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# Engine Operated Harrow (Compact Machine for Farmers)

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***Abstract – Harrowing operation is carried out to remove the weeds between the crops after the one or one and half months from ridges. The operation is mainly done in soya jawar, wheat etc. till today's date this operation was done manually which required lot of human effort so, we decided to go for engine operated in ridges & furrows without human efforts. It consists of a 150 cubic capacity engine which rotate the shaft by using chain drive. The engine & other assembly is mounted on the chassis frame which made by Mild Steel Metal. About 70 percent population in this field required modern harrowing equipment in agricultural industry so it can be produced commercially produced.***

***Keywords—Harrow; Agriculture; Acclerator; Weeds; Transmission.***

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## 1. INTRODUCTION

The harrowing process is very difficult and hard working in now days no any equipment present in the market which reduces the effort of frames during harrowing process. Our project name "Engine operated harrow" already describe equipment in normal harrowing process is very hard working and time consuming, to overcome this programs and increase working efficiency this project is selected. While harrowing, farmers often have an additional task of removing the weed which grows alongside the crops and hence damage the crops. The farmers therefore use a harrow to remove it . Thus, the aim of our project is to build an engine operated harrow which achieves the following objectives:

- Remove/destroy unwanted grass/weed.
- Uses least possible time to do more work.
- Helps the farmers by reducing number of labors.

Such a device which reduces labor has the potential to be a must have for every farmer, just like the tractor. It would also be one or more step towards mechanization of agriculture. There would be a significant growth in agricultural output. We would get more output within less time.

Weeds growing around crops tend use up the nutrients in the soil. As a result, the crops do not get sufficient nutrients, thus they get damaged. We get a low output. Thus, it is required to remove the unwanted weed so that the crops get all the required nutrients. Also, as a result of using the harrow, more soil gets pushed towards the base of the crop, thus increasing the amount of nutrients to the crops and getting a healthier crop.

## II. LITERATURE SURVEY

In the year 1992 Alan K. Watson has studied on Biological and other alternative control measures. Alternative synthesis of herbicides includes preventative, physical, cultural, and biological methods. In his research work he focused on controlling weeds using biological methods [1]. In the year 1994 James W. King has carried out study on sustainable agriculture. In his study he mainly concentrated upon basic ecological concepts to the agricultural and forestry productive processes, identification of main ecological problems related production and use of ecological methodologies to study agricultural ecosystems [2]. Later in year 2007 Knezevic has developed a new tool for weed control. In his study he concluded that broadleaf weeds and broadleaf crops are more susceptible to flaming than grassy species [3]. In 2010 Deng Wei and Chen Liping have reviewed on non-chemical weed management for green agriculture. He suggested for

Standardization for weeding methods, integration of weed control techniques and suggested improvements for the existing weed control methods and weed detection technologies [4]. C. Cordill, T.E. Grift have successfully designed and tested an intra-row mechanical weeding machine for corn. Their research work addresses the intra-row weed control in maize and removal of weed plants within the row by enabling dual tine carriers to engage the soil whilst circumventing the maize stalks [5]. In the year 2013 Lotfie A.Yousif developed a computer system using excel and visual basic software for agricultural management and the selection of machinery depending on crop growth in rotations during specific time to perform field work was based on program [6]. Very next year Rajashekar M designed and analyzed low cost weeder which uses no electric power. The developed machine was used to control weeds simultaneously from three rows. The equipment was designed using CATIA software and analysis was done using FEA and ANSYS [7]. H.P Pathade and Priya Shinde developed multipurpose weeding machine. They have concentrated on ergonomic aspects of farmers for comfort posture also focused on productivity improvement [8]. In the year 2015 Vivek Gndhewar has designed solar powered blade harrow equipment. Component design for absorbing, storing and controlling of solar energy has been made. The equipment is working using renewable energy source [09]. Jed Colquhoun and Robin Bellinder has focused on new cultivation tools for weed control also he has discussed on relative advantages and disadvantages of the same machines [10].

