

A MAJOR PROJECT REPORT

ON

“(SEMI AUTOMATIC UREA FERTILIZER SPREADER)”

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OF

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Session (2021-2022)



CERTIFICATE

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We are also thankful to our present, friends and all staff of MECHANICAL ENGINEERING DEPARTMENT, for providing us relevant information and necessary clarifications, and great support.

ABSTRACT

India is agriculture-based country. This project is based on automatic fertilization process. Our aim was to improve the performance of fertilizer distribution in sustainable fertilizer spreader. The project design divided into three stages. First stage consist hopper. Middle stage consist impeller. Last stage consist motor. The whole design is supported by frame. For small-scale uses, it not possible to use costly tractor mounted spreaders. This project solves the problem of manually spreading of fertilizer. It also reduces waste of fertilizer due to overlapping.

Keywords: Uniform Spreading, Fertility, Agriculture Mechanism, Fertilizer Spreader, Centrifugal Spreading, Productivity.

India is agriculture-based country. Almost 70% people of our country are farmers. Our economy also largely depends on agricultural products. Nowadays tremendous changes have occurred in conventional methods of agriculture works like seed plantation, irrigation system, pesticides and spray used. For developing our Economic condition, it is necessary to increase our agricultural productivity and quality also. Farming process includes many stages, out of which fertilization is one of the important stages and which is not exploded up. Farmer are used to do spreading of fertilizer in traditional way which is time consuming, costlier as well as not provide comfort to the labor. Also, some tractor operated machines for spreading of fertilizer are available. So, we need is an alternative to the traditional as well as tractor operated fertilizer spreading machine which will fulfill all the requirements. So, we are going to design a manually operated machine for fertilizer spreading by taking into consideration the user group and their needs which helps to them to work easy and functional. The Fertilizer Spreader machine should satisfy the NT2610 project. The initial part of the NT26 series of projects identified urea as an alternative to ammonium nitrate as a nitrogen fertilizer. This project draws on the experience gained from that work and other more recent developments to investigate the spreading performance of urea-based fertilizers.

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1.INTRODUCTION

India is agriculture-based country. Near about 70% people of our country are farmers. Our economy also depends on agricultural products. Nowadays tremendous changes have occurred in conventional methods of agriculture like seed plantation, irrigation system, pesticides and spray used. For developing our Economic condition, it is necessary to increase our agricultural productivity and quality also. Farming process includes many stages, out of which fertilization is one of the important stages and which is not exploded up to the mark up till now. Nowa-days, we are used to do spreading of fertilizer in traditional way which is time consuming, costlier as well as not provide comfort to the labor. Also, some tractor operated machines for spreading of fertilizer are available. So, what we need is an alternative to the traditional as well as tractor operated fertilizer spreading machine which will fulfill all the requirements. So, we are going to design a manually operated machine for fertilizer spreading by taking into consideration the user group and their needs which helps to them to work easy and functional.

Agriculture is the backbone of India. India has an agriculture-based economy 43% of India's territory remains employed in agricultural activities as against 11% in the world. In India around 70% of the population earns its livelihood from agriculture. India's geographical condition is unique for agriculture because it provides many favorable conditions. India is agriculturally based country. Near about 70% of people of our country are farmer. Our economy also depends on agricultural product. Now a day tremendous changes have occurred in conventional method of agriculture like seed plantation, irrigation system, pesticides & spray used for developing our economic condition. It is necessary to increase our agricultural productivity & quality also. Fertilizer is any material of natural or synthetic origin used to enhance the growth of plants. This improves the soil's physical properties, with better retention of moisture and more aeration. Fertilizers are commonly used for growing all crops, with application rates depending on the soil fertility, usually measured by a soil test and according to the particular crop. A major technical problem in agriculture, directly related to increasing production in sustainable agriculture is optimization of the construction of agricultural machinery to increase its reliability and efficiency. For small-scale uses, it not possible to use costly tractor mounted spreaders. Hence, in this framework, Mathematical models can be used to improve performance and field's works. It is helping for farmers with smallholding of agricultural land for improving crop cultivation with less effort and less cost. So, we are going to design automatically fertilizer spreader by taking into consideration the user group and their needs which helps to them to work easy and better functionality. This spreader machine controls the flow of fertilizers along to two direction which helps to elimination of waste of fertilizer with no overlapping & uniform spreading.

