

## UREA SPREADER MACHINE

Prashant Pandharinath Patil<sup>1</sup>, Amit Subhashrao Ghodke<sup>2</sup>, Sandeep Rajkumar Kalme<sup>3</sup>,  
Mr. Ashish Rajkumar Devshette<sup>4</sup>

<sup>1,2,3</sup>Students, Vishweshwarayya Abhiyantriki Padvika Mahavidyalay, Almala, Maharashtra, India

<sup>4</sup>Project Guide, Lecturer, Mechanical Engineering Department, Vishweshwarayya Abhiyantriki Padvika Mahavidyalay, Almala, Maharashtra, India

\*\*\*

**Abstract** - 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.

**Key Words:** agriculture products, productivity, quality, fertilization, NT 26 project,

### 1. INTRODUCTION

In the recent days it has been found that farmers are unable to gain more crop production by use of conventional agricultural methods. So there is big need for the development of engineering system for compensating these drawbacks. It is well known that by using farm equipment's, farmer's yields more crop productions which ultimately have impact on national economy. Itself it gives prior need of agro equipment's in the field of agriculture. As we can see today, the major problem faced by the farmers is shortage of labor's and also the time required for Fertilization is more. So in order to have solution to it, it was proposed to manufacture a Fertilizer Spreader machine. So, the farmers can work more easy and functional.

### 1.1 UREA FERTILIZER

- Solid fertilizers are manufactured in two main forms; I. Pilled materials where particles are formed in a molten state and are largely spherical.
- Pills usually have a narrow size distribution but there is a practical limit to their mean size. ii. Granular materials are slightly more irregular in shape. They can be larger but usually have a wider size distribution. Because the physical properties of fertilizers, such as density and particle size, have an influence on their spreading performance,
- The SP quality assurance scheme for straight nitrogen fertilizers was developed (Miller 1996). The scheme utilizes a combination of standardized laboratory tests, measurements using an indoor test rig to simulate the performance of a standardized spinning disc unit.
- It was developed using a combination of particle trajectory modeling, and distribution tests carried out in halls and in the field.
- This project draws on the experience gained from that work and other more recent developments to investigate the spreading performance of urea based fertilizers.

### 1.2 PROBLEM DEFINITION:

- 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.
- Conventional spreading of fertilizers by hand in a farm is more time consuming method and require more human effort.
- So Urea spreader machine is suitable more for agriculture work as it will improve crop production easily and with minimum efforts.

## 2 LITERATURE REVIEW

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

• **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. So it is necessary to develop a fertilizer spreader for small scale farming

• **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.

**3. PROCEDURE/METHODOLOGY**

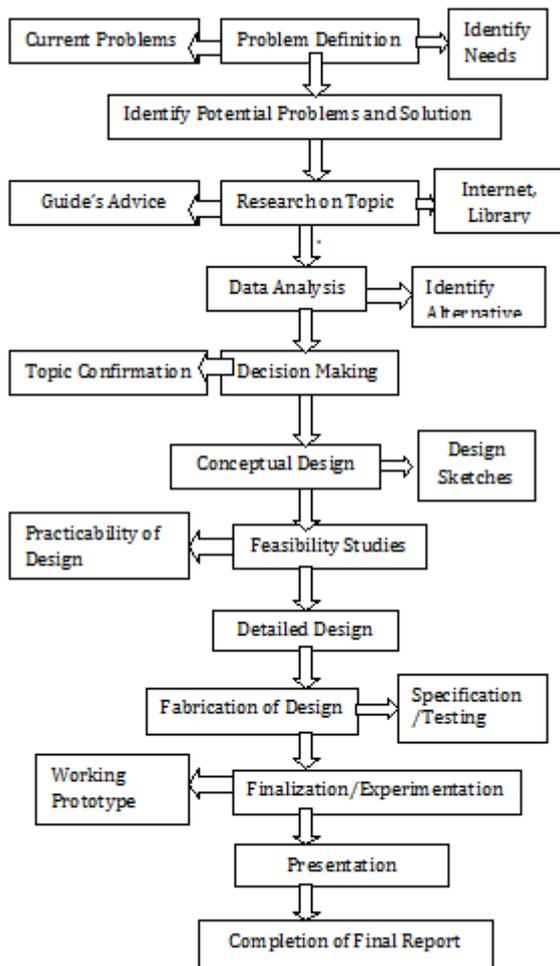


Chart 3.1: Procedure of Urea Spreader Machine Making

**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 4.1: Urea Spreader Machine Model

**5. COMPONENTS AND DESCRIPTION**

1. **Hopper:** Hopper is used to keep fertilizer. Hoper 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.

