iJRASET
International Journal For Research in Applied Science and Engineering Technology


INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 Issue: IV Month of publication: April 2024

DOI: https://doi.org/10.22214/ijraset.2024.60031

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

# Design, Analysis and Fabrication of Manually Operated Seed Sowing Machine

Dr. D. Sai Chaitanya Kishore[1], E. Vamsi[2], B. Manjunath[3], T.V Rohith[4], B. Sai Charan[5], B. Hareesh Kumar Reddy[6]
*[1]Professor, Department of Mechanical Engineering, Srinivasa Ramanujan Institute of Technology, Rotarypuram, Bukkaraya Samudram, Ananthapuramu, Andhra Pradesh, India*
*[2, 3, 4, 5, 6]UG student, Department of Mechanical Engineering, Srinivasa Ramanujan Institute of Technology, Rotarypuram, Bukkaraya Samudram, Ananthapuramu, Andhra Pradesh, India*

***Abstract: Sowing machine should be suitable to all farms, all types of corps, robust construction, also it should be reliable, and this is basic requirement of sowing machine. Manually operated seed sowing machine reduces the efforts of farmers thus increasing the efficiency of planting also reduces the problem encountered in manual planting. Manually operated seed sowing machine can plant different types and different sizes of seeds also can vary the space between two seeds while planting. This increases the planting efficiency and accuracy. The focus of this research work is to design, analysis of plough and fabricate a low-cost Manually Operated Seed Sowing Machine for effective handling of the machine by any farmer or by any untrained worker with simplified design. The components of seed sowing machine were modelled by using Auto CAD 2022. Analysis of plough was performed by using Ansys 2023-student version. The fabricated seed sowing machine perform the various simultaneous operations and saves labour requirement so as labour cost, labour time and also save lots of energy.***
***Keywords: Sowing, Hopper, Dispensing wheel, Plough, Deformation analysis.***

## I. INTRODUCTION

The Indian economy heavily relies on agriculture, and its development is crucial for the country's economic growth. However, farmers in India face several challenges such as a shortage of labor, the use of inefficient farming equipment, and the traditional, time-consuming methods of farming. This project aims to enhance seed sowing and pesticide spraying operations in farming by introducing a multifunctional seed sowing machine. The primary goal is to accurately place seeds in each row at the correct depth and spacing, thus reducing planting time, labor costs, and increasing production efficiency. Traditional seed sowing methods are based on assumptions and are inefficient, often resulting in physical strain for farmers. Additionally, farmers also struggle with pest control due to changing climates, requiring them to spend significant time and effort on pesticide spraying. This machine addresses these issues by incorporating pesticide spraying functionality, making it multifunctional and beneficial for farmers. By improving agriculture processes like seed sowing and fertilizer distribution, this project aims to enhance productivity while requiring less manual labor and energy input. Overall, this project contributes to the mechanization of the agriculture industry in India, which is essential for meeting the growing demand for produce as the population increases.

Klocke (1) described the construction of two experimental planters, one with a smooth coulter and the other with a ripple-edged coulter, both followed by hoe openers, which performed satisfactorily with adequate soil moisture for seed placement.

Kumar et al. (2) developed a manually operated seeding attachment for an animal-drawn cultivator, achieving a seed rate of 43.2 kg/hr and a field capacity of 0.282 ha/hr.

Ladeinde and Verma (3) compared three Jab planter models with traditional planting methods, finding similar field capacities and labor requirements but reduced backaches and fatigue with the planters.

Molin et al. (4) created a rolling planter for stony conditions with 12 spades, cam-activated doors, and a plate seed meter, leading to improved planting efficiency and accuracy.

Bamgboye et al. (5) devised a manually operated two-row Okra planter with a field efficiency of 71.75% and a field capacity of 0.36 ha/hr, with low seed damage. Gupta and Herwanto (6) designed a direct paddy seeder for a two-wheel tractor, boasting a field capacity of 0.5 ha/hr and minimal seed damage.

Marode et al. (7) proposed sowing seeds in multiple lanes simultaneously to reduce labor and time consumption. Hannure et al. (8) developed an automatic seed feeder for nurseries to decrease labor and time in seed feeding.

Sagar et al. (9) studied a semi-automatic seed feeding vehicle to plant seeds at the required depth and spacing, reducing effort and cost. Singh (10) designed a two-row tractor-drawn ridge planter for winter maize.

Bamgboye et al. (11) tested a manually operated two-row Okra planter with a field capacity of 0.36 ha/hr and a field efficiency close to 72%.

Pundkar et al. (12) investigated innovations in seed sowing machines for agriculture, highlighting the impact on cost and yield. Raut et al. (13) explored the importance of mechanization in agriculture for input conservation, higher productivity, and lower unit cost.

Ramesh et al. (14) examined innovations in seed sowing equipment for optimal yields and efficiency in agriculture.

Sawalakhe et al. (15) discussed the need for new sowing techniques in India to increase crop production without affecting soil texture.

Pundkar (16) emphasized the importance of high precision pneumatic planters for uniform seed distribution and higher yield. Shelke (17) noted the increasing necessity of bullock-drawn planters due to a diminishing workforce, highlighting the importance of planting distance and plant population for maximizing crop yields.

Soomro et al.(18) evaluated different sowing methods and seed rates for wheat, recommending drilling at 125 kg/ha for optimal yield and quality Adalinge et al. (19) developed a manually operated seed sowing machine for simultaneous tasks involved in seed sowing, with a simple design.

Rohokale et al. (20) compared conventional and modern sowing methods, highlighting the benefits of modern machines in reducing human effort. Shriprasad et al. (21) described a seeding and fertilizing agriculture robot using microcontrollers, aimed at improving agricultural efficiency and productivity.

## II.DESIGN

### *A. Main Frame*

The main frame is constructed using 20*20 mm square pipe and 20*40 mm mild steel rectangular pipe. And for the handle 20 mm diameter pipe is used. The main frame has all provisions to install wheels, plough and seed dispenser. First the steel pipes are cut and a basic frame is welded. To install the wheels, holes are drilled on the main frame to hold the bearing block and for guiding the machine handle is welded. A frame to install the seed dispenser is also provided.

Figure: 1 Main frame

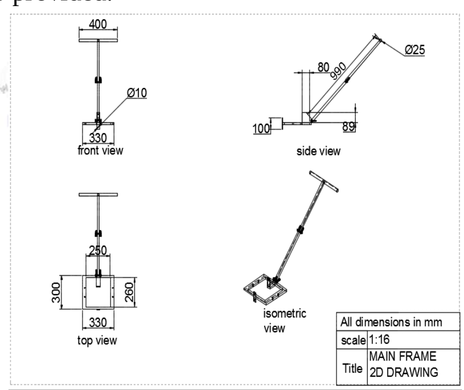



Figure: 2 Main frame 2D diagram

### *B. Seed Dispensing Wheels*

The seed dispensing wheels are responsible to pass the seeds into the ground coming from the hopper. Holes are provided on the dispensing wheels. The number of holes vary from crop to crop. It depends upon the seed spacing.

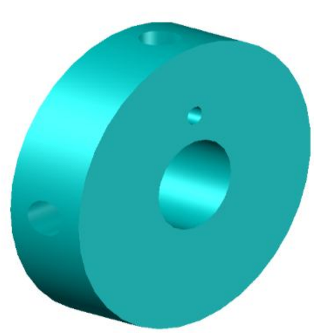


Figure: 3 Dispensing wheel

*C. Shaft*

It acts as a connection between wheels and dispensing wheels. Shaft is responsible for rotating the seed dispensing wheels.

Figure: 4 Shaft

*D. Hopper*

It's function is to keep the seeds in it and dispense them when needed.

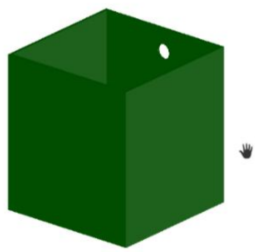


Figure: 5 Hopper

*E. Plough*

A plough is one of the agricultural tools used for the initial soil cultivation in preparation for seed sowing or planting to loosen or turn the soil. It is usually made of wood and is drawn by two bulls. It has been used since ancient times for tiling, turning the soil and adding fertilizers.

