

Design and Fabrication of Multi Task Operating Machine

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Abstract: This study elaborate how the multi-task operational mechanical system mainly carried out for production-based organization, industries are basically meant for production of useful products at low manufacturing. In this work the effort has been made to develop a modernized "Multi-Task Operating Machine" with less stress full operation for cutting Wood, Metal pipes & rods. The surface finish can be obtained by using Grinding wheel. The milling setup is introduced to perform face & end milling and drilling is introduced to drill the holes on metal and wood surfaces. The aim of this work is to develop vertical milling operation to perform facing on a metal & wooden work. The external Electric motor is connected to operate the above tasks like Cutting, Grinding & Drilling. This model can overcome the traditional way of cutting of pipes & rods, the mechanism works significantly with minimum vibrations & jerks, also be done cutting of different materials with good surface finish, hence the purpose model of multi task operating machine will be welcomed by many industries due to compactness & efficiency, to achieve this goal the multi task operating machine is developed.

Keywords: Drilling, Grinding, milling cutter, motor.

I. INTRODUCTION

Production industries are basically meant for production of useful goods and services at low cost. But to perform various operations on work piece different machines required which demands huge investments and expenditure. Small scale industries required to invest huge amount in machinery which is unaffordable some times, every industry desire to achieve a high productivity rate while maintaining the quality and standard of the product at a low cost and to develop a system which would be capable of performing different operations simultaneously while also being economically efficient. The Multi-Task operational machine have different work-stations which capable of carrying out a series of machining operations on the same machine which would otherwise require several machines in order to perform the same machining operations, to design and construct a low capital Multi – Task operational machine for the machine shop of the industries. We made system can perform operations like Drilling, Cutting, Grinding and Milling, the speed was very slow & the productivity time is more & production is also very less, as well as required more man power. It was not affordable adopt the manual cutting methods as the demand goes on increasing. In order to full-fill the shortfall, the motorized machines were invented. So, with the help of external grinding wheel, vertical milling is also introduced to perform related tasks of works. Semi-skilled worker can operate easily. In metal

industries the cutting procedure is continuously done &with continuous sub process like surface finishing, material removing to obtained with the help of multi task operating machine.

Problem Statement

In the present scenario, different machines used to perform various machining operations on work piece. Because of that movement of the work piece increases which leads to the increase cost of material handling and material damage chances also increases as well as production cost and time required to perform these operations are increases. Also, we required more electric energy to run all these machines to complete the operation. Use of multipurpose mechanical machine reduces the machining equipment cost as four machining operations combined together and can used simultaneously on same platform.

II. LITERATURE SURVEY

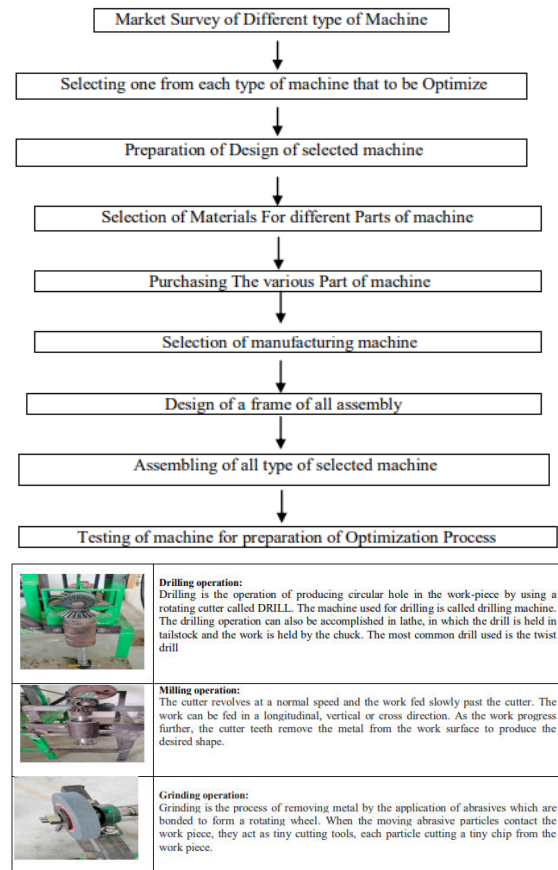
Machine is designed for the purpose of multi-operations i.e. drilling, cutting and grinding. This machine performs multipurpose operation at same lime with required speed. The project aims at designing and developing a multipurpose machine tool which is capable of performing multiple tasks simultaneously. The machine is operated by giving drive to the main shaft to which worm gear mechanism is directly attached [1]. Which will have ability to perform multiple mechanical operations of several machines instead of having one machine for one work Utilizing this machine,