Spreaders are used to evenly distribute fertilizer and grass seed across your lawn. There are two types: drop and broadcast, also known as a rotary spreader. There are two types of broadcast spreaders: walk-behind and hand-held

- Best Value: Scotts Turf Builder EdgeGuard Mini Broadcast Spreader.
- Best for Large Yards: Chapin 80-Pound Professional Turf Spreader.
- Best Automatic Handheld Option: Scotts Wizz Spreader.
- Best Towable Fertilizer Spreader: Agri-Fab 130-Pound Tow Spreader.

The Expert: I've been involved with construction, maintenance, and home renovation for more than 30 years from both a personal and professional standpoint. I owned a maintenance and construction business with my husband for nearly 20 years. I love a lot about my home—a fixer-upper built in the 1800s that's located in a rural mountain region of Pennsylvania—but taking care of a big yard can be a time-consuming task, so I'm always on the lookout for tools that can make the process easier to work into a busy schedule. Applying fertilizer isn't exactly a super exciting task, so I've used a variety of fertilizer spreaders over the years to make the process quicker and easier.

Type:

Fertilizer spreaders come in a variety of categories, which are fairly self-explanatory:

- Walk-behind: This type dispenses its contents as you push the spreader forward while walking behind it.
- Towable: A tractor or other machine tows the spreader around.
- Handheld: Carried by hand, this type of spreader is best for distributing a small amount of product.

Capacity:

If you have a lot of area to cover, you'll want to choose a spreader with a larger capacity. But keep in mind, a large spreader will be heavy, especially once it's filled with fertilizer or other lawn materials. The smallest models we recommend can hold a couple pounds, and the largest accommodate up to 130 pounds.

Storage:

The physical size of your potential spreader is another factor to consider, given that some of the larger models can take up a significant amount of space.

Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. —A man without food for three days will quarrel, for a week will fight and for a month or so will die. Agriculture is a branch of applied science. Agriculture is the

science and art of farming including cultivating the soil, producing crops and raising livestock. It is the most important enterprise in the world. Over the years, agricultural practices have been carried out by small-holders cultivating between 2 to 3 hectare, using human labor and traditional tools such as wooden plough, yoke, leveler, harrow, mallot, spade, big sikle etc. These tools are used in land preparation, for sowing of seeds, weeding and harvesting. Modem agricultural techniques and equipments are not used by small land holders because these equipments are too expensive and difficult to acquire. By adopting scientific farming methods we can get maximum yield and good quality crops which can save a farmer from going bankrupt but majority of farmers still uses primitive method of farming techniques due to lack of knowledge or lack of investment for utilizing modern equipment. The use of hand tools for land cultivation is still predominant in India because tractors require resources that many Indian farmers do not have easy access to. The need for agricultural mechanization in India must therefore be assessed with a deeper understanding of the small holder farmer's activities. There is huge gap in technology adoption and Implement used with small and marginal farmers. Sustainable improvement in the livelihoods of poor farmers in developing countries depends largely on the adoption of improved resource conserving cropping systems. While most of the necessary components already exist, information on the availability and performance of equipment is lacking and effective communication between farmers and agricultural research and development department is unsuccessful.

1.1 Farm Mechanization:

- a) Ensure timely field operations to increase productivity, reduce crop losses and improve quality of agro produce.
- b) Increase land utilization and efficiency.
- c) Increase in labor productivity using labor saving and drudgery reducing devices besides, being cost effective and ecofriendly. Appropriate machinery has been adapted by farmers for ensuring timely field operations and effective application of various crop production inputs utilizing human, animal and mechanical power sources.

1.2 Uniform Spreading:

In conventional fertilizing spreading system, waste of fertilizer is considerably large because of overlapping spreading. In our model, issue of overlapping is resolved. Thus, the uniform spreading can be achieved.