Figure: 6 Plough

*F. Final Assembly & Working Principle*

It has a frame constructed from 20*20mm square pipe and 20*40 mm rectangular mild steel pipe. It has provisions for installation of wheels and seed dispensing mechanism. To guide the machine a handle made up of 20mm*20mm and 20 mm diameter mild steel pipe is used. A plough made up of 2 inch flat bar is used in the front to make a small trench in the ground to sow the seeds. A hopper made up of 14 gauge sheet metal is used to store the seeds. The seed dispensing wheel is fitted inside the hopper using bearings this dispensing wheel is engaged with the axel. When the machine is given a push, the wheels starts to rotate hence the seed dispensing wheel also rotates .This makes the seed to come out one by one through the groove provided in the dispensing wheel.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

The number of groves provided on the wheel determines the number of seed to be dispensed and seed spacing. The seed dispensing wheel can be changed according to the seed used and seed spacing required.

The number of seed dispensing wheels can also be increased to cover multiple rows. Now once the sowing is done the seeds should be covered with soil. In order to do it, a metallic bar is attached behind the machine and it is simply dragged over the small trench. This covers the trench with soil and finishes the process.

Figure: 7 Final Assembly

## III.ANALYSIS OF PLOUGH

With the emerging importance of CFD and finite element analyses, it is of great necessity that engineering students get a good base of knowledge on one of the most used software packages in the industry of simulation, ANSYS.

ANSYS is a finite element analysis package used widely in industry to simulate the response of a physical system to structural loading, and thermal and electromagnetic effects. ANSYS uses the finite-element method to solve the underlying governing equations and the associated problem-specific boundary conditions.

FEM, A computer based analysis technique for calculating the strength and behavior of model during the given limits. In the FEM the model is represented as finite elements and is joined at special points which are called as nodes. Finite element analysis is the numerical solution of the mechanical components that are acquired by discretizing the mechanical elements into a small finite number of building blocks (known as elements) and by investigation those mechanical components for their acceptability and reliability. FEM is the simple technique as compared as the theoretical methods to discover the stress developed in a pair of gears. Models for numerical analysis have been prepared in SOLIDWORK and these have been bring in into ANSYS as IGES files for further analysis. The proportions of gear obtained from theoretical analysis have been used for preparing geometric model of gear. The condition for analysis has been assumed as static. This manual includes the procedure of solving the (static structural, Fluent) problems.

### *A. Analysis For Different Materials Of Plough At Different Loads*

#### *1) Structural Steel*

Structural steel is a versatile and durable construction material composed primarily of iron and carbon, with additional elements for strength and stability. Known for its high strength-to-weight ratio, it can support heavy loads while being relatively lightweight. Steel components, such as beams, columns, and plates, are fabricated off-site and assembled on-site, reducing construction time and costs. With its resistance to corrosion, fire, and pests, structural steel is used in a wide range of applications, including building frames, bridges, industrial structures, and high-rise buildings. Its recyclability also makes it an environmentally friendly choice for construction projects.

Table: 1 Structural steel material properties

| Youngs modulus | Poissons ratio | Density |
|---|---|---|
| 210 GPa | 0.3 | 7900 kg/m$^3$ |

*a) 30N force – structural steel plough*

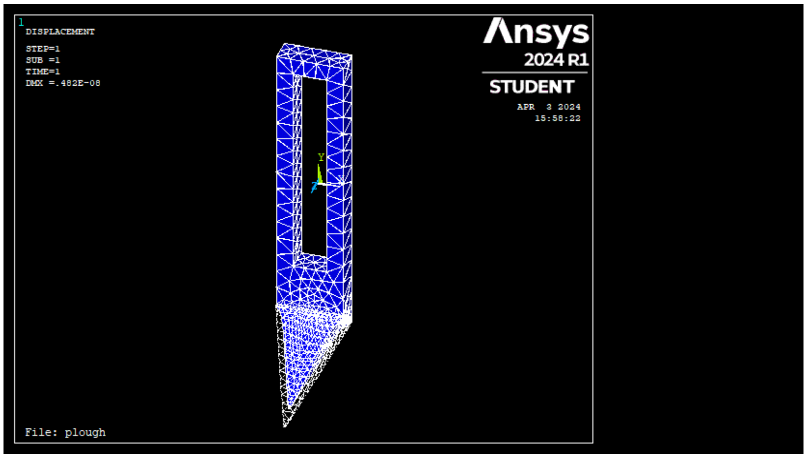



Figure: 8 Deformation $0.482e^{-8}$ m

Figure 8 shows the effect of deformation, when a 30N force is applied on the structural steel plough, a maximum value of $0.482e^{-8}$ m deformation is observed.

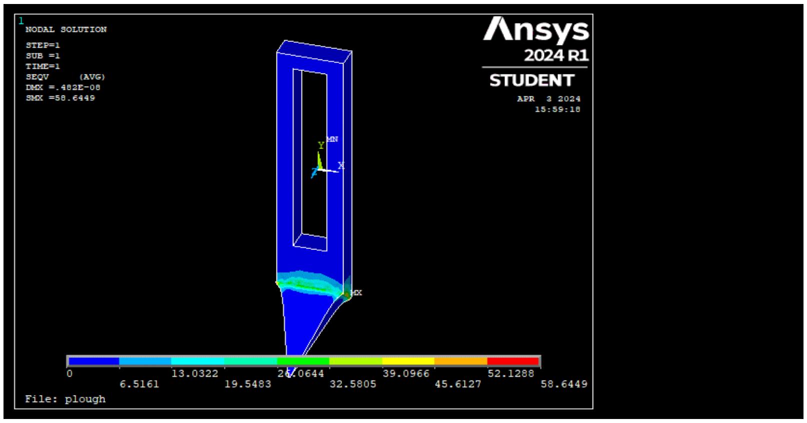



Figure: 9Von mises stress 58.6449 Pa

Figure 9 shows the effect of von mises stress, when a 30N force is applied on the structural steel plough, a maximum stress value 58.6449 Pa is observed.

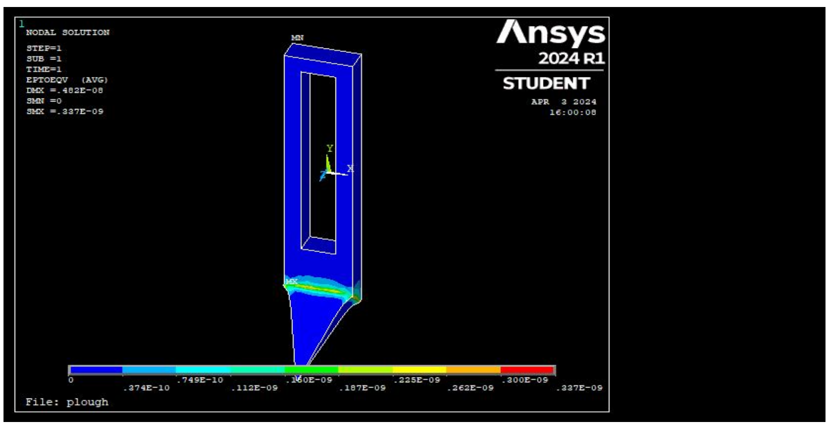



Figure: 10 Von-mises strain $0.337e^{-9}$ m/m

Figure 10 shows the effect of von mises strain, when a 30N force is applied on the plough, a maximum strain value $0.337e^{-9}$ m/m is observed.