## III. METHODOLOGY

In actual working process the harrow move from row of crops. At a one time, there are three row are covered. Therefore the working efficiency is increases and also time reduces. The blades used to remove the grass. These blades can disassemble after the work and easy to move in the cultivated land.

## IV. CONSTRUCTION AND WORKING PRINCIPLE

In the present work simplest construction is used. It consists of 150cc engine. It is mounted on the chassis frame having dimensions of 33.3cm width & 62.8cm in length. Wheel shaft is attached to the chassis with P204 bearings. For transmission of engine power chain drive wheel is used. Kawasaki boxer's (two wheeler) chain sprocket is selected for chain drive. Big sprocket wheel is mounted on wheel shaft having diameter of 2cm. fuel tank capacity is 1.5 liter. The distance between carburetor & fuel tank is 97cm. The moped vehicles wheels are selected for harrowing process we have attached three grass removing blades at the rear side of the equipment.

Standard parts:

- Engine
- Gear Box & Cable
- Accelerator, Clutch & Their Cables
- Catalytic Convertor

This project is conducted for the agricultural use because of engine operated harrow the harrowing process is very simple. The main principal behind this project is reduces the human effort, increase working efficiency and also reduces cost of the harrowing process. In now days, in agricultural area the harrowing process is very difficult. There is the human operated harrow is used for harrowing process and our equipment definitely reduce human effort increase human effort increase human efficiency and also reduce the cost of harrowing process.

A. ENGINE

**Fig. 1. Engine**

The engine specifications are hereunder:

**TABLE NO: 1 ENGINE SPECIFICATINS**

| Type | Specifications |
|---|---|
| Engine | Two Stroke |
| Cooling Type | Air Cooled |
| Displacement | 145cc |
| Number of cylinders | 1 |
| Man Power | 7.5bhp |
| Maxium Porwe RPM | 5500 |
| Maxium Torque | 10.8 Nm |
| Maxium Torque RPM | 3500 |
| Ignition Type | CDI Electric |
| Carbuttor | Spaco SI-20-20mm ventury carb |
| Transmission Type | 4 Speed Constant Mesh |

| | |
|---|---|
| Clutch Type | Wet Multi Disc |
| Electrical System | 12V AC |
| Head Light | 35W |
| Hron | 12V AC |
| Chesis Type | Monocoque |

B. SPROKET

Number of teeth on its periphery = 44 teeth

Outer diameter of sprocket = 156 mm

Inner diameter of sprocket = 32 mm

Distance between two sprockets=508 mm

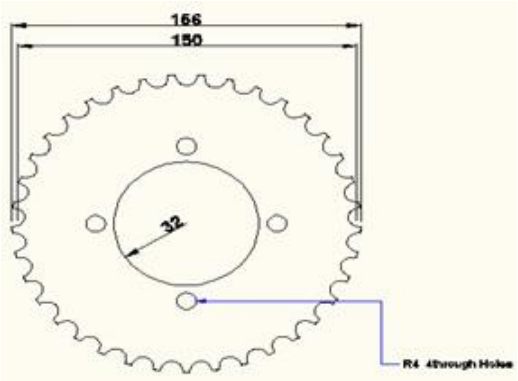


**Fig. 2. Sprocket**

C. NUT AND BOLT

Material used for bolt = Mild steel

Diameter of the bolt = 20mm

Pitch between the threads = 1.5mm

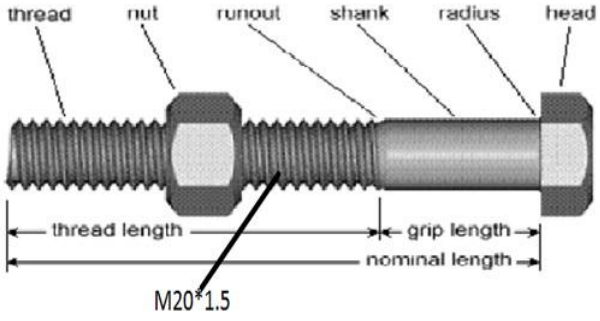


**Fig. 3. Nut and Bolt Assembly**

## V. MATERIAL SELECTION

Many factors are to be considered while selecting the right material for sprocket including the cost as well as the material performance required. Steels are alloys of iron and carbon, with the exception of stainless steels, which are alloys of iron, chromium and nickel. Chemical composition: C=0.40%, Mn=0.75%, P=0.03% max, S=0.05%