1.3 Different types of Fertilizer Spreader:

There are different types of spreaders we can utilize to fertilize the farm. Some of them are follows:

- A. Handheld Spreaders
- B. Drop Spreaders
- C. Rotary Fertilizer Spreader
- D. Liquid Fertilizer Spreader

1.4 Unique Points:

- 1) Combination of seed and fertilizer feeder for cultivation.
- 2) Elimination of waste of fertilizer.
- 3) No over lapping and uniform spreading.
- 4) Proper utilization of fertilizer.
- 5) Increase crop quality and soil fertility.

a) Ensure timely field operations to increase productivity, reduce crop losses and improve quality of agro produce.

b) Increase land utilization and efficiency.

c) Increase in labor productivity using labor saving and drudgery reducing devices besides, being cost effective and ecofriendly. Appropriate machinery has been adapted by farmers for ensuring timely field operations and effective application of various crop production inputs utilizing human, animal and mechanical power sources

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There are different types of spreaders we can utilize to fertilize the farm. Some of them are follows:

A. Handheld Spreaders

B. Drop Spreaders

C. Rotary Fertilizer Spreader

Our recommendations of the best fertilizer spreaders include a variety of spreader types and styles, ensuring that the majority of homeowners will find an option that fits their needs. The majority of the models below are standard walk-behind spreaders for medium-sized yards, but we also included several handheld units for people with smaller lawns or who just have a patch of grass they want to cover. For people with larger areas to cover, we also included a tow-behind option that can be attached and pulled by a lawn tractor or riding lawn mower.

2. LITERATURE REVIEW

There are different researchers who invented different types of fertilizer spreading machines. They publish their papers and the papers published are given below:

- Arun Abraham studied that, Conventional spreading of fertilizers for small-scale farming are by hand. The farmers have to carry heavy bags throughout the spreading process. Therefore, it is necessary to develop a fertilizer spreader for small-scale farming. The proposed fertilizer spreader uses a trolley type of mechanism. The main part is spreader disk, which helps for uniform spreading. The feed for the disk is from the wheels of the trolley using gear transmission. By using this spreader, a lot of time can be saved, human effort used for carrying heavy bags of fertilizer is reduced and wastage of fertilizer can also be avoided. [4]

- S. Ramchandra studied that, In India 73% of population is directly or indirectly depends upon the farming. Until now, our farmers are doing farming in same traditional way. The main objective of fertilizer broadcaster at sowing time is to uniformly distribute the fertilizer over entire field. [4]

- Joao P.A.R. Cunha studied that; the quality of fertilizer distribution process is important to the success of agriculture. This research aimed to study the distribution uniformity of fertilizers with spreaders capable of performing variable rate. Evaluations were carried out in different farms, in the Southwest region of the State of Goias, Brazil. [4]

- Narode R. R. studied that; He has generated a method to spread the fertilizer uniformly over a fallow land by dropping the fertilizer over the impeller disc. The system consists of three wheels, two at the front and one at the back. These two wheels at the front are used to impel the fertilizer. The two hoppers are used to store the fertilizer; these hoppers are placed at some height from the wheel axle so that the fertilizer falls on to the impeller. The hopper is provided with flow control mechanism. In fertilization, the flow maintenance is necessary. Generally, every crop should get sufficient amount of fertilizer. This condition is satisfied by Spring Mechanism. [9]

- Vignesh B. studied that; A method was generated to spread the fertilizer automatically over the agricultural land by dropping the fertilizer over the impeller disc. A 25cc engine is used to

rotate impeller disc in which the fertilizer drains and spreads from hopper where it is introduced. In tractor mounted or manual system they carry four and three wheels respectively. But here two wheels are used in which the bigger front wheel is connected to engine through supporting wheel can be adjustable.

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There are different researchers who invented different types of fertilizer spreading machines. They publish their papers and the papers published are given below:

Chaudhari et. al [1] studied the sugarcane plantation in India and need of an alternative to the traditional as well as tractor operated fertilizer spreading machine. In India near about 70% people of our country are farmers. Due to these reasons the author developed the machine which has minimal capital cost compared to traditional fertilizing equipment. Laghari et. al. [2] focuses on beneficial uses of fertilizer in agriculture. Soil contains various micro and macro elements which are essential for plant growth and yield. It is necessary to save important nutrient elements like nitrogen, phosphorus and potassium by application of chemical fertilizers. For certain situations broadcast applications can be an inefficient method of application because there is much greater soil to fertilizer contact in more fixation or tie-up of nutrient. Narode R. R et al. [3] have generated a method to spread the fertilizer uniformly over a fallow land by dropping the fertilizer over the impeller disc. The system consists of a three wheels, two at the front and one at the back. These two wheels at the front are used to impel the fertilizer. The two hoppers are used to store the fertilizer; these hoppers are placed at some height from the wheel axle so that the fertilizer falls on to the impeller. The hopper is provided with flow control mechanism. In fertilization, the flow maintenance is necessary. Generally, every crop should get sufficient amount of fertilizer. This condition is satisfied by Spring Mechanism. Kweon & Grift [4] have proposed a method which employs control of the drop location of fertilizer particles on a spinner disc to optimize the spread pattern uniformity. The system contained an optical sensor as a feedback mechanism, which measured discharge velocity and location, as well as particle diameters to predict a spread pattern of a single disc. Das et al. [5] have done a review of different fertilizer and pesticide spreaders. Author has sought attention towards growing population in India which is projected to be 1.6 billion in next few years. He also emphasizes that 73% of population is in Agricultural sector and out of that 65% farmers are small land and marginal farmers. In this he has discussed various types of spreaders and pesticides like Backpack sprayer, Lite-Trac, Motorcycle Driven Multi-Purpose Farming Device, Aerial Sprayer and their advantages & disadvantages. Joshua et.al [6] have