*b) 40N force – Structural Steel Plough*

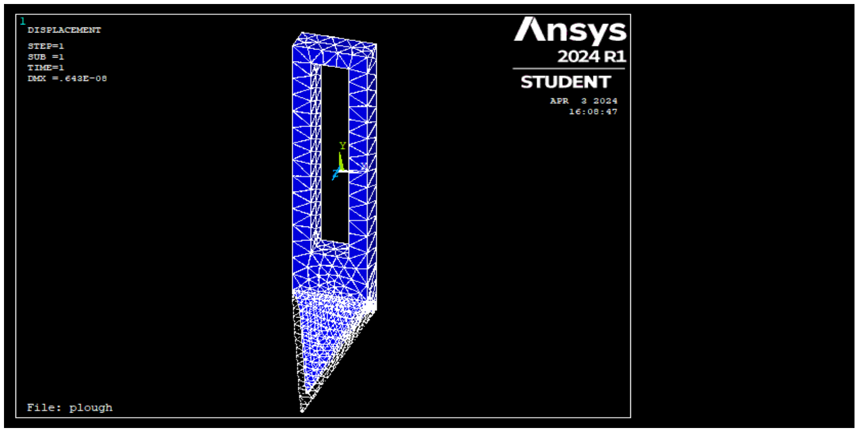



Figure: 11 Deformation 0.643e$^{-8}$ m

Figure 11 shows the effect of deformation, when a 40N force is applied on the structural steel plough, a maximum value 0.643e$^{-8}$ m deformation is observed.

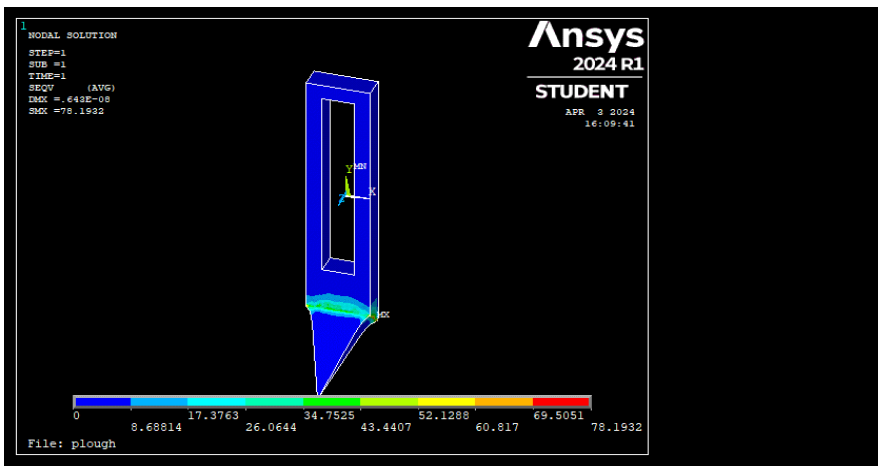



Figure: 12 Von mises stress 78.1932 Pa

Figure 12 shows the effect of von mises stress, when a 40N force is applied on the structural steel plough, a maxium value 78.1932 Pa stress is observed.

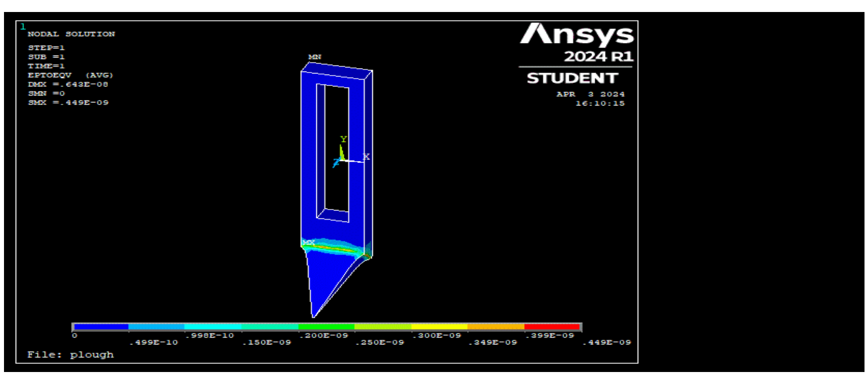



Figure: 13 Von mises strain 0.449e$^{-9}$ m/m

Figure 13 shows the effect of von mises strain, when a 40N force is applied on the structural steel plough, a maximum value 0.449e$^{-9}$ m/m strain is observed.

*c) 50N force – Structural Steel Plough*

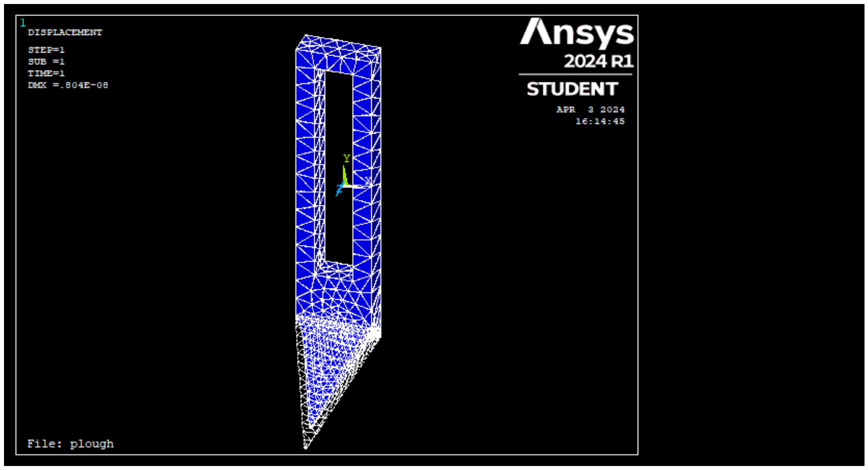



Figure: 14 Total deformation 0.0013217 mm

Figure 14 shows the effect of deformation, when a 50N force is applied on the plough, a maximum value 0.0013217 mm of deformation is observed.

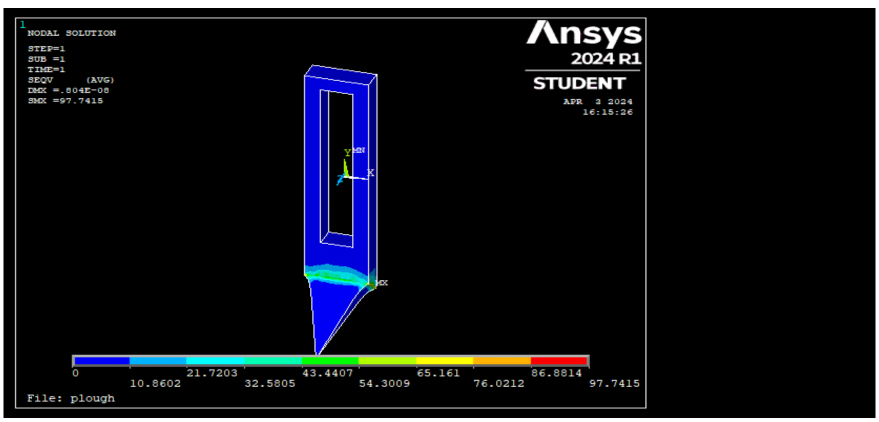



Figure: 15 Von mises stress 97.7415 Pa

Figure 15 shows the effect of von mises stress, when a 50N force is applied on the structural steel plough, a maximum value 97.7415 Pa stress is observed.

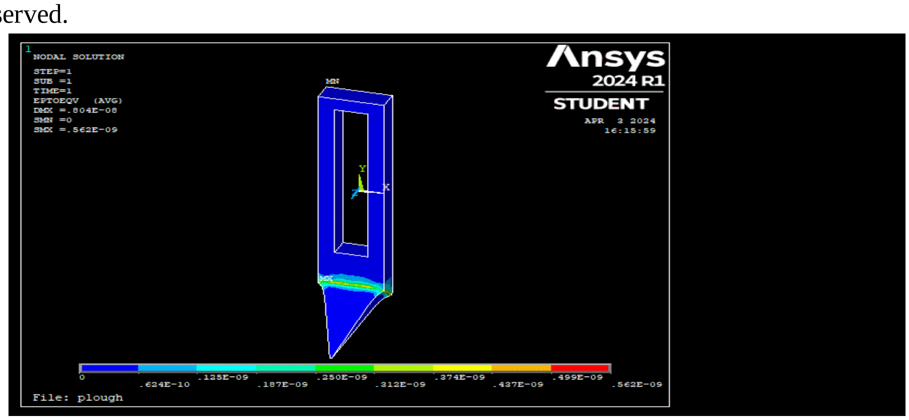



Figure: 16 Von mises strain $0.562e^{-9}$ m/m

Figure 16 shows the effect of von mises strain, when a 50N force is applied on the structural steel plough, a maximum value $0.562e^{-9}$ m/m strain is observed.