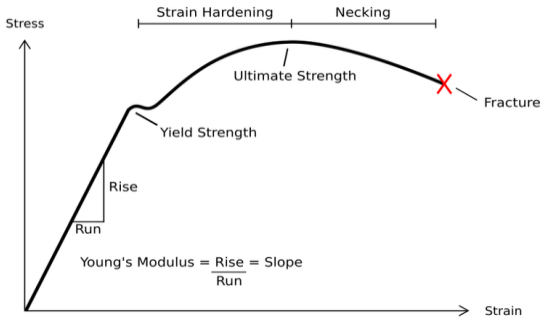


**Fig 4. Stress Strain Digram for Mild Steel**

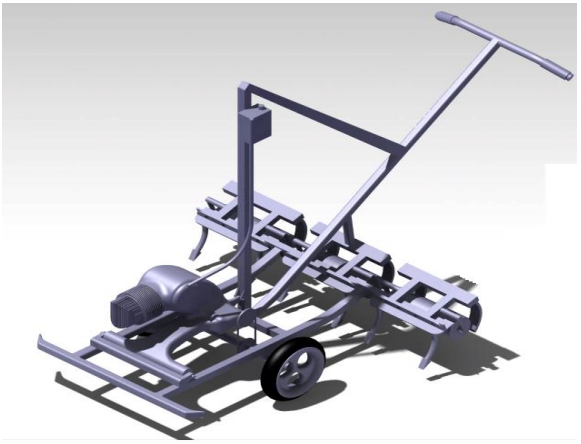

**Fig. 5. 3D View of the harrow**

**Fig. 6. Front View of the harrow**

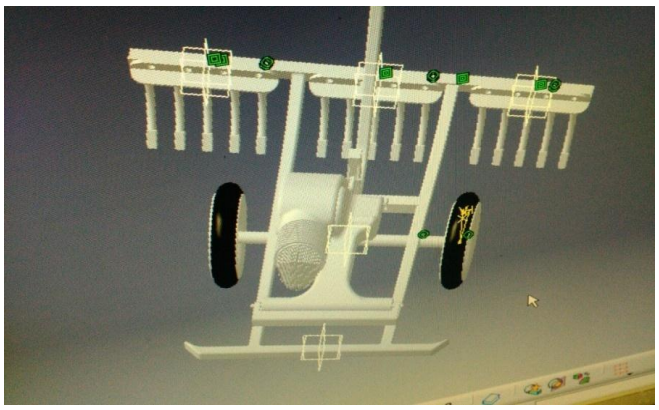

**Fig.7. Top View of the harrow attached with blades**

## VI. DESIGN

The scientific approach, technical principles, information and imagination are considered while designing for development of new or improved machine to perform a specific with maximum economy & efficiency.

So much attention is needed to be given for design In the present work we adapted the two types of design methodologies:

- System Design
- Mechanical Design

Physical constraints ergonomic aspects, space requirements are the main areas to be focused in system design. Also assembling parts, man and machine interface, total number and position of controls, working environment of machine, failure criterion, safety issues, servicing facilities, maintenance, scope for further improvement, over all weight of machine and a lot more aspects are needed to be focused upon.

In mechanical design the two components are the key issues on which one has to glance.

- Designed Parts
- Parts to be purchased.

