

# Design and Analysis over the Manual General Purpose Machine Tool

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**Abstract**— The manual energy is our basic energy which can be achieved easily by hand or by self. Sometimes due to breakdown of smart energy or electric energy the machine working is stopped suddenly in industries and companies. Here we can use the manual power to run the machinery continuously. This is the last option to continue the industry working. By using effective and light mechanisms we can make such type manual machine which may be derived by one or two workers effectively and manual power to run the machinery continuously. This is the last option to continue the industry working. By using effective and light mechanisms we can make such type manual machine which may be derived by one or two workers effectively and easily. By using different type gear ratios we can obtain the various type speeds on the machine as required.

**Keywords:** Manual General Purpose Machine

## I. INTRODUCTION

In the various type small industries the small works may be completed easily by using manually derived machines. In the small industries the power consumption greatly effects the running cost. Here the single person may derive the manual machine easily and may perform any type machining operation or production operation in less time consumption. Here there are two type manual machines may be used as a general purpose manual machine and a single purpose manual machine. At the general purpose manual machine we can perform the various type different-2 production operations easily one by one or simultaneously by using special attachments. The manual machine may be derived by hand or by foot whatever is easy and effective method. In critical operations more than one persons may be used to complete the machining effectively.

## II. METHODOLOGY

### A. Methodology Related To the Effect on the Production Work of the Industry

The production work is improved sufficiently because the wastage of time is reduced due to fewer breakdowns of industries. Sometimes the machine working is stopped in industries till a long time period due to serious electric problem created in electric power supply. At such situation the production work is disturbed instantly and the target is achieved late. Besides it the efficiency and performance of the company becomes dull or slow. To avoid it and to maintain the production work continuously the manual general purpose machine tool is the last option.

### B. Methodology Related To the Effect on Efficiency and Performance of the Manufacturing Industry

By using the manual general purpose machine tool the efficiency of the industry is maintained continuously because it is very helpful in serious breakdown conditions. It is very important option of continuous working in industries where

the production work is required at mass level. Here the breakdown of industry may create a heavy loss of industry in production. Besides it the performance of the industry also may be affected if the breakdown situations are occurred in mass production industries again and again. For a good and busy industry a manual working option should be available always.

### C. Methodology Related To the Effect on Working Environment of the Industry

The working environment of the industry is also improved significantly because the labor is always busy in their working with interest. A skilled labor is always ready for working if the working is done continuously without any breakdown.

### D. Methodology Related To the Growth of Industry

There is a great advantage of manual working where the power is not available sufficiently or where the power cut is done again and again. Besides it for small industries it is a very advantageous option because here the consumption of energy or power effects the production cost directly.

### E. Methodology Related To Effect on Future Demand of Working

Manual power is always important, everything cannot be done by using power or electrical energy. Sometimes due to serious damage the power is not available always, at such condition the manually generated power is used. I think the manual working will be required always till the presence of human. So there is a different and very important place of such type manual general purpose machine.

## III. ANALYSIS

### A. Analysis over the Human Effort Applied Normally

Generally a human may apply 300N to 400N pushing force or pulling force over the machine.

This force is sufficient to provide the drilling, boring, counter boring, reaming, spot facing, facing, grooving etc. operations on the light materials like Aluminium, copper, brass, plastic etc. Means this type manual machine is sufficient to provide the machining operations on light metals easily. Besides it we can perform these mechanical operations on thin plates of iron or its alloys till 5mm minimum by using two operators simultaneously for running the cycling mechanism of the machine.

### B. Analysis over the Force and Torque Applied and Material Used for Machining Work

By using this 300 to 400N force

$$\text{the max. torque applied } T = F \times l = 300 \times 0.20 = 60 \text{ Nm}$$

Where

F = force applied by human on the paddle of the cycling mechanism.

L = length of lever connected with the paddle and center of shaft as given fig.(A).

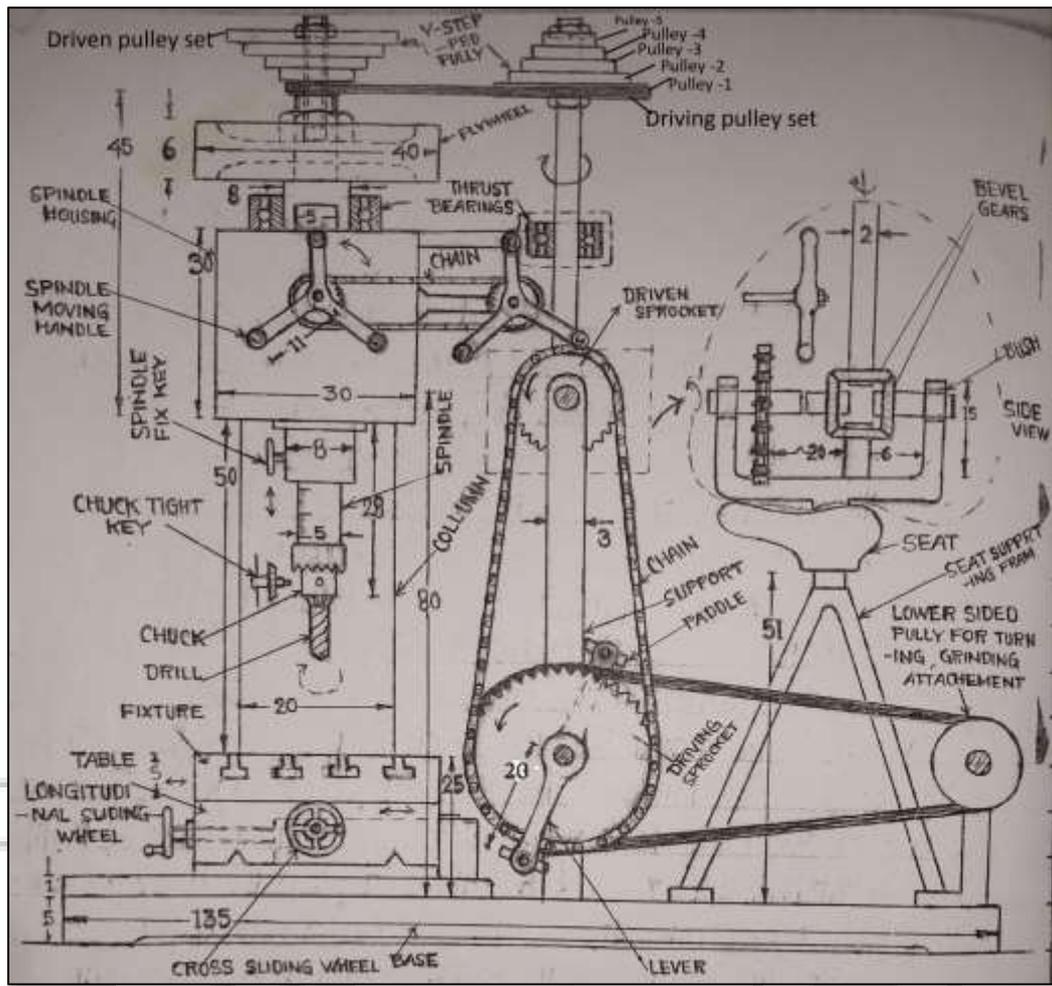


Fig. A: Manual general purpose machine tool (All dim. are in cm)

we can perform many type machining operations easily at medium to low hard materials like aluminium, copper, brass, bronze, wood, plastic, asbestos etc. For finishing operations and light cutting operations the low effort is sufficient for rotation of spindle and for cutting feed force. Besides it due to mounting of the flywheel over the machine head the extra energy is stored in the flywheel which is utilized at machining time to make the machining operation uniform. The energy stored in flywheel may be calculated by  $E = 1/2 I\omega^2$ .

C. Analysis Related to the Change in Velocity Ratio of Cycling Mechanism and Its Effect on Machining Operations

Let the human may run the cycle easily at 15km/h then by this we can find the initial rpms of the driving sprocket of the cycling mechanism as following –

$$V = \pi dN \text{ or } N = V/\pi d$$

Where

$$V = 15\text{km/h}$$

d = dia. Of driving sprocket.

$$N = (15 \times 1000) / (\pi \times 0.36 \times 60) = 221.05 \text{ rpm}$$

S. N	Pulley	Driving Pulley dia. D (m)	Driven pulley dia. D (m)	Ratio (D/d)
1	Pulley -1	36	4	9.00
2	Pulley -2	28	12	2.33
3	Pulley -3	20	20	1.00
4	Pulley -4	12	28	0.43
5	Pulley -5	8	36	0.11

Table 1: Pulley diameters

S. N	Initial speed of cycling mechanism $N_1$ (RPM)	Velocity Ratio ( $D_1/D_2$ )	Final speed Of operating Mechanism $N_2$ (RPM)	Final Torque (T) for operation (Nm)	Power (P) (kw)
1	221.05	9.00	1989.45	$300 \times 0.02 = 6$	1.25
2	221.05	2.33	515.05	$300 \times 0.06 = 18$	0.97
3	221.05	1.00	221.05	$300 \times 0.10 = 30$	0.69
4	221.05	0.43	95.05	$300 \times 0.14 = 42$	0.42
5	221.05	0.11	24.31	$300 \times 0.18 = 54$	0.14

Table 2: Final speed of pulleys

Hence it is clear that we can obtain the high operational speed manually by using the required velocity ratio as Tables 1 and 2. Besides it we can find the more high rpms and torque if the two operators run the cycling mechanism simultaneously. In other words we can say that the some machining operations may be performed on thick plates also by using some more power.

Analysis over the change in working environment and effect of this manual working over the production, quality and target completed etc.

The working environment is changed significantly because the human is always reliable about his self-working energy. Sometimes the external energy may be missing but human's self-energy is always present. Means the working will continue at least with some low production rate. There will be no more effect on the quality of the product. The production target will be achieved some delay in comparison with the target achieved by power energy.

Note – On the other hand the driven sprocket of the cycling mechanism may also be used for rotating machining operations in extra as fig.(A).

#### IV. CONCLUSION

In resultant we can say that such type manual general purpose machine is very advantageous in a manual working option. Besides it we can improve its working capacity by attachment of some more mechanisms as required to it.

#### REFERENCE

- [1] M/c tool technology.
- [2] Self-thinking.