worked on solar operated pesticide sprayer. Most of the increase in the area of irrigated land in the world has been through the increasing use of engine-driven pumps. However, the increasing price of oil-based fuel has reduced the margin to be gained by farmers from irrigation, since food prices have generally been prevented from rising in line with energy costs.

Adamade et al. [7] worked on mechanization is recognized as the necessary major means needed to accelerate agricultural production and create a period of surplus in Nigeria. Indeed, food sufficiency can only be attained in Nigeria by encouraging and promoting local designs and manufacture of implements and equipment at low cost. We have taken the useful data from this research paper. Kishore et al. [8] described various machineries present in sugarcane farming such as Mechanized land preparation in which animal or power driven vehicles or tractors are used. Kshirsagar et.al [9] have created a Multifunctional Agricultural vehicle which can perform many operations such as seed sowing, fertilizer spraying and grass eruption from roots. Small-size farms are a huge issue in mechanization because it is against of the “economics of scale”. These problems are classified into technological constraints, financial and economic problems, and environmental issues. Focuses on the basic problems faced by fellow farmers i.e. Seed sowing, fertilizers spraying and grass eruption.

Mada et.al [10] have mentioned importance of mechanization in agricultural by giving examples. The conclusion from the paper was need of a cheap and simple vehicle for ease of different processes in farm. Vignesh et.al

[11] have draws attention towards incredible changes that have arisen in conservative methods of agriculture like seed plantation, irrigation system, pesticides and spray castoff. For emerging our monetary condition, it is obligatory to upsurge our agricultural production and superiority also

3 OBJECTIVES

The objective of this invention is to provide a simple and inexpensive fertilizer spreader, in a form of a two – wheeled ‘walk-behind’ device which may be easily and quickly pushed by the farmers for spreading solid fertilizers like urea. problems: generally, in the manually spreading of the fertilizers in the farm, some of the problems are occurring like uneven spreading of the fertilizers (wrong stuff and wrong amount) which may result in the crop damage. moreover, the conventional spreading of fertilizers by hand in a farm is more time-consuming method and require more human effort. project discussion: this is a type of spreader which can be operated manually for spreading granular materials in farms especially for solid fertilizers like urea. the spreader has hopper with at least one orifice in it. at the bottom of hopper, a rotating disc is provided for spreading granular materials. as the device gets pushed manually the rotation of the wheels get converted in to vertical rotation of spreading disc by the set of bevel gears. the spreading device normally has a bladed centrifugal spreader comprising disc which is rotated about vertical axes and onto which the product to be spread on the ground is dropped in a suitable manner. each disk also has a plurality of substantially radial spreader blades for directing the product to be spread by the centrifugal effect induced by the rotation and for projecting it onto the ground from the ends of the blades farthest from the axis of rotation. results: present invention results in increase in uniformity of fertilizer spreading, good crop yield, reduction in time required to spread, less human fatigue, prejudiced use of fertilizers and less waste. conclusion: author in this paper has taken up design related project to understand and overcome various problems occurring in conventional fertilizer spreading. uneven spreading, reduce human efforts and reduce time of spreading have been highlighted as key factor for this paper.

