
**“STUDY OF DESIGN AND FABRICATION OF HOLE DRILLING MACHINE FOR TREE
PLANTING”**

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ABSTRACT: *This project is about the design of a hole-drilling machine for planting trees. The technology of the deep compaction of soil in the vertical plane is examined. Relations and monograms are presented to determine the distance between drill holes and drilling speed in relation to the diameter and depth of the holes and the sequence in which they are expanded. A machine has been proposed that is going to address the shortcomings of the existing hole drilling methods and provide a solution to the problem of hole drilling for planting trees or even for other purposes such as for electricity, telephone and fencing poles. The technology of the deep compaction of soil in the vertical plane is examined. Relations and monograms are presented to determine the distance between drill holes and drilling speed in relation to the diameter and depth of the holes and the sequence in which they are expanded. The dependence of the duration of soil compaction on the time spent performing the main and auxiliary operations are also determined.*

Keywords: hole-drilling machine, drilling speed

1. INTRODUCTION

Drilling is the act of making a hole in a material using cutting equipment and can be done on the earth's surface. Hole drilling on the earth's surface is primarily done for several purposes, which include erection of structures, extraction of oil or planting trees. The structures erected in drilled holes include electricity poles, flag posts, masts; buildings etc. extraction of oil involves a vigorous drilling exercise of extracting oil from depths of over 800 feet. Hole drilling for Planting trees is a major activity that involves digging holes using either a drilling machine mechanism or hand tools. Trees are defined as woody plants that have secondary branches supported clear of the ground on single main stem or trunk with clear apical dominance. A minimum height specification at maturity varies from 3m to 6m ; a minimum of 10cm trunk diameter (30cm girth). Compared with most other plants, trees are long lived, some of them getting to be several thousand years old and growing to up to 115m (375 ft) high., scenic beauty and medicinal value among other reasons.

2. HOLE DIGGING METHODS

Hole digging involves either of the following methods

- Traditional methods
- Mechanized methods

2.1 Traditional methods

Traditionally, simple tools like hoes, pangas and crow bars are used in the digging of holes for planting trees. This process is labour intensive and involves

- digging of the holes

- pick up soil using spade or hand depending on the size of the hole,

The above method has the following limitations:

1. Its slow and time consuming
2. Its tedious and quite involving i.e. a lot of energy is spent on digging of the holes
3. Large-scale plantation needs a large human labour force.
4. It may not be done to the required dimensions i.e. depth hole and diameter of hole since it depends on the limited human accuracy
5. it's expensive; high labour cost
6. The hole digger has to touch dirt every now and then hence becoming dirty
7. Proper orientation of holes is difficult to maintain

2.2 Mechanized methods

Currently, hand held augers are used for drilling the holes for planting trees. The drilling of the holes typically involves cutting of the roots of the harvested stump with an implement such as an axe then using hand – held motorized auger to drill the hole to the desired depth. The use of the hand –held motorized auger has the following limitations:

1. It is difficult to control due to the weight of the device and the engagement of the roots of the harvested tree stump during operation.
2. It requires considerable muscular effort and difficult to maintain because of the difficult operative nature of the motorized auger. With the hand held motorized augers, the hole drilling process is labour intensive. It requires substantial effort getting up and down to chop roots, pickup

the hand-held motorized auger, drill the hole, lower the hand held motorized auger, get down on your knees to plant the seedling, pack dirt around the seedling, and then pick-up all the equipment to move on to the next site.

3. Some motorized auger devices tend to scatter dirt away from the holes being drilled by the auger, resulting in more difficult effort to pack soil around the seedling to finish the plant in process

4. The movement of machine around the farm is cumbersome.

5. The cost of machines involved is high

3. TREE PLANTERS

3.1 Mechanical planters

Mechanical tree planters are machines attached to a tractor that makes a slit in the soil. A seedling tree is placed in the slit and the packing wheels on the planter close the slit and firm the soil around the seedling. In addition, some are equipped with furrowing attachments to scalp part of the planting area, while designs that are more recent have spray attachments for applying herbicides to control unwanted vegetation. These planters are only as good as their operators. Adjustments may be required for depth and firmness of packing around the seedlings. During tree-planting, correct spacing of trees is usually achieved by adjusting the speed of the tractor.

There are three types of mechanical planting machines;

i. Floating type- it is attached to a tractor by a three-point hitch so that the entire machine can be raised from the ground by the hydraulic lift on the tractor.

ii. Semi-floating type - it has its front end carried by the tractor and its back end carried on wheels; the tractor cannot lift it.

iii. Trailer type – it has all or nearly all its weight carried on its own wheels.

