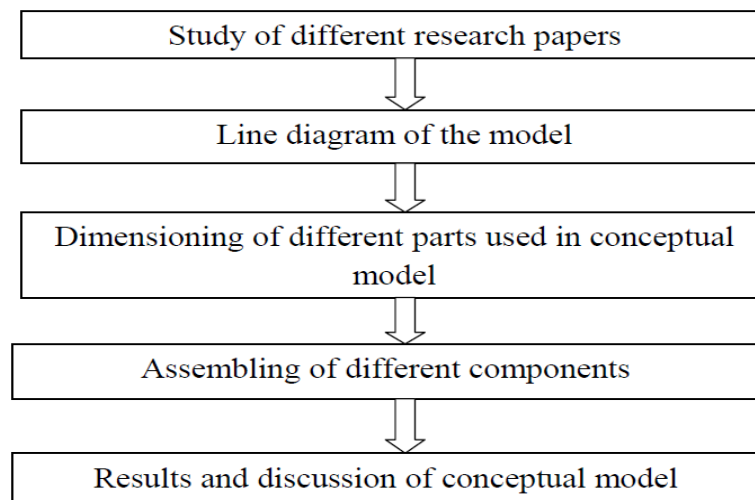


Fig. 1 :- Proposed Methodology

IV. EXPERIMENTAL SETUP

In this conceptual model we will involve the pulley arrangement for power transmission at different working centers. Basically different pulleys are arranged parallel on the main shaft with different sizes to perform the different operations like drilling, cutting and grinding. A gear box is connected at one end of the main shaft to convert rotational motion of the shaft into translatory motion for cutting operation. Two or more gears working in tandem are called a transmission and can produce a mechanical advantage through a gear ratio and thus may be considered a simple machine. Geared devices can change the speed, torque, and direction of a power source. The most common situation is for a gear to mesh with another gear; however, a gear can also mesh with a non-

rotating toothed part, called a rack, thereby producing translation instead of rotation. A motor is connected through one pulley (P_5) to rotate the main shaft to operate the different operations.

V.SPECIFICATIONS

1. Base = $L \times B = 61 \times 61 \text{cm}^2$
2. Height = 60cm
3. Motor power = 0.5 HP
4. Motor speed = 2500 rpm
5. Grinder wheel dia. = 8.5cm
6. Length of main shaft = 42cm
7. Dia. of main shaft = 1cm
8. Pulley diameter, $d_1 = d_2 = d_3 = d_4 = 4.5 \text{cm}$ & $d_5 = 5.5 \text{cm}$
9. $L_1 = 45.5 \text{cm}$
10. $L_2 = 52 \text{cm}$
11. Drilling center pulley dia. = 4cm
12. Connecting link hack saw length = 30 cm
13. Clamp = 17cm x 17cm
14. Dimension of shell = 16cm x 14cm
15. Distance between pulleys,
 - a) P_1 and $P_5 = 17.5 \text{cm}$
 - b) P_1 and $P_3 = 3 \text{cm}$
 - c) P_4 and $P_5 = 2.5 \text{cm}$

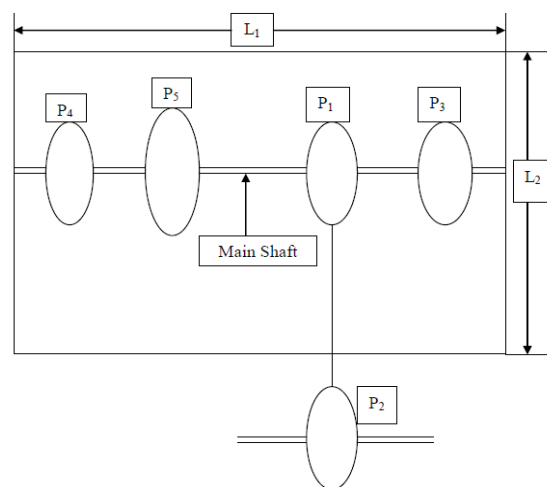


Fig. 2 :- Layout of Pulleys & Main Shaft

VI.RESULTS AND DISCUSSIONS

For designing the structure, motor is kept as a main power source. According to our design all the necessary parts are assembled. Although we have designed the structure with considering the necessary safety factors, these are theoretical values that we have collected from the parts from our design dimension. After the actual market research for the availability of the parts of our machine, we are able to process the parts of our desired dimensions. In that case, the standard parts with an approx. conformance with our calculated values would be preferred and corresponding modifications can be done.

VII.CONCLUSION

We see that all the industries, which are production based want low production cost and high work rate which is only possible through the utilization of multi-function operating machine which will use less power as well as less time and less labour. Since this machine provides working at different center so it reduces the time consumption up to an appreciable limit.

In an industry a considerable portion of investment is being made for machinery installation which is very costly. So we have proposed a machine that can perform operations like drilling, cutting & grinding at different working centers simultaneously which shows that industrialist have not to pay for machine performing above tasks individually for operating the operations simultaneously.

The following conclusions can also be drawn that

1. The machine is useful particularly for small scale industries.
2. Workers movements can be minimized.
3. Number of operations can be carried out on the single machine.
4. Power consumption is reduced.
5. Floor area required is reduced.
6. Cost of manufacturing is also reduced.

FUTURE SCOPE

1. Other operations can also be incorporated in to the machine.
2. The machine can be made more portable.
3. Cost can also be reduced to some extent by manufacturing it on a mass scale.

REFERENCES

- [1]. Dharwa Chaithanya Kirthikumar, “A Research on Multi Purpose Machine”, International Journal for Technological Research in Engineering (Vol.1, Issue.1, ISSN:2347-4718) (2013).
- [2]. Heinrich Arnold1”The recent history of the machine tool industry and the effects of technological change “University of Munich, Institute for Innovation Research and Technology Management, November 2001.

- [3]. Dr. Toshimichi Moriwaki “*Trends in Recent Machine Tool Technologies*” Professor Department of Mechanical Engineering Kobe University, *NTN Technical Review No.74*(2006).
- [4]. T. Moriwaki “*Multi-functional machine tool*”, Department of Industrial and Systems Engineering, Setsunan University, Neyagawa, Japan CIRP Annals - Manufacturing Technology, *DOI:10.1016 / j.cirp.2008.09.004*.
- [5]. Frankfurt am Main “*Multi-purpose machines ensure enhanced*“, 1 January 11.