they are able to achieve the goal of low investment machine for not only use but also for various colleges for practice. In future these machine complex variations can help to full fill the requirement [2]. Implementation of fabrication of multipurpose tooling machine, they have presented the development of multipurpose machine in various modes by which it can be actively adopted. Different types of attachment and tools which can be implemented on multipurpose machine have been discussed [3]. The numbers of operations are required in manufacturing processes. However, the separate equipment is required for performing each and every operation and hence the cost of setup is very high. This project deals with the fabrication of multipurpose mechanical machine which is capable of performing a number of operations in single machine [4]. 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 [5]. Found that how to increase the productivity by fabricating a Motorized Multipurpose machine that could perform three machining operation (Drilling, Grinding & Sheet Metal Cutting) at a time. The Bevel gear mechanism, Rack & pinion mechanism and CAM mechanisms were used in our project to make the Multioperations possible with a single input [6]. This mechanical machine is designed to perform multi operations specially drilling, cutting and grinding. The machine is designed to perform all the operations at same time with desired speed. This model of the multi operational machine may be used in industries and domestic operation which can perform mechanical operations [7]. Which will have ability to perform multiple mechanical operations of several machines instead of having one machine for one work Utilizing this machine, they are able to achieve the goal of low investment machine for not only use but also for various colleges for practice. In future these machine complex variations can help to full fill the requirement [8].

Recent trends in the machine tool technologies are surveyed from the viewpoints of high speed and high performance machine tools, combined multifunctional machine tools, ultra precision machine tools and advanced and intelligent control technologies[9]They fabricated the multi operation machine which able to perform four operations like

cutting, grinding, slotting, and drilling. Because of that cost of using separate machine for every separate operation reduces and machining time and electricity saved. For power transmission different methods are used like belt and pulley system, or through gear-shaft. Power transmission is done in such way that it minimizes the loss or no loss happened between them [10].

III. MATERIALS AND METHODS



IV. EXPERIMENTAL SETUP

In this system we have involved the gear arrangement and belt pulley for power transmission at different working centers, basically gear is a rotating machine part having cut teeth which mesh with another toothed part in order to transmit torque, in most cases with teeth on the one gear being of identical shape, and often also with that shape on the other gear. 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.



Figure 1: Multi Task Operating Machine

On other hand, bevel gears will rotate and transmit the power to the shaft connect to the grinding wheel. Also with this bevel gear pinion is mesh and attach to shaft on which the drilling belt placed on it. As per this, all three operations will perform simultaneously using single power supply and at near working centres. Bevel gears are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of a gear is the imaginary toothless surface that you would have by averaging out the peaks and valleys of the individual teeth. The pitch surface of an ordinary gear is the shape of a cylinder. The pitch angle of a gear is the angle between the face of the pitch surface and the axis. So that we can ultimately reduce the overall manufacturing cost compared to Basic individual cutting, Grinding and Drilling Machines. This also reduces the floor space when compared to Individual Machines. For making drilling action, bevel gears are arranged at the End position of the shaft. All the operations are carried out by giving electrical current to the motor. It converts electrical energy into mechanical energy. Then the mechanical energy is transferred to the rotating shaft and split into different operations. The overall power consumption is also reduced by the replacement of Individual Machines with Multi-machines. Grinding is an abrasive machining operation that uses a grinding wheel as the cutting tool.

Grinding is used to finish the work piece that

requires surface quality as well as high accuracy of shape and dimension.