*2) High Carbon Steel*

High carbon steel, also known as carbon tool steel, contains a higher carbon content than other steel types, typically ranging from 0.60% to 1.00%. This increased carbon content makes the steel harder and stronger but also more brittle compared to low carbon steel. High carbon steel is often used for cutting tools like knives, chisels, and blades, as well as springs and high-strength wire. It can be heat treated to improve its hardness and toughness, making it suitable for applications where sharpness and durability are crucial. However, its brittleness means it is less suitable for applications requiring flexibility or impact resistance.

Table: 2 High carbon steel material properties

| Young's modulus | Poisson's ratio | Density |
|---|---|---|
| 200 GPa | 0.28 | 7,800 kg/m$^3$ |

*a) 30N force – high carbon steel plough*

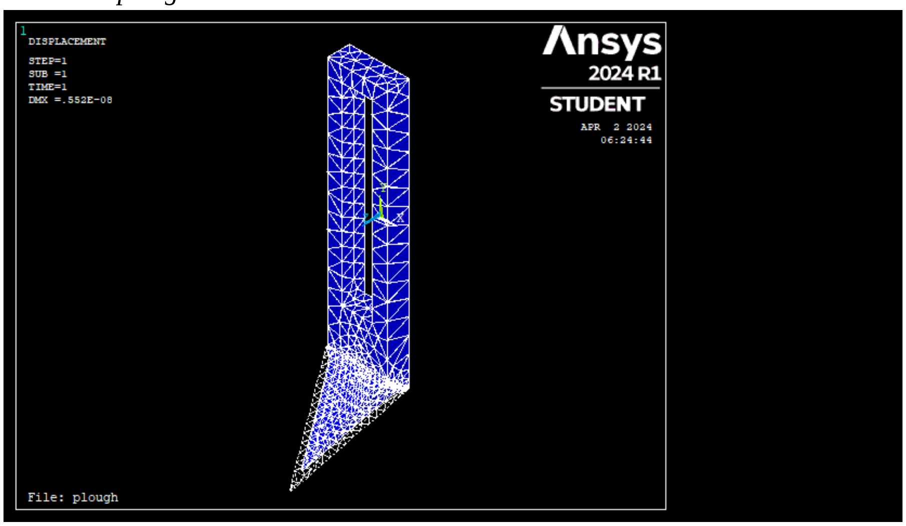



Figure: 17 Deformation 0.552e$^{-8}$ m

Figure 17 shows the effect of deformation, when a 30N force is applied on the high carbon steel plough, a maximum value 0.552e$^{-8}$ m is observed.

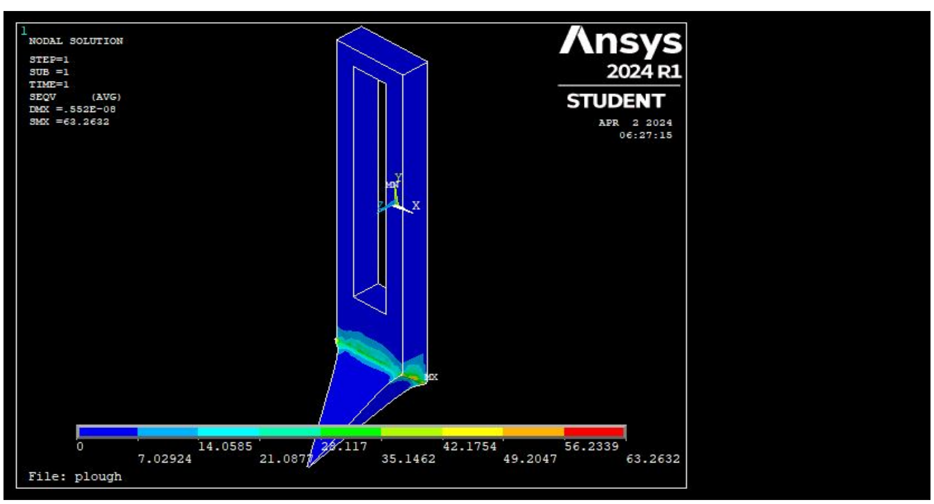



Figure: 18 Von mises stress 63.2632 Pa

Figure 18 shows the effect of von mises stress, when a 30N force is applied on the high carbon steel plough, a maximum value 63.2632 Pa von mises stress is observed.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

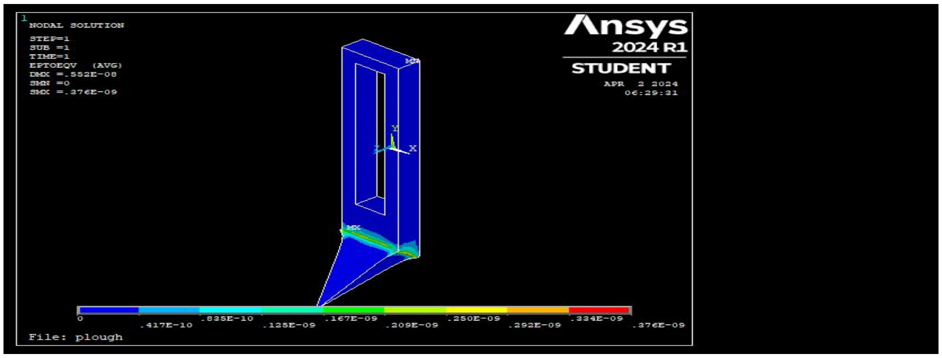



Figure: 19 Von mises strain $0.276e^{-9}$ m/m

Figure 19 shows the effect of von mises strain, when a 30N force is applied on the high carbon steel plough, a maximum value $0.276e^{9}$ m/m von mises strain is observed.

*b) 40N force – high Carbon Steel Plough*

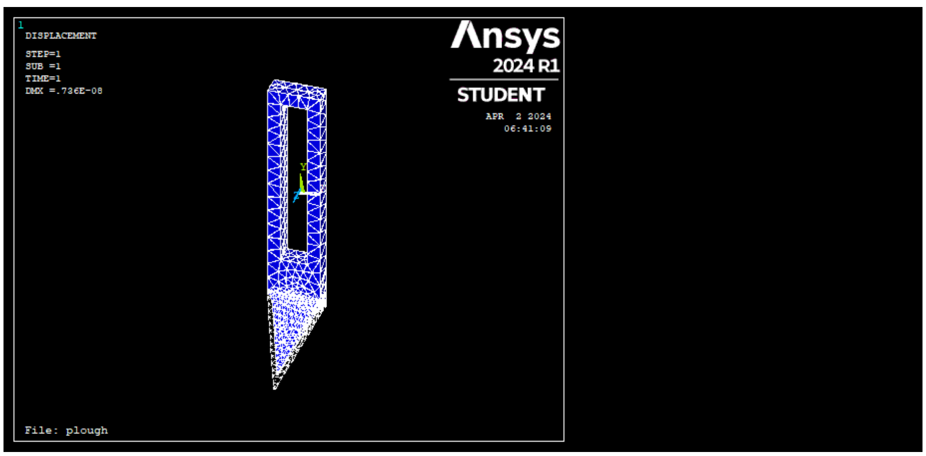



Figure: 20 Deformation $0.736e^{-8}$ m

Figure 20 shows the effect of deformation, when a 40N force is applied on the high carbon steel plough, a maximum value $0.736e^{-8}$ m deformation is observed.