- Precision farming with lower fertilizing time
- Reduce physical strength of farmers
- Precisely spreading of fertilizer
- Convenient technique compared to conventional method
- No need to manually (by own hands) spread fertilizer
- Better and Accurate mechanism
- Eliminate the wasting of fertilizer
- Do not require carrying of heavy bags Uniform spreading of fertilizer over the farm

3.1. Design Models:

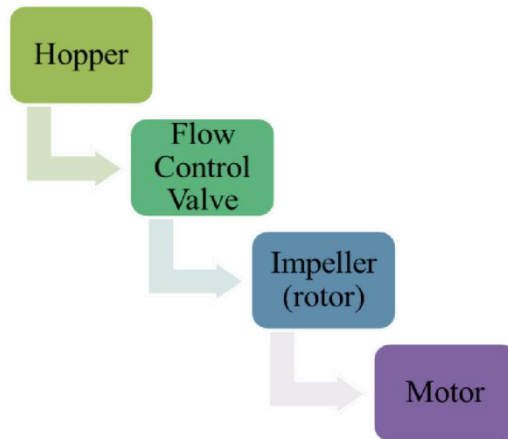


Fig. 1. Flow Chart of Fertilizer Spreader

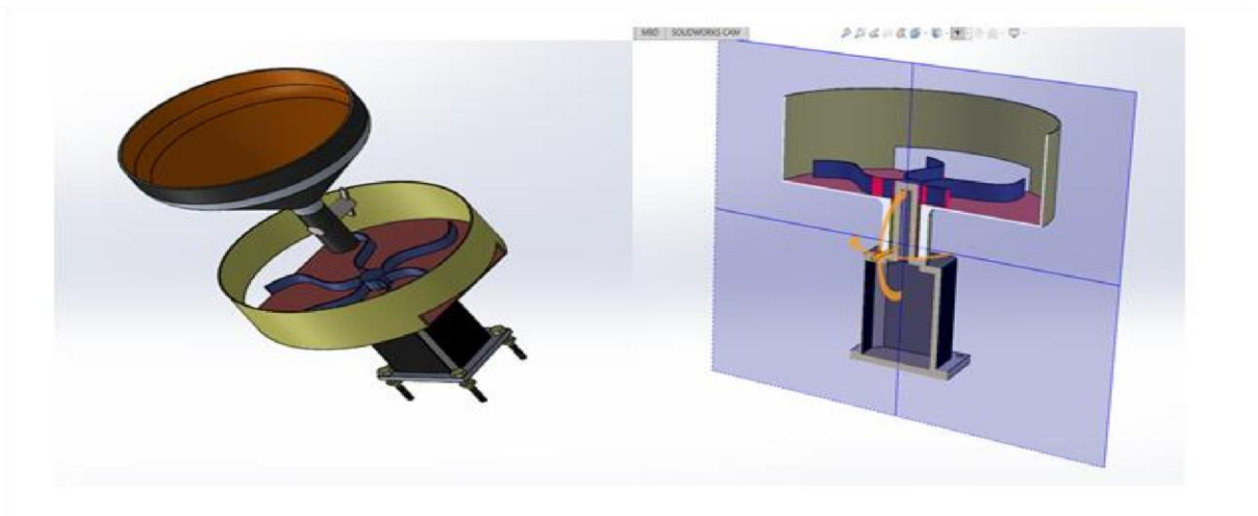


Fig. 2. Isometric and Cross-section View of Fertilizer Spreader



Fig. 3. Main Four Processes(ploughing, seed sowing, fertilizer spreading, levelling) Explanation Drawing



Fig. 4. Real Image of Fertilizer Spreader



Fig. 5. Real Image of Main Four Processes Explanation Model

4. WORKING PRINCIPLE

- It is based on motion of ground wheel using gear arrangement. The flow of fertilizer is maintained by using spring mechanism.
- It is a machine for spreading the fertilizer in continuous and controlled flow at uniform rate. It can cover an acre of farm within half an hour
- Three wheels are used in this machine. In front axle two wheels are located to carry the load of the machine in proper way and last wheel is used to balance overall load of the machine.
- First two ground wheels transmit the input power by the operator to the rotor by gearing arrangement.
- On rotor, Hooper is located to reservoir of fertilizer, of which flow is controlled by spring mechanism. The control of spring mechanism is under control of operator.
- This machine is operated is operated using a motion of ground wheel through gear transmission arrangement.
- The flow of fertilizer is controlled by spring mechanism.



Fig 6: Urea Spreader Machine Model

4.1 COMPONENTS AND DESCRIPTION

4.1.1. Hopper:

Hopper is used to keep fertilizer. Hopper is used for convey the fertilizer to the rotating disc. In this machine material used for hopper is PVC. Flow control mechanism is provided in hopper

4.1.2. Rotating disc:

Rotating disc is look like impeller. It is mounted on motor shaft. Hopper opens on rotating disc eccentrically and due to centrifugal force fertilizer spread in farm.

4.1.3. Vertical Column:

Two vertical columns are used for support the solar plate, hopper, rotating disc, motor. Mild steel is use for making a vertical column. Vertical column is hollow and cross section of pipe is square

4.1.4. Frame:

The frame works as a supporting structure. The Aluminum material used for making a frame. At bottom of the frame wheel are attached.

4.1.5. Bevel Gear:

- Bevel gears are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of bevel gears is a cone.
 - The pitch surfaces of meshed external bevel gears are coaxial with the gear shafts; the apexes of the two surfaces are at the point of intersection of the shaft axes.
 - Bevel gears that have pitch angles of greater than ninety degrees have teeth that point inward and are called internal bevel gears
- Bevel gears are classified in different types according to geometry:
- Straight bevel gears have conical pitch surface and teeth are straight and tapering towards apex.
 - Spiral bevel gears have curved teeth at an angle allowing tooth contact to be gradual and smooth.

6. Bearings:

A bearing is a device to allow constrained relative motion between two or more parts, typically rotating or linear movement bearings according to their principle of operation as well as by the direction of applied load they can handle.

5.DIFFERENT TYPES OF FERTILIZER SPREADER

There are different types of spreaders we can utilize to fertilize the farm. Some of them are as follows:

- A. Handheld spreaders
- B. Drop Spreaders
- C. Rotary Fertilizer Spreader
- rD. Liquid Fertilizer Spreader I

6.THEORY AND DESIGN

A. Introduction It includes design of hopper for different farm sizes, design of different components such as bearing, screw conveyor and shaft. We calculated amount of fertilizer required for a single furrow and designed the capacity of hopper for a complete travel of machine. Also found out different forces acting on chassis and designed rear axle accordingly.

Hopper has capacity to store 20kg of fertilizer. Urea or any other solid fertilizer is stored in hopper. When vehicle is pushed, the fertilizer will flow through pipes from two holes provided in hopper under gravity. This fertilizer then passes through screw conveyor and two discharge pipes provided. This two pipes can be adjusted so that fertilizer falls at the roots of crops.

It is important when spreading fertilizer that a spreader can achieve a consistent level of performance at various application rates whilst driving at a specific about width. It is shown from this study that for different capacity we can achieve various discharge rates. With variation in plantation methods, we collected various data. The tested spreader has 50 cm rear width and 82.5 cm length. It can be used for 3 different plantation method. The result obtained from multiple testing varied significantly from above results. Result shows that for different plantation, discharge of fertilizer required is not the same. There is no consistency between plantation methods, so the product can be used for all methods.

Types of Gear:

The different types of Gears are:

- Spur Gear
- Helical Gear
- Double Helical and Herring Bone Gear
- Crossed Helical Gears
- Worm Gear

Spur Gear:

A spur gear is the most common type of gear. They have Straight teeth they are mounted on the parallel shaft. When the spur gears are Engaged the contact will be to the Entire width parallel to the Axis of the shaft.

Due to this these will the sudden application of load stress will be Impact & Detrimental (Dangerous) & Excessive sound when they are applied for high speeds.

When the teeth are cut outside the cylinder, They are known as External gears and when teeth are cut inside, it is known as internal gears.

When External meshes, they will rotate in opposite directions, and when internal meshes they will Rotate in the same direction. As we know there is no axial thrust.

There is one Advantage of that bearing work will be Reduced. Due to the impact loading force is acting for very little time and Due to this, there will be chances of fatigue failur

Spur Gear Application:

The following application of Spur gear is:

- Electric Screw Driver
- Washing Machine

- **Helical Gear:**

Teeth are cut at an angle so that when the teeth of helical gear Engage, the contact starts at one end of the teeth and It will gradually spread as the gear Rotate up to when the two teeth will be engaged fully. So we can say :

- There will be a gradual Engagement.
- There will be less impact on teeth.
- There will be less noise.
- Due to the Angle of teeth, there will be thrust or Axial load that was not present in Spur gear So we have to use the bearing to minimize the load.
- These gears have higher load Carrying capacity & can be used for higher.
- The teeth can be Right-handed or left-handed. Right-hand teeth (when slope away from the viewer) and Left-hand teeth (when slope toward the viewer).

Helical Gear can be used in cars. The cost will be high.

The stresses will be normal stress that will produce bending in 2 planes Shear stress due to tangential force and Axial load due to teeth Inclination.

Helix angle:

Angle at which teeth are Inclined to the Axis of gear. It is also called a spiral angle.

Double Helical and Herring Bone Gear:

To overcome the Axial thrust in helical gears Double helical gears are used. These are like pair of helical gears secured together one will have a right-hand helix and the other will have a left-hand helix So the Effects of force will be equal & opposite and they will cancel out.

While joining the two helical gears a small gap is maintained between them. In Case of double helical gear sufficient gap is provided between the two Identical helical gears (The same module should be there) But the hand of the helix should be opposite It is easy to fabricate and cheaper.

Double helical gears are made by gear hobbing process which is a highly productive gear making /gear cutting process. But due to the more Intermediate gap, it requires more space.

In the Case of herringbone gears, there is no such gap It is produced / Manufactured by the gear shaping process which is a slow process than the hobbing process.

Herringbone gears are mostly used in heavy machinery these gears have a side-to-side combination not face to face of helical gears because of no groove.

Bevel Gear:

It can be assumed that the motion of the gears is two cones are rolling and there will be no slipping between them means the shafts will be intersecting type.

Simply when the teeth are made on the cone. It will become straight bevel gear and when the teeth are Inclined It is known as the helical bevel.

Bevel gears are mostly mounted for a shaft having a 90° angle between them but can be designed when the shafts will be at an angle. Note one thing the pitch curve formed of bevel gear is a cone .

Pitch surface is that can be Imagined when the gear meshes from peaks/crust and valley /root of Individual teeth .so pitch angle is angle between this pitch surface & the Axis of shaft for spur gear helical gear this angle was 90° But for bevel gear it is less than 90° .

This gear is useful when shafts are operating at angle means when power is transmitted at an operating angle .Bevel gears are used in differential drives. It is also used in mechanism of hand drill.

Crossed Helical Gears:

They are used for non-parallel, Non-intersecting shaft where uniform rotation or rotary motion is not possible. By just pure rolling here there will be some sliding motion too.

Hyperboloid:

It is the surface of revolution generated by the skew line revolving around an Axis in another plane keep the angle between them as constant). The minimum distance between this skew line & Axis is called the throat of the hyperboloid.

So hyperboloid /generating surface will mesh & these can on a common line. Means line is common between the 2 gears.

But as we know that this is a case of different planes & mating hyperboloid have limited width & have the rolling motion for desired motion. Along the common line that two hyperboloids touch each other continuously, there should be rolling and sliding.

Crossed helical gears or spiral gears are limited to light load application will be machine tools, camshaft smell IC engine, etc.

Worm Gear:

They come as worm and worm wheel worm acts as a driver. It has a very high spiral angle and Driven will be a worm wheel. We cannot make a worm wheel driver it will increase the normal reaction which will increase the friction.

Worm gears are used when large gear reductions are required. It is quite common up to 20:1 - 300:1.

It has a special feature due to the spiral angle that worm can easily turn the wheel but the wheel cannot turn the worm because friction will come into the picture . These gears are also non-parallel Non-intersecting shaft.

The shaft may have any angle but usually, they have 90° . The worm can be Imagined as a screw with a V thread & worm wheel as a spur gear.

The worm can be a single thread or multiple threads the concept is worm wheel with 24 teeth will provide gear reduction of 24:1 & multi-start worm, the Gear reduction equals to No. of teeth divided by no. of starts on worm.

Gears are mechanisms that mesh together via teeth and are used to transmit rotary motion from one shaft to another. Gears are defined by two important items: radius and number of teeth. They are typically mounted, or connected to other parts, via a shaft or base.