The power is transmitted to the long shaft from the electrical motor which is driven by electrical current. The machine which is used to produce the product with high accuracy and quality and produce the goods in an economical manner. It makes the inventory cost less. The multipurpose machine has performed different operations simultaneously with high possibility. It usually occupies less space when compare to other machines and it can be portable from one place to another place. And this mechanical machine consumes low power, because of multi operations are performed in one machine at time.

V. RESULTS AND DISCUSSIONS



Figure 2: Drilling -operations performed on work piece

S.NO	MECHANICAL OPERATION	THEORITICAL SPEED(R.P.M)	ACTUAL SPEED(R.P.M)
1	Grinding	1440	1490
2	Drilling	276	290
3	Milling	350	365

As in Multi operational mechanical system, grinding wheel is fixed to the shaft of dual shaft motor. So the speed of motor is the speed of grinding wheel so the speed of motor is 1440 rpm because of that theoretical speed of grinding wheel is 1440 rpm for grinding operation. But using tachometer, the speed of grinding wheel measured as 1490 rpm. By these we conclude that mechanical machine works on the following above table values. For Drilling and Grinding operation we have used the identical bevel gears therefore both operation will have same velocity ratio. All the operations are performed simultaneously with good surface finish with good depth of cut. In the process of milling the shaft is moving in the speed of 365rpm with good cutting rate and with good surface finish. This work entitled multipurpose working can perform grinding, milling and drilling operation noise and vibration will be reduced.

VI. CONCLUSIONS AND FUTURE SCOPE

The project carried out by us is very much useful in the field of small scale industries. It is also useful for the workers to carry out a number of operations in a single machine. Our project is to ultimately reduce the power consumption and manufacturing cost and also to reduce the floor space. We can see that all the production based industries want low production cost and high work rate which is possible through the utilization of multipurpose machine which will require less power as well as less time, since this machine provides working at different centres it really will reduce the time consumption up to appreciable limit. In an industry a considerable portion of investment is being made for machinery installation. So we conclude in this project, proposed system which can able to perform operations like drilling, milling & grinding at different working centres simultaneously which implies that industrialists have not to pay for machine performing above tasks individually for operating operation simultaneously. This efficiently reduces the size of the system because of the use of dual shaft motor. Due to the combining of systems, maintenance cost of the system also reduces. The main advantages of this system are that it is easy to rectify the fault and increase the productivity of the system with less input electricity used.

This project has a very good scope in the future because we are combining three machining operations such as drilling, grinding, cutting in a single module. It ultimately reduces the power consumption and occupies less floor area and also portable. Compared to the individual machining operations this combination of various operations into a single machine, ultimately reduces the overall budget. This kind of Multi-Machines is mostly suited for the small-scale industries. This method of Multi-machine can be adapted to other machining operations and ultimately we can reduce the floor space and also the overall manufacturing cost.

REFERENCES

1. Rahul Kajabe (Feb-2019) Title: Design and Development of Multipurpose Machine.
2. Abhilash A. Aher (April 2018) Title: Design and Development of Multi operational Mechanical System.

3. Rahul R. Deshpande (Mar-2018) Title: Study of Fabrication of Multipurpose Tooling Machine.
4. Rahul U.Urunkar (April-2018) Title: Design and Development of Multipurpose Machine for Sawing, Drilling and Grinding.
5. Singh Ankitkumar Awadhesh (May 2017) Title: Design of Machine Elements, V.B.Bhandari, and TMH Publishers, New Delhi, 2ndEdition, 2013.
6. M. Prathyusha (April 2016) Title: Multiple operating machines.
7. Syed Shahnawaz (March 2017) Title: Design and Fabrication of Multi operational Machine.
8. Production Technology by R.K Jain and S.C Gupta, Khanna Publishers, 17thEdition, 2012.
9. Machine Design, R.L Norton, Tata McGraw Hill Publishers, 2nd Edition, 2012.
10. Tool Design, Donaldson, Lucian and Gold, Tata McGraw Hill, 4th Edition, 2012