3.2 Auger Drilling

Auger drilling is a drilling method that uses a large helical shaped screw to extract material from the ground. When used for drilling, the auger drill bit screws into the soil and material is automatically moved up the shaft of the rotation device. There are many types of augers available today. Large, powered augers are typically used in the farming, construction, and utility industries. These auger-drilling devices are used to drill holes for fence posts, utility

poles, and large drainage pipes under highways. Some of these augers are large and cumbersome to operate.

3.3 AEON Tree Planter

The AEON tree planter was invented by Norbert noecker in 1946. It was the first successful tree planting machine in the state of Michigan. The planting machine is now called AEON TREE PLANTER. Each machine is hand crafted by Larry Kaylor or KAYLOR WELDING SERVICES. The basic design of the AEON TREE PLANTER consists of a coultter, trencher, and packing wheel. These basic parts have remained unchanged since the planter was invented. However, there have been several improvements made to increase strength and convenience. One makes the frame out of steel bars five inches and half inches with a trencher welded securely to it. Each machine is equipped with a single seat for planting ease and comes with a tub to hold the trees being planted. Lift eye balances whole planter while being loaded for transit. In addition, each machine comes with two support legs to simplify storage and hook-up procedures.

4. MACHINE DESIGN

It is proposed to design a machine that can easily be used to drill holes for planting trees, electricity or telephone poles and other applicable areas. The machine to be designed can drill a hole of 400mm diameter and a maximum depth of one meter. The holes to be produced by the machine will be of uniform diameter throughout as opposed to the ones drilled by augers, which are usually conical. It is also possible to drill holes of different diameters like 200mm, 300mm and 400mm by just changing the size of the cutter plate. Important features of the proposed machine are: ease of transportation to drilling site, ease of assembly at the drilling site, being able to be attached and detached from the driving power easily.

5. MACHINE COMPONENTS

5.1 D c motor

Why spend hours manually digging post holes, when you could do it in a fraction of the time with this top quality Trade Tested borer. Aside from shovels, there are a few different tools available for digging post holes. These petrol powered borers are the best for taking the time and strain out of the task. Be kind to your back and order yours today. This model comes with 1 x 150mm auger. We have larger sizes you can add to your order. Just check out our other items for augers in 100mm, 150mm and 200mm diameters.

5.2 Shaft

The Shaft size is dictated by torque, but changes in horsepower and speed (RPM) affect torque as shown in the following equation of determining power;

$$P = \omega \times T$$

Where T = Torque.

ω = speed (RPM).

$$T = \frac{P}{\omega}$$

accordingly, an increase in horsepower would require more torque, as would a decrease in RPM.

5.3 Epicyclic gear

Modern automated machineries are increasingly using flexible high dynamic servomotors because of their ability to speed up and flexibly automate complex motions these machineries need to perform. Planetary gear heads are used frequently in conjunction with servomotors to match the inertias, lower the motor speed, boost the torque, and at the same time provide a sturdy mechanical interface for pulleys, cams, drums and other mechanical components. main reasons why the planetary (epicyclic gear systems) are the preferred choice for “servo applications” (applications using servo motors);

- what influencing the positioning accuracy repeatability of a planetary servo gear;
- helical gears in planetary systems;
- the rating practices establishing a transparent “comparability” of different torque listings;

6. APPLICATIONS

- Suitable for all kinds of geological.
- Widely used in the garden, agriculture, fishing, geophysical exploration and construction etc.
- Equipped with a variety of specifications of the drill bit, to meet different needs of users.
- Use drilling efficiency is 20 times than artificial, to realize operate automatic; make your work easier, more efficient.
- Strong power, beautiful appearance, comfortable operation.
- Portable-type, light weight, easy to carry do the wild field operations.
- Low noise, easy to start.
- Post hole digger machine is forestation; planting bananas, citrus, lynched, flowers and other crops fertilized ideal digging equipment.

- Post hole digger machine can be adapted to all types of terrain.

7. DISCUSSION AND CONCLUSION

Discussion

The main aim was to design various components for a hole-drilling machine for planting trees and even holes for erection of electricity, telephone and fencing poles.

The machine component was successfully designed and has the following specifications:

a) Cutter plate

Plate thickness (h) = 12.55mm..

b) Shaft

Diameter = 30.25mm

Length = 1100mm

(d) spur gears

Pinion teeth, n = 16.


Gear teeth, N = 16.

pitch circle diameter of pinion power can be transmitted by gear = 7.269kw

8. REFERENCES

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9. AUTHOR PROFILE

 A portrait photograph of a young man with dark hair, wearing a grey suit jacket, a white shirt, and a red tie. He is looking directly at the camera with a neutral expression.	<p>SUYOG THAKARE completed the Bachelor of Engineering in Mechanical Engineering from P. R. Pote (Patil) College of Engineering, Amravati, India</p>
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