Motorized Multipurpose Machine

Krishnappa R¹, Venkatesh G², Shriram M V³, Gowtham T⁴, U A Varun Prasad⁵, Venkatesh Patki⁶

¹,² Asst. Professor, Department of ME, Atria Institute Of Technology
³,⁴,⁵,⁶ Department of ME, Atria Institute of Technology

Abstract—This paper presents the concept of Multi-Function Operating Machine mainly carried out for production based industries. Industries are basically meant for Production of useful goods and services at low production cost, machinery cost and low inventory cost. Today in this world every task have been made quicker and fast due to technology advancement but this advancement also demands huge investments and expenditure, every industry desires to make high productivity rate maintaining the quality and standard of the product at low average cost. We have developed a conceptual model of a machine which would be capable of performing different operation simultaneously, and it should be economically efficient. In this machine we are actually giving drive to the main shaft to which scotch yoke mechanism is directly attached, scotch yoke mechanism is used for sawing operation. On the main shaft we have use bevel gear system for power transmission at two locations. Through bevel gear we will give drive to drilling centre and grinding centre. The model facilitate us to get the operation performed at different working centre simultaneously as it is getting drive from single power source. Objective of this model are conservation of electricity (power supply), reduction in cost associated with power usage, increase in productivity, reduced floor space.

Keywords—Multipurpose, Drilling, Grinding, Shaping, Sawing, Scotch yoke mechanism

I. INTRODUCTION

Industries are basically meant for Production of useful goods and services at low production cost, machinery cost and low inventory cost. Today in this world every task have been made quicker and fast due to technology advancement but this advancement also demands huge investments and expenditure, every industry desires to make high productivity rate maintaining the quality and standard of the product at low average cost. In an industry a considerable portion of investment is being made for machinery installation. So in this paper we have a proposed a machine which can perform operations like drilling, sawing, shaping, 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 in the Manufacturing Belt in the United States. Manufacturing provides important material support for national infrastructure and for national defense.

II. LITERATURE SURVEY

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 the idea of a machine which may give solution to all these factors are as follows:

Heinrich Arnold (November 2001): 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 have 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. About 100 interviews were conducted with decision-makers and industry experts who witnessed the development of the industry over the last forty years. 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.

Dr. Toshimichi Moriwaki (2006): Recent trends in the machine tool technologies are surveyed from the view points of high speed and high performance machine tools, combined multifunctional machine tools, ultra precision machine tools and advanced and intelligent control technologies. Frankfurt-am Main, 10 January 2011. The crisis is over, but selling machinery remains a tough business. 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. Multi-purpose machines are the declarations of independence. The trend towards the kind of multipurpose 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. NECESSITY FOR A MOTORIZED MULTIPURPOSE MACHINE

Industries are basically meant for Production of useful goods and services at low production cost, machinery cost and low inventory cost. Today in this world every task have been made quicker and fast due to technology advancement but this advancement also demands huge investments and expenditure, every industry desires to make high productivity rate maintaining the quality and standard of the product at low average cost
IV. METHODOLOGY AND WORKING PRINCIPLE

![Flow Chart]

**Working Principle**

- There are only two major principle on which our proposed machine
  1. Scotch-Yoke mechanism
  2. Power transmission through bevel gears.

1. **Scotch Yoke Mechanism** : The Scotch yoke is a mechanism for converting the linear motion of a slider into rotational motion or vice-versa. The piston or other reciprocating part is directly coupled to a sliding yoke with a slot that engages a pin on the rotating part. The shape of the motion of the piston is a pure sine wave over time given a constant rotational speed.

2. **Power Transmission Through Gears**: In the conceptual model of “motorized multipurpose machine” we are giving supply to the main shaft as we move along the axis of shaft we have mounted a pair of bevel gears, through the pinion shaft we are giving drive to drill shaft through belt-pulley arrangement, we have installed the stepped pulley in the arrangement therefore we can made the speed variation. Now again as we move along the axis of main-shaft further we have again used the bevel gear arrangement to give the drive to grinding center. As we can see that the scotch yoke mechanism is directly fabricated to the main shaft and have same angular velocity as that of main-shaft.

V. FUNCTIONAL DESCRIPTION

The functional description of the project work is explained in brief here. For better understanding, the total project work is divided into various blocks and each block explanation is provided here. The following is the description of overall function of the module. In this project generally the power is applied to the shaft on which a bevel gear is mounted on it and a second bevel gear at a right angle to it has been mounted on a drill shaft to which a drill bit is being attached. At one end of the shaft, power is applied manually and other end is being joined to a circular disc, through this circular disc scotch yoke mechanism is being performed (rotator y motion is converted to reciprocating motion).
Also in between these two, a helical gear is mounted which transfer its motion to other helical gear which is mounted on a shaft consist of grinding wheel

VI. PROPOSED MODEL OF A MULTI PURPOSE MACHINE

![Figure 2. Actual model](image)
VII. MATERIAL REQUIREMENTS AND ITS SPECIFICATION

Table 1. Material specification

<table>
<thead>
<tr>
<th>Material</th>
<th>Specification</th>
</tr>
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<tbody>
<tr>
<td>Mild steel plates</td>
<td>being cut according to size required for the frame</td>
</tr>
<tr>
<td>ac motor</td>
<td>220 volts (1/4hp) speed 1440 rpm</td>
</tr>
<tr>
<td>Ball bearing</td>
<td>which is mounted on the frame to hold the shaft in place</td>
</tr>
<tr>
<td>V-belt</td>
<td>a type which is used to transmit power from motor to other setups in the frame</td>
</tr>
<tr>
<td>Scotch yoke mechanism</td>
<td>(using cam shaft) to convert rotary motion</td>
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VIII. OBJECTIVE
With the help of a motorized multipurpose machine, the following objectives can be achieved:
- Reduction In Cost Associated With Power Storage
- Increase In Productivity
- Conservation Of Electricity
- Reduced Floor Space

IX. CONCLUSION
We can see that all the production based industries wanted low production cost and high work rate which is possible through the utilization of multi-function operating machine which will less power as well as less time, since this machine provides working at different center it really reduced the time consumption up to appreciable limit. 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, sawing, grinding at different working centers simultaneously which implies that industrialist have not to pay for machine performing above tasks individually for operating operation simultaneously.

REFERENCES
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