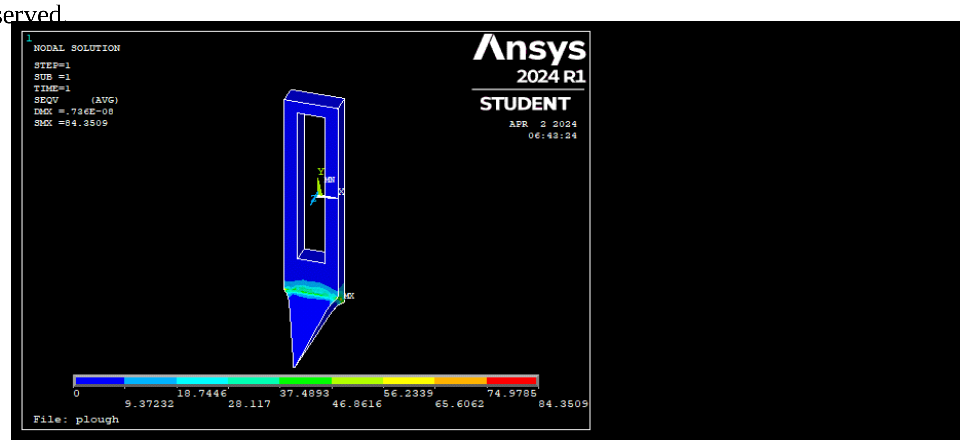



Figure: 21 Von mises stress 84.3509 Pa

Figure 21 shows the effect of von mises stress, when a 40N force is applied on the high carbon steel plough, a maximum value 84.3509 Pa von mises stress is observed.

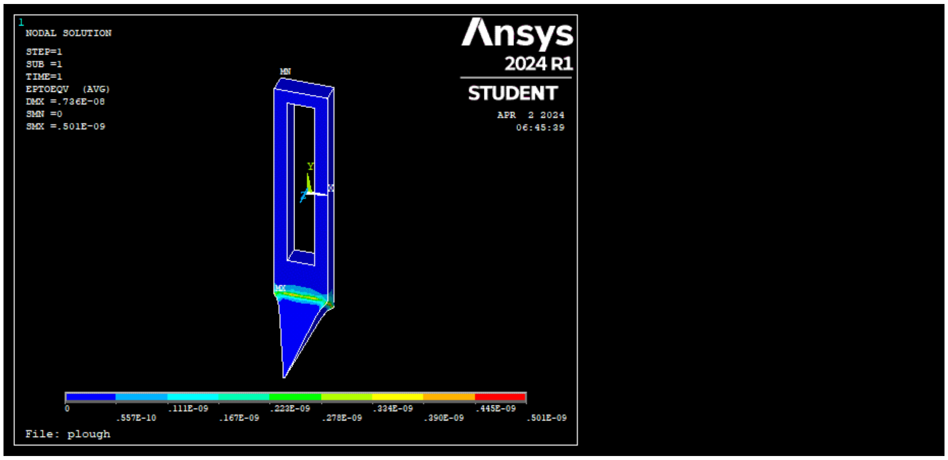



Figure: 22 Von mises strain 0.501e$^{-9}$ m/m

Figure 22 shows the effect of von mises strain, when a 40N force is applied on the high carbon steel plough, a maximum value 0.501e$^{-9}$ m/m von mises strain is observed.

*c) 50N force – high carbon steel Plough*

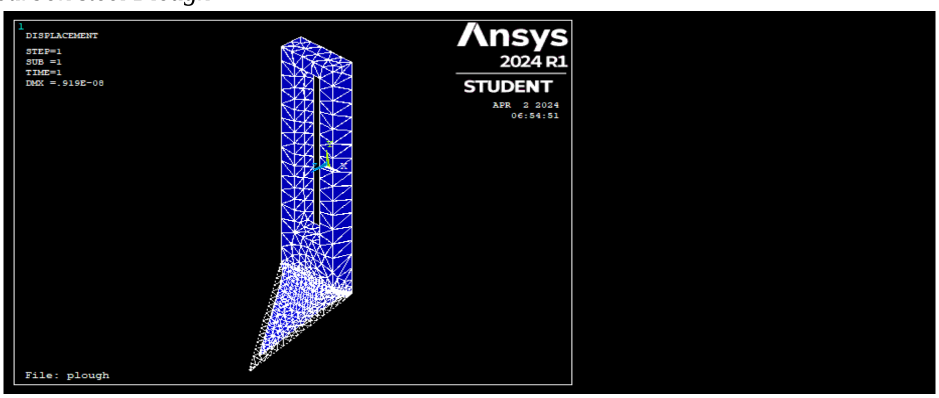



Figure: 23 Deformation 0.919e$^{-8}$ m

Figure 23 shows the effect of deformation, when a 50N force is applied on the high carbon steel plough, a maximum value 0.919e$^{-8}$ m deformation is observed.

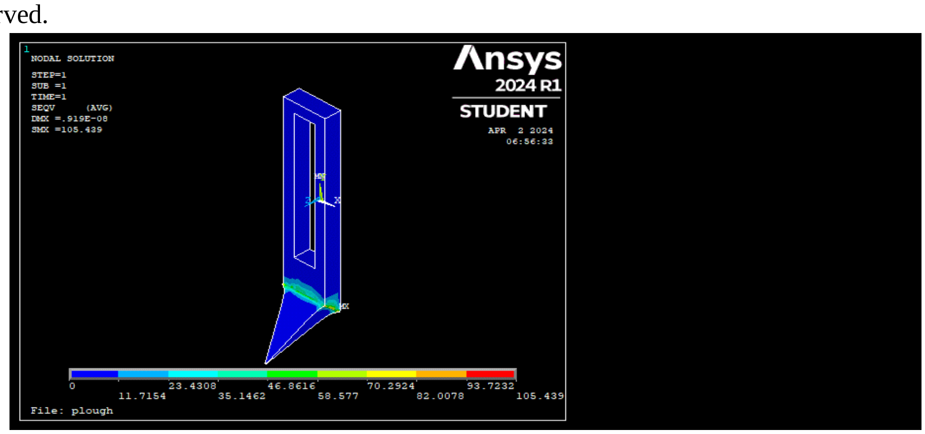



Figure: 24 Von mises stress 105.429 Pa

Figure 24 shows the effect of von mises stress, when a 50N force is applied on the high carbon steel plough, a maximum value 105.429 Pa and a von mises stress is observed.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

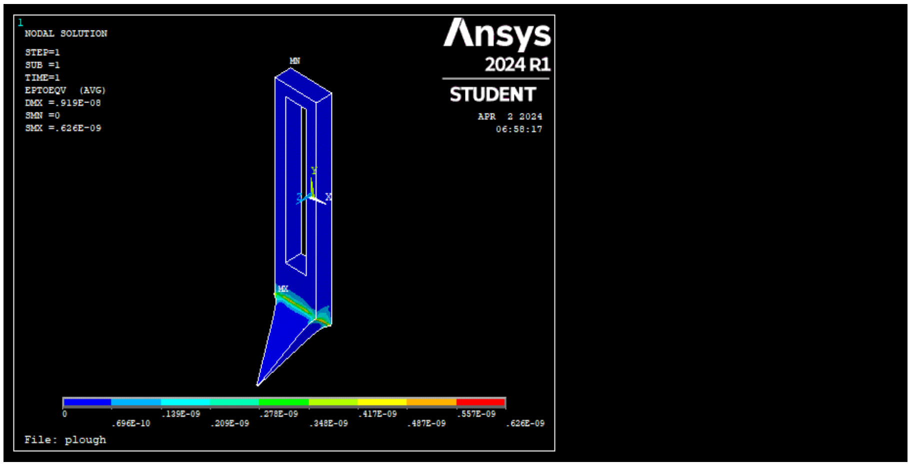



Figure: 25 Von mises strain $0.626e^{-9}$ m/m

Figure 25 shows the effect of von mises strain, when a 40N force is applied on the high carbon steel plough, a maximum value $0.626e^{-9}$ m/m von mises strain is observed.

*3) Mild Steel*

Mild steel, also known as low carbon steel, is a widely used material in various industries due to its low cost, ease of machining, forming, and welding. It contains a relatively low amount of carbon (typically 0.05-0.25% by weight), which gives it moderate strength, high ductility, and excellent weldability. Mild steel is easily formed into different shapes without breaking, making it ideal for construction, automotive manufacturing, shipbuilding, furniture making, and general engineering. While it is not as corrosion-resistant as stainless or galvanized steel, mild steel can be protected from rusting through various coating methods. Despite its versatility and widespread use, mild steel may not be suitable for applications requiring high strength or corrosion resistance, where other types of steel or alloys may be more appropriate.

Table: 3 Mild steel material properties

| Young’s modulus | Poisson’s ratio | Density |
|---|---|---|
| 200 GPa | 0.25 | 7,850 kg/$m^3$ |

*a) 30N force – mild steel plough*

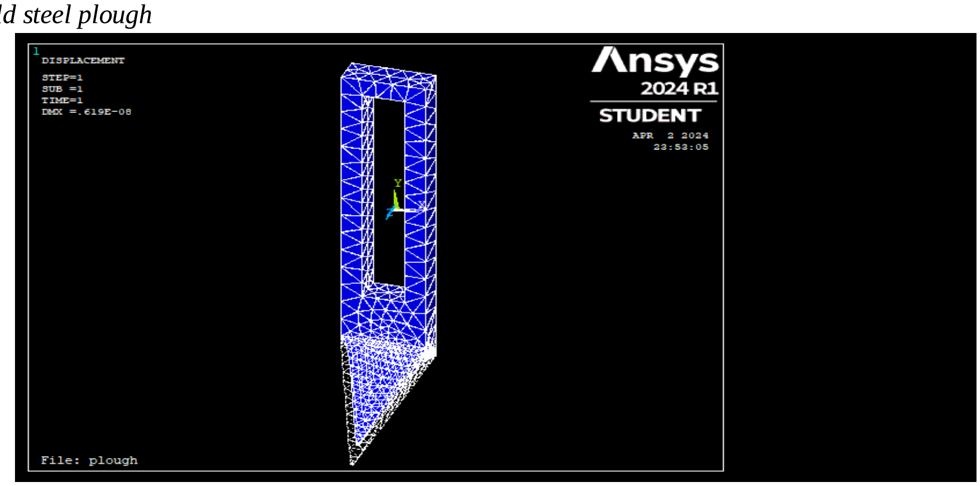



Figure: 26 Deformation $0.619e^{-8}$ m

Figure 26 shows the effect of deformation, when a 30N force is applied on the mild steel plough, a maximum value $0.619e^{-8}$ m is observed.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538*
*Volume 12 Issue IV Apr 2024- Available at www.ijraset.com*

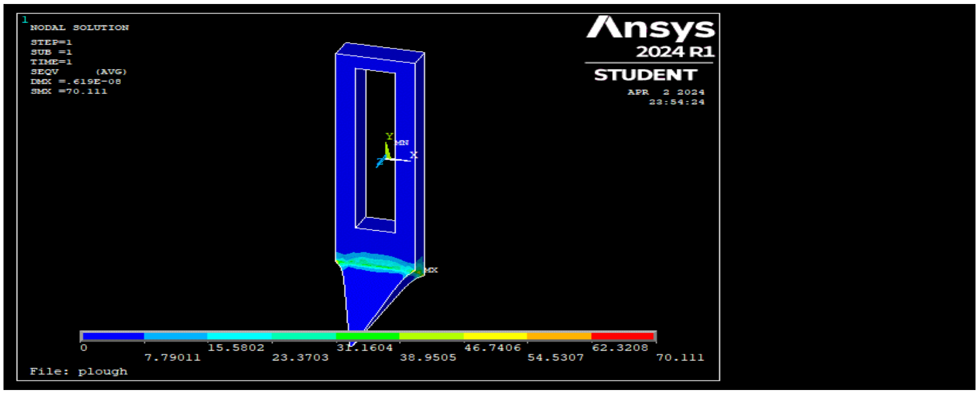



Figure: 27 Von mises stress 70.111 Pa

Figure 27 shows the effect of von mises stress, when a 30N force is applied on the mild steel plough, a maximum value 70.111 Pa von mises stress is observed.

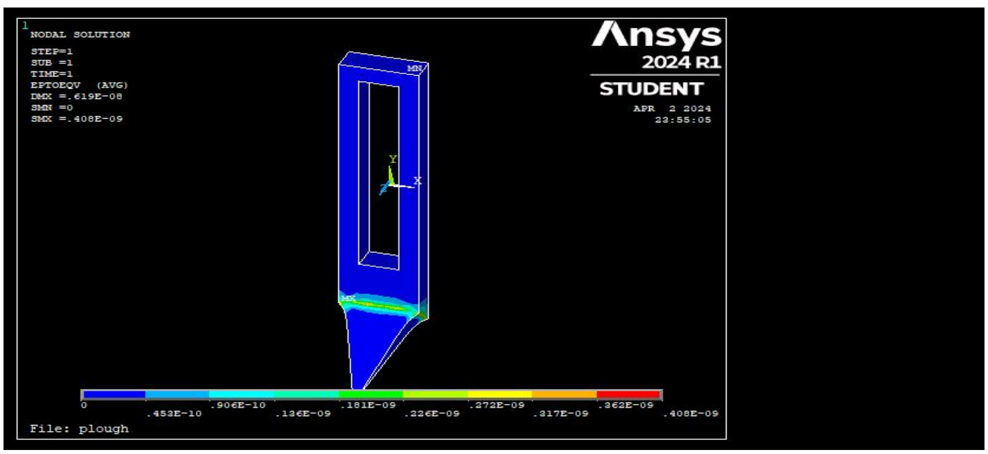



Figure: 28 Von mises strain $0.408e^{-9}$ m/m

Figure 28 shows the effect of von mises strain, when a 30N force is applied on the mild steel plough, a maximum value $0.408e^{-9}$ m/m von mises strain is observed.

*b) 40N force – mild steel plough*

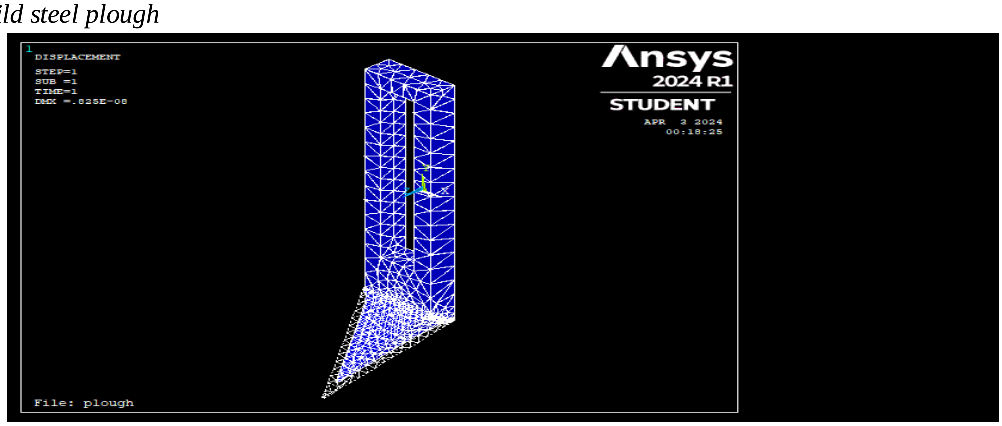



Figure: 29 Deformation $0.825e^{-8}$ m

Figure 29 shows the effect of deformation, when a 40N force is applied on the mild steel plough, a maximum value $0.825e^{-8}$ m is observed.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538*
*Volume 12 Issue IV Apr 2024- Available at www.ijraset.com*

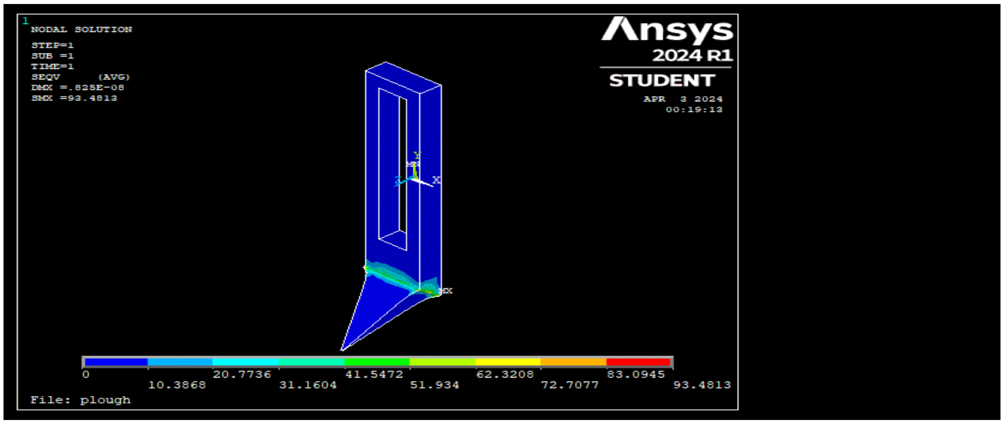



Figure: 30 Von mises stress 93.4813 Pa

Figure 30 shows the effect of von mises stress, when a 40N force is applied on the mild steel plough, a maximum value 93.4813 Pa von mises stress is observed.

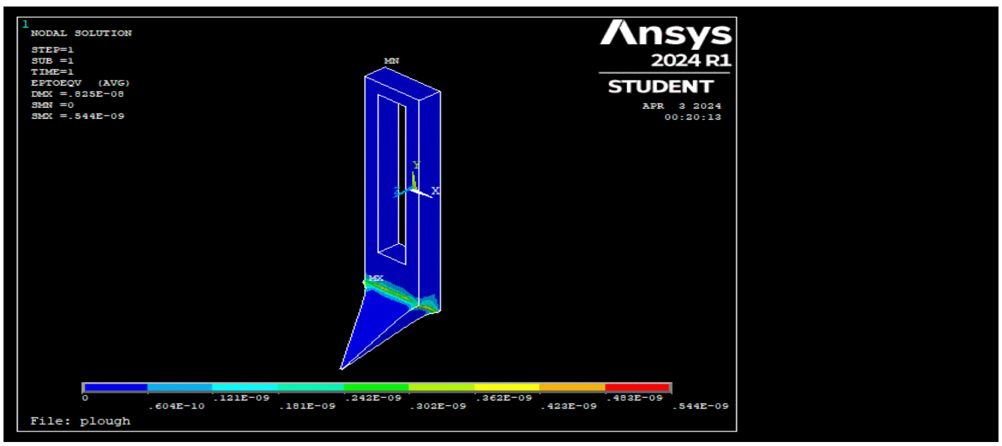



Figure: 31 Von mises strain $0.544e^{-9}$ m/m

Figure 31 shows the effect of von mises strain, when a 40N force is applied on the mild steel plough, a maximum value $0.544e^{-9}$ m/m von mises strain is observed.

*c) 50N force – mild steel plough*

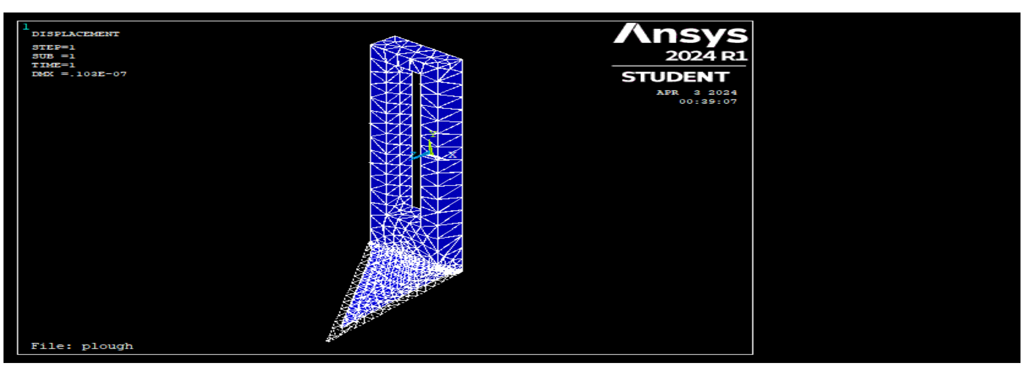



Figure: 32 Deformation $0.103e^{-7}$ m

Figure 32 shows the effect of deformation, when a 50N force is applied on the mild steel plough, a maximum value $0.103e^{-7}$ m is observed.

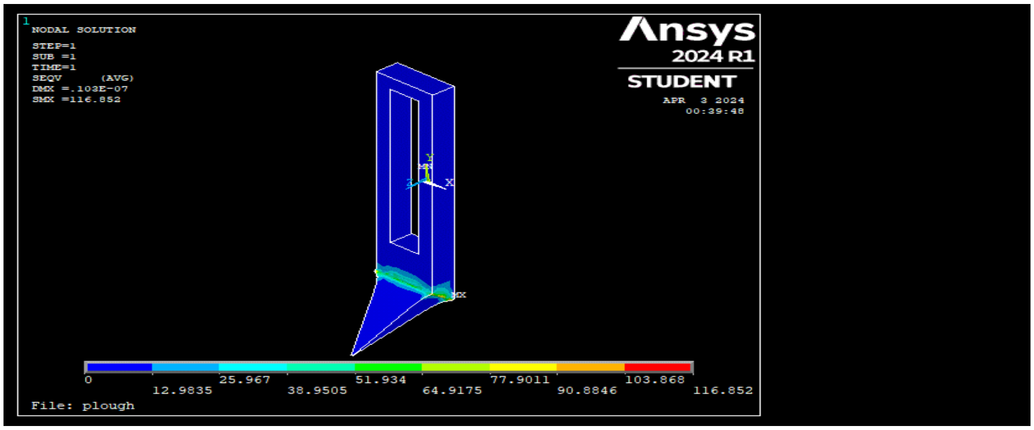



Figure: 33 Von mises stress 116.852 Pa

Figure 33 shows the effect of von mises stress, when a 50N force is applied on the mild steel plough, a maximum value 116.852 Pa von mises stress is observed.

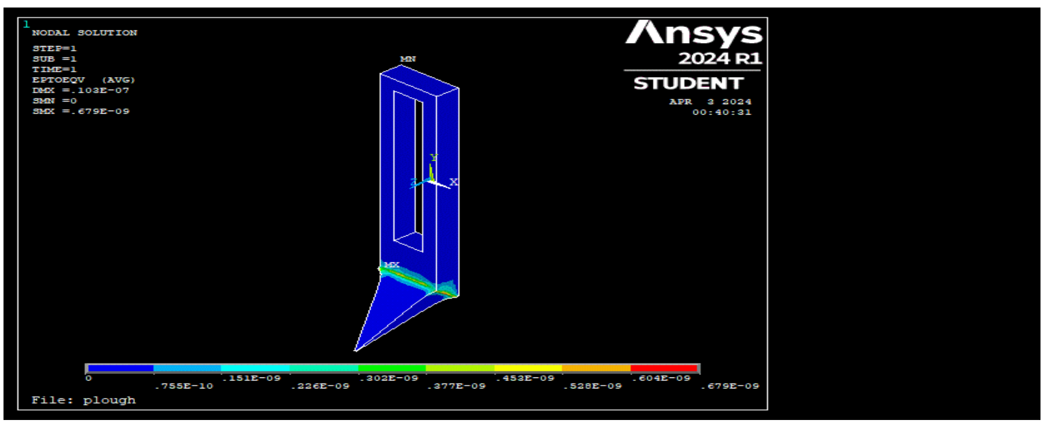



Figure: 34 Von mises strain SMX = $0.679e^{-9}$ m/m

Figure 34 shows the effect of von mises strain, when a 50N force is applied on the mild steel plough, a maximum value $0.679e^{-9}$ m/m von mises strain is observed.

### *B. Comparison Of Results Of Different Materials With Different Loads*

Table: 4 Deformation of different plough materials

| Sl.No | Material | Loads(N) | Deformation(mm) |
|---|---|---|---|
| 1 | Structural Steel | 30 | 0.00000482 |
| 2 | | 40 | 0.00000643 |
| 3 | | 50 | 0.00000804 |
| 4 | High Carbon Steel | 30 | 0.00000552 |
| 5 | | 40 | 0.00000736 |
| 6 | | 50 | 0.00000919 |
| 7 | Mild Steel | 30 | 0.00000619 |
| 8 | | 40 | 0.00000825 |
| 9 | | 50 | 0.0000103 |

Table: 5 Von mises stress values of different plough materials at different loads

| Sl.No | Material | Loads(N) | Von mises maximum stress (Pa) |
|---|---|---|---|
| 1 | Structural Steel | 30 | 58.6449 |
| 2 | | 40 | 78.1932 |
| 3 | | 50 | 97.7415 |
| 4 | High Carbon Steel | 30 | 63.2632 |
| 5 | | 40 | 84.3509 |
| 6 | | 50 | 105.429 |
| 7 | Mild Steel | 30 | 70.111 |
| 8 | | 40 | 93.4813 |
| 9 | | 50 | 116.852 |

Table: 6 Von mises strain values of different plough materials at different loads

| Sl.No | Material | Loads(N) | Von mises maximum strain |
|---|---|---|---|
| 1 | Structural Steel | 30 | $0.337e^{-9}$ |
| 2 | | 40 | $0.449e^{-9}$ |
| 3 | | 50 | $0.562e^{-9}$ |
| 4 | High Carbon Steel | 30 | $0.276e^{-9}$ |
| 5 | | 40 | $0.501e^{-9}$ |
| 6 | | 50 | $0.626e^{-9}$ |
| 7 | Mild Steel | 30 | $0.408e^{-9}$ |
| 8 | | 40 | $0.544e^{-9}$ |
| 9 | | 50 | $0.679e^{-9}$ |

## IV.FABRICATION OF MANUALLY OPERATED SEED SOWING MACHINE

### A. *Process used*

To make seed sowing machine, we are mainly using two process.

1) *Metal Cutting:* Metal cutting is the process of removing unwanted material in the form of chip, from a block of metal, using cutting tool.
2) *Welding:* Welding is a fabrication of sculptural process that materials, usually metals (or) thermoplastics, by using high heat to melt the parts together and allowing them to cool causing fusion. Welding is distinct from lower temperature metal-joining techniques such as brazing and soldering, which do not melt the base metal.

In addition to melting the base metal, a filler material is typically added to the joint to form a pool of molten material (the weld pool) that cools to form a joint that, based on weld configuration (butt, full penetration, fillet, etc), can be stronger than the base material (parent metal). Pressure may also use in conjunction with heat, or by itself, to produce a weld. Welding also requires a form of shield to protect the filler metals or melted metals from being contaminated 0r oxidized.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

*B. Manufacturing of Parts*

*1) Frame*

For the main frame manufacturing we selected mild steel pipes of rectangular shapes.

Figure: 35 Metal Cutting

Figure: 36 Welding

*2) Hopper*

G.I sheet material is selected for hopper and hopper is designed in such a way that it can handle of 1kg capacity seeds. We cut the sheet on shearing machine as per the design. Hoppers are then manufactured by folding process. At the bottom of the hopper a rectangle type outlet is prepared for the flow of seeds through seed dispensing wheel.

Figure: 37 Sheet Metal Folding

*3) Wheels and Shaft*

Both wheels and shaft are directly available in market. The shaft and wheel are attached through bearings as per the requirement using nut and bolt mechanism.

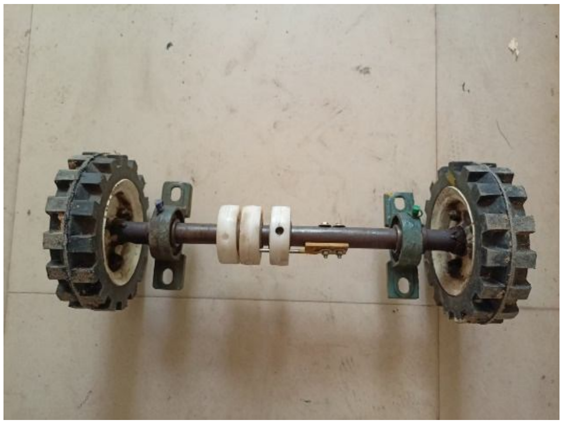


Figure: 38 Wheels and Shaft

After purchasing and fabrication of all components the assembly of the Manually Operated Seed Sowing Machine has been done. The components such as wheels, mild steel pipe, bearings(UC 205), seed dispensing wheels and mild steel sheet are purchased as per requirements. The components such as frames are fabricated by collecting the required materials. Later on fabrication has been done according to the required shape and size.

### *C. Assembling*

1) The first step in assembling is ball bearings(UC 205) are attached to the main frame using welding process.
2) The seed dispensing wheels are mounted on the shaft at a desired distance.
3) The shaft along with the dispensing wheels is placed between the ball bearings(UC 205).
4) The wheels are attached at the both ends of the shaft using a nuts and bolts.
5) The hopper is attached on the top of the main frame with the help of a nut and bolt.
6) A permanent heavy metal bar is fixed using chains at the back of the main frame.
7) The plough of the required shape is attached at the front of the main frame using a nut and bolt which can adjusted for the required depth of sowing.
8) An inclined bar is attached at the back of the machine to push the machine and transmit power manually.

Figure: 39 Disassembly of parts

Figure: 40 Final Assembly

### *D. Mathematical Calculations*

- The dispensing wheel in directly mounted to the wheel axle hence, when the wheel completes one rotation, the dispensing wheel also completes one rotation.
- For demonstration purpose, the dispensing wheel is used for sowing ground nut, lady finger and green pees.
- Circumference of the wheel :-

$$2\pi r = 2\times3.14\times10.2 \text{ cm}$$
$$= 64 \text{ cm}$$

When the wheel completes one rotation, it covers 64 cm on ground.

1) Number of grooves on the dispensing wheel

A. Ground nuts:

The seed spacing for ground nut is 20 cm.

Number of grooves on the dispensing wheel = $\frac{Circumference}{Seed\ Spacing}$

$$= \frac{64}{20} = 3.2 \approx 3.0$$

$\therefore$Three grooves are required for ground nut.

B. Lady Finger:

The seed spacing for lady finger is 30 cm.

Number of grooves on the dispensing wheel = $\frac{Circumference}{Seed\ Spacing}$

$$= \frac{64}{30} = 2.1 \approx 2.0$$

$\therefore$Two grooves are required for lady finger.

C. Green pees:

The seed spacing for green pees is 15 cm.

Number of grooves on the dispensing wheel = $\frac{Circumference}{Seed\ Spacing}$

$$= \frac{64}{15} = 4.2 \approx 4.0$$

$\therefore$Four grooves are required for green pees.

*2)* Volume of the Hopper

Length, breadth and height of hopper = 10 cm.

Volume = $Lenght * Breadth * Height = 10 * 10 * 10 = 1000\ cm^3$

*3)* Hopper capacity for different seeds

A 166 $cm^3$ volume cup was taken and the amount of seeds that can be accommodated in it was measured in grams and the amount of seeds that the hopper can hold is calculated.

A. Ground nuts:

Amount of ground nut in 166 $cm^3$ cup = 104 grams

$$1000 * \frac{104}{166} = 626\ grams$$

Hopper capacity for ground nut = 626 grams

B. Green pees:

Amount of Green pees in 166 $cm^3$ cup = 125 grams

$$1000 * \frac{125}{166} = 753\ grams$$

Hopper capacity for green pees = 753 grams

C. Lady finger:

Amount of lady finger in 166 $cm^3$ cup = 116 grams

$$1000 * \frac{116}{166} = 698\ grams$$

Hopper capacity for green pees = 753 grams

## V.CONCLUSION