A gear is a wheel with teeth around its circumference. Gears are usually found in sets of two or more, used to transmit rotation from the axis of one gear

Gears are a very useful type of transmission mechanism used to transmit rotation from one axis to another. As I mentioned previously, you can use gears to

There are a few different terms that you'll need to know if you're just getting started with gears, as listed below. In order for gears to mesh,

7. Calculation Power required to drive the impeller of fertilizer spreader:

- Diameter of impeller = 30 cm
- Thickness of impeller = 0.254 cm
- Density of ss plate = 0.007850 kg/cm³
- R.P.M. of impeller (n) = 200 r.p.m.

$$W = \pi/4 \times d^2 \times t \times \rho \times g$$

$$= 0.785 \times 900 \times 0.254 \times 0.007850 \times 9.8$$

$$= 13.80 \text{ N}$$

$$T = F \times r$$

$$= 13.80 \times 0.30$$

$$= 4.14 \text{ Nm}$$

$$P = T \times \omega$$

$$= (F \times r) \times 2\pi n/60$$

$$= (13.80 \times 0.30) \times 20.93$$

$$= 86.66 \text{ w}$$

8. PROBLEM DEFINITION

In the recent days it has been observed that farmers are not able to gain more crop production by use of conventional agriculture methods. And the manually spreading of the fertilizers in the farm creates some of the problems like uneven spreading of the fertilizers and this process is time consuming and this conventional method is inconvenient. As we can see now a day, the major problem face by the farmer is shortage of labor's and the time required for fertilization is more. In conventional method, uniform spreading of fertilizer is not possible and wasting of fertilizer is occur due to overlapping of fertilizers. Also, farmers are spreading fertilizers with the use of their own hands. So, in this process physical strength of farmers are required very high. Furthermore, presently available farm machineries are costly and not useful for small scale farmers. So, in order to have solution to it, it was necessary to manufacture a fertilizer spreader.

Fertilizer application:

organic fertilizer is applied during ploughing, chemical fertilizer is applied before sowing and during vegetative stage.

Spreading fertilizers will be easy with an agriculture fertilizer spreader. The fertilizer spreader machine is specially manufactured for crop care and crop growth. This helps replenish the soil by fertilizers equally with fertilizers.

Spreaders are used to evenly distribute fertilizer and grass seed across your lawn. There are two types: drop and broadcast, also known as a rotary spreader. There are two types of broadcast spreaders: walk-behind and hand-held.

A broadcast seeder, alternately called a broadcaster, broadcast spreader or centrifugal fertilizer spreader (Europe) or "spinner" (UK), is a farm implement commonly used for spreading seed where no row planting is required (mostly for lawns and meadows: grass seeds or wildflower mixes), lime, fertilizer, sand, ice melt, etc., and is an alternative to drop spreaders/seeder. Apart from spinners there is also a type of broadcast spreader called "wagtail spreader" (the name describing the movement of its distributing part), used with tractors. The smallest are handheld with a hopper of several liters and which operate via hand cranking. A bit larger are push units with the spinning disk powered by gearing to the wheels. The next size up is designed to be towed behind a garden tractor or ATV. Very similar in size to the tow behind units are broadcast seeders that mount to the three point hitch of a compact utility tractor, these are ideal for landscape and small property maintenance. Still larger are commercial broadcast seeders/spreaders designed and sized appropriately for agricultural tractors and mount to the tractor's three point hitch. The broadcast seeders that are mounted to a three-point hitch are powered by a power take-off (P.T.O.) shaft from the tractor. At the largest size are pull behind or chassis mounted units for agricultural use that can spread widths of up to 90 feet.

8.1 Advantages and limitations:

➤ Advantages

- Time saving.
- High speed fertilization.
- Easy & better controlling of features.
- Uniform spreading is possible.
- Flow control valve controls flow of fertilizer.
- No skilled operator required.
- Pollution free operation.
- Low cost.
- Time saving.
- High speed fertilization.
- Easy & better controlling of features.
- Uniform spreading is possible
- . • Flow control valve controls flow of fertilizer.
- No skilled operator required.
- Pollution free operation.

➤ **Disadvantages**

- DC electric power required.
- Useful for small & medium farms.
- Consume more time.
- Difficult to cultivate large areas.
- Laborious & time consuming method
- Require more labour, hence increase the cost of cultivation
- Only high value & bold seeds are sown
- Require strict supervision.

9. CONCLUSION

The main objective of our project was to fulfil the need of farmers suffering from the problems of fertilizing timing is more, high physical strength of farmer is required, manually spreading of fertilizer, precisely spreading of fertilizer is not possible, carrying of heavy bags. Also, this fertilizer spreader provides convenient technique to fertilize the whole farm with uniform spreading of fertilizers and eliminate the wasting of fertilizers. The drawbacks in the existing spreader model are reduced in this system. In addition, this machine is easy to operate with low capital cost and less troubleshoots.

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