A. System Design

The friendliness of a machine with the operator is an important criterion of design. It is the application of ergonomics & psychological principles to solve problems arising from Man and Machine relationship. Following topics have to be considered while designing.

a) Chances of failure

The problems occurred during working incurred by owner in case of any failure are important criteria of design. The Factor of safety will provide more while designing any mechanical machine parts so that chances of failures are less. Moreover is required to keep unit healthy.

b) Height of Machine from ground

The height of the machine should be properly designed For ease and comfort of operator in any workshops to expect more out comes towards workers. properly decide so that he may not get tried during operation. The machine should be higher than the waist level also enough clearance should be provided from the ground level in order to maintain for cleaning purpose.

c) Weight of Machine

There are the two factors governing the total weight of the machine namely material selection and dimensions of the same. For heavily weighing machines transportation creates major problems at the same time if any breakdowns occur the maintenance could become difficult and unable to carry to the workshop because of more weight .

d) System Selection Based on Physical Constraints

Large scale industries usually provide more space for the heavy machineries. Space limitation will not create major problems during transportation and maintenance .But in case of small scale industries the space will be limited and the machines must be compact so that it could be accommodated even in a smaller area.

The mechanical design is integrated with the system design. So while designing the physical parameters are to be taken utmost care. so that the dissimilarities can be reduced after comparing with the standard designing practices.

e) Arrangements of Various Components

According to the space limitations the machines should be placed to service easily. There must be the clear view of all the components, because the hidden components are difficult to service or recondition. Components must be arranged in such a way that it utilizes minimum space.

f) Components of System

The machine can be accommodated at the corner of a room as already mentioned that the compact

designs save enough space. All the moving parts should be well covered & compact. A compact system design will gives a high weighted structure which is expected.

B. Mechanical Design

The correct design analysis of the problem leads success of the project. Mechanical design is very important from the designer point of view.

Many preliminary alternatives are eliminated during this design, the designer should have more knowledge about availability of the material and their physical properties. Also knowledge of load conditions, stresses, deformations, and failures. Theories of failures for wear analysis. He should identify the external and internal forces acting on machine parts.

The force may be classified as

- Dead weight process
- Friction forces
- Inertia forces
- Centrifugal forces
- Forces generated during power consumption, etc.

Using design equations the designer should estimate these forces very accurately. If he doesn't have adequate information to estimate them he should create certain practical assumptions depending upon similar conditions. This will almost satisfy the required functional needs. Assumptions considered must always be on the safer side.

Another important step in design is selection of factors of safety to find working stress or design stress of working dimensions of machine elements. The modifications in the theoretical stress values are to be made according to the types of loads, type of material & maintenance required.

Selection of material should be made according to the loading conditions & desirable properties of material.

## VII. PART LIST

**TABLE NO: 2. PARTS LIST**

| S.No | Parts Name | No of parts | Material Used |
|---|---|---|---|
| 1 | Engine | 1 | Cast Iron & aluminum alloys |
| 2 | Square tube | 6 | Mild steel |
| 3 | Square bar | 6 | Mild steel |
| 4 | Angle bar | 6 | Mild steel |
| 5 | Handle | 1 | Mild steel |
| 6 | Nut bolt | 10 | Mild steel |
| 7 | Tyre | 2 | Rubber |
| 8 | Washer | 10 | Mild steel |
| 9 | Shaft | 1 | Mild steel |

## VIII. MERITS AND DEMERITS

A. Merits

- A device which reduces labor.
- More output within less time.
- It would also be one or more step towards mechanization of agriculture.
- Reduces human effort increase human efficiency and also reduce the cost of harrowing process.
- It is simple in design & easy to handle.

B. Demerits

- Initial cost of the engine is high.
- Harrowing speed is low.
- Skilled labors are required.
- Proper maintenance is required.

## IX. APPLICATIONS

- Engine operated harrow is applicable in the agricultural area.
- Engine operated harrow is used in the sowing of wheat, corn, soya, etc.
- Used to remove the weeds.

## X. CONCLUSION

The present work includes innovative idea in the sense that engine operated harrow machines are unique in design. Even some modifications could be done by replacing bullock by engine. It is more

efficient than the present existing machines. This machine is designed keeping in mind of the middle class farmers. It could effectively remove weeds in multiple rows thereby helping to improve the productivity of cultivation land.

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