Dimension of hopper:  
 Diameter = 12 inch  
 Height =8 inch  
 Short cylindrical pipe Diameter =2.5 cm  
 Height =4cm



Fig 5.1: Hopper

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

Specification  
 Diameter =20.32 cm  
 Thickness =1.5cm

2. **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.

Specification

Height = 40 inch = 101.6cm

Cross section = 4cm\*4cm

Thickness = 2.5cm

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.

Specification

Width of each plate = 3.8cm

Thickness of each plate = 1.5cm



Fig 5.2: Flow control Mechanism

5. Bevel Gear:

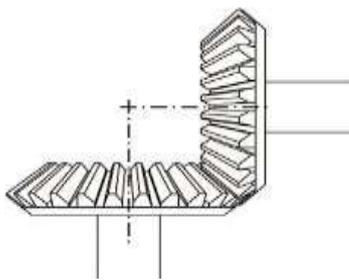


Fig 5.3: Bevel Gear

- 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.
- Zero bevel gears are very similar to a bevel gear only exception is the teeth are curved: the ends of each tooth are coplanar with the axis, but the middle of each tooth is swept circumferentially around the gear. Zero bevel gears can be thought of as spiral bevel gears, which also have curved teeth, but with a spiral angle of zero, so the ends of the teeth align with the axis.
- Hypoid bevel gears are similar to spiral bevel but the pitch surfaces are hyperbolic and not conical. Pinion can be offset above, or below, the gear centre, thus allowing larger pinion diameter, and longer life and smoother mesh, with additional ratios e.g., 6:1, 8:1, 10:1. In a limiting case of making the "bevel" surface parallel with the axis of rotation; this configuration resembles a worm drive. Hypoid gears were widely used in automobile rear axles.



Fig 5.3: Use of Bevel Gear

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.

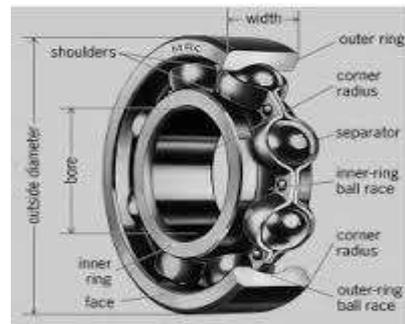


Fig 5.4: Ball Bearing elements

- A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls.

The common principle of operations:

- Plain bearing, also known by the specific styles: bushings, journal bearings, sleeve bearings, rifle bearing.
- Rolling element bearings such as ball bearings and roller bearings.
- Jewel bearings in which the load is carried by rolling the axle slightly off centre.
- Fluid bearings, in which the load is carried by a gas or liquid.
- Magnetic bearings, in which the load is carried by a magnetic field.



**Fig 5.5:** Urea Spreader Machine

### Working:

- 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.
- Hopper is 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. In normal conditions spring is not in tension and hopper is closed. As operator apply tension on the spring, controlling plate moves backward and hopper is open.

- Below this system there is an impeller. It is mounted on output shaft. Hooper opens on Impeller eccentrically and due to centrifugal action fertilizer spreads in the farm.
- This high value of centrifugal force is generated by the help of proper gear reduction ratio. The gears are coupled to the shaft of wheel with this machine.
- Percentage reduction in time required for Fertilization was observed to be 50% and reduction in labor cost as compared to conventional method was 80%. It has solved the problem of traditional way of Fertilization

## 6. ADVANTAGES AND LIMITATIONS

### ADVANTAGES

- Time savings
- Less fatigue to labor.
- High speed Fertilization.
- Applicable for small and medium farms.
- No electric power required.
- Easy to operate, as no skilled operator required.
- Easy to assemble.
- It is pollution free.
- Maintenance cost is low.

### LIMITATIONS

- Machine requires more effort in hard soil.
- Operating force varies from person to person.
- It is manually operated, so it is difficult to run continuously.

## 7. CONCLUSION

The main objective of our project was to fulfil the need of farmers suffering from the problems of increasing cost of Fertilization, labor cost and availability as it is operated by single person. The draw backs in the existing spreader models are reduced in this system. It has solved the problem of traditional way of fertilization by saving almost 50 % time. Also this machine is ecofriendly, easy to operate with low capital cost and less troubleshoots.

## 8. REFRENCES

- [1] S. C. Jain, "Farm Machinery-An Approach", PP-5, 36, 45
- [2] D. S. Sharma and Mukesh Sharma, "Farm Machinery Design Principles and problems", PP-225-245.
- [3] R.S. Khurmi , J. K. Gupta, "Machine Design", S. Chand Publications New Delhi,1st edition,2010 PP-387-390, 510-512, 766-774