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Design and Development of Multiple Drill CKUCK

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ABSTRACT

The growth of Indian manufacturing sector depends largely on its productivity & quality. Productivity depends upon many factors, one of the major factors being manufacturing efficiency with which the operation /activities are carried out in the organization. Productivity can be improved by reducing the total machining time, combining the operations etc. In case of mass production where variety of jobs is less and quantity to be produced is huge, it is very essential to produce the job at a faster rate. This is not possible if we carry out the production by using general purpose machines. The best way to improve the production rate (productivity) along with quality is by use of special purpose machine. Usefulness and performance of the existing radial drilling machine will be increased by designing and development of multi spindle drilling head attachment. This paper deals with such development undertaken for similar job under consideration along with industrial case study.

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I. INTRODUCTION

Conventional Radial & pillar drilling machine carries out operations as listed below,

1. Drilling
2. Reaming
3. Spot facing
4. Boring
5. Counter boring
6. Countersinking

Time saved by component handling (loading and unloading), using hydraulic clamping, Increase in productivity both qualitative and quantitative, Less human intervention, indirectly reduction in operator fatigue, Increase the profit of company. Special purpose machine is part of multi-tasking machine. This is new approach to increase the productivity of organization. If we compare between ordinary machine and special purpose machine in terms of time, costs, number of steps involved, etc. The multi-tasking machine is preferred choice. The most noteworthy aspect when using multi-spindle machines is the cycle time, due to parallel machining the total operating time is dramatically decrees.

Methods

Now a days the manufacturing sector have their own problems to archive the pick of the productivity, hence they put the various methods to be mass production with minimum lead time.

Adjustable multispindle drilling head Can be used in many components, where change the centre distance to some range. It will increase drilling capacity in single special purpose machine.

Fixed Multispindle drilling head Design & development of multi spindle drilling head.

Multispindle drilling machine

As the name indicates multiple spindle drilling machines have two spindles driven by a single power head, and these two spindles holding the drill bits are fed into the work piece simultaneously. The spindles are so constructed that their centre distance can be adjusted in any position within the drill head depending on the job requirement. For this purpose, the drill spindles are connected to the main drive by means of universal joints. The rotation of the drills are derived from the main spindle and the central gear through a number of planetary gears in mesh with the central gear) and the corresponding flexible shafts. The positions of those

parallel shafts holding the drills are adjusted depending upon the locations of the holes to be made on the job. Each shaft possesses a telescopic part and two universal joints at its ends to allow its change in length and orientation respectively

Todays manufacturing indusrties have some essues which directly affect the productuvity

Our concern is that a vendor compony in Satara faces problem which have defines follow.

II. PROBLEM DEFINITION

Approach to problem:

- Manufacturing process time maximum
- Drilling setup change or adjust again and again.
- Tedious work to match the centre of drilling bit & work piece.
- Minimum production batch.
- Profit loss.
- Machine ideal.
- Time consuming process.

Solution to problem:-

The Gang drilling attachments an ideal solution to the above problem where in the conventional drilling machine is used to perform two or more operations at a time, so also different operations like drilling, reaming, countersinking or spot facing can be done simultaneously. The gang drilling attachment is easy to mount on the radial drilling machine, where in the MT-2 taper arbor directly fits into the drilling machine sleeve, if necessary a support sleeve can be attached to the top casing plate for extra stability. In the Gang drilling attachment three spindle are driven simultaneously which carry three drill tools. The drill chucks can receive twist drills, reamers, countersinking drills or spot facing cutters to perform the desired operation
In our attempt to design a special purpose machine we have adopted a very a very careful approach, the total design work has been divided into two parts mainly;

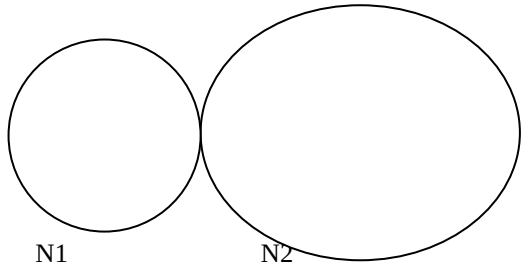
- System design
- Mechanical design

System design mainly concerns with the various physical constraints and ergonomics, space requirements, arrangement of various components on the main frame of machine no of controls position of these controls ease of maintenance scope of further improvement; height of m/c from ground etc. In Mechanical design the components are categories in two parts.

- Design parts
- Parts to be purchased.

For design parts detail design is done and dimensions thus obtained are compared to next highest dimension which are readily available in market this simplifies the assembly as well as post production servicing work. The various tolerances on work pieces are specified in the manufacturing drawings. The process charts are prepared & passed on to the manufacturing stage .The parts are to be purchased directly are specified &selected from standard catalogues. In system design we mainly concentrate on the following parameter such as System selection based on physical constraints, Arrangement of various components, Components of system, Chances of failure, Servicing facility, Height of m/c from ground, Weight of machine.

Design of Gears



Where,

N1:- Driver

N2:-Driven

Speed Ratio = N1/N2 = T2/T1

Gear ratio = i = zg/zp

Standard- for SAE-8620 (Alloy steel) Material is used for less than 1500 rpm.

Tensile strength -530-600 mpa

Yield Strength -385-400 Mpa

Gear trains -Simple gear train is used.

Motor selections

As calculation by torque and speed motor is selected .

As catalogue Torque is 4.94 Nm at1440 rpm

Assuming an transmission ratio of 1:4

Mt=W x t

Where,

t=(dm/2)

T= pt x dp/2

We know no. Of teeth and PCD.
Dp =mZp
M = Dg/ Zg

Pt = $\frac{2Mt}{dp}$

V = $\frac{\pi dp\ X\ np}{60\ X\ 10^3}$

Cv t concerned with = $\frac{3}{3+V}$

Peff = $\frac{Cs}{Cv}\ X\ Pt$

Sb = m b σb y

F(s) = $\frac{Sb}{Peff}$

(As notations and symbol have their usual meaning)
Bearing and key way should be as selected as the requirement of the structural design.

III. CONCLUSION

As discussed at the starting of the paper that is concerned with special problems occurred at the manufacturing industry .From that the we don't claim that all the problems is solved but this is an startup for the same as our study project contributed in it with some extend following have some conclusion as our prospective .

1. Reduction in cycle time
2. Quantitative productivity improvement
3. Improved repeatability and accuracy
4. Less human intervention
5. Less rejection due to automatic controls
6. Reduced power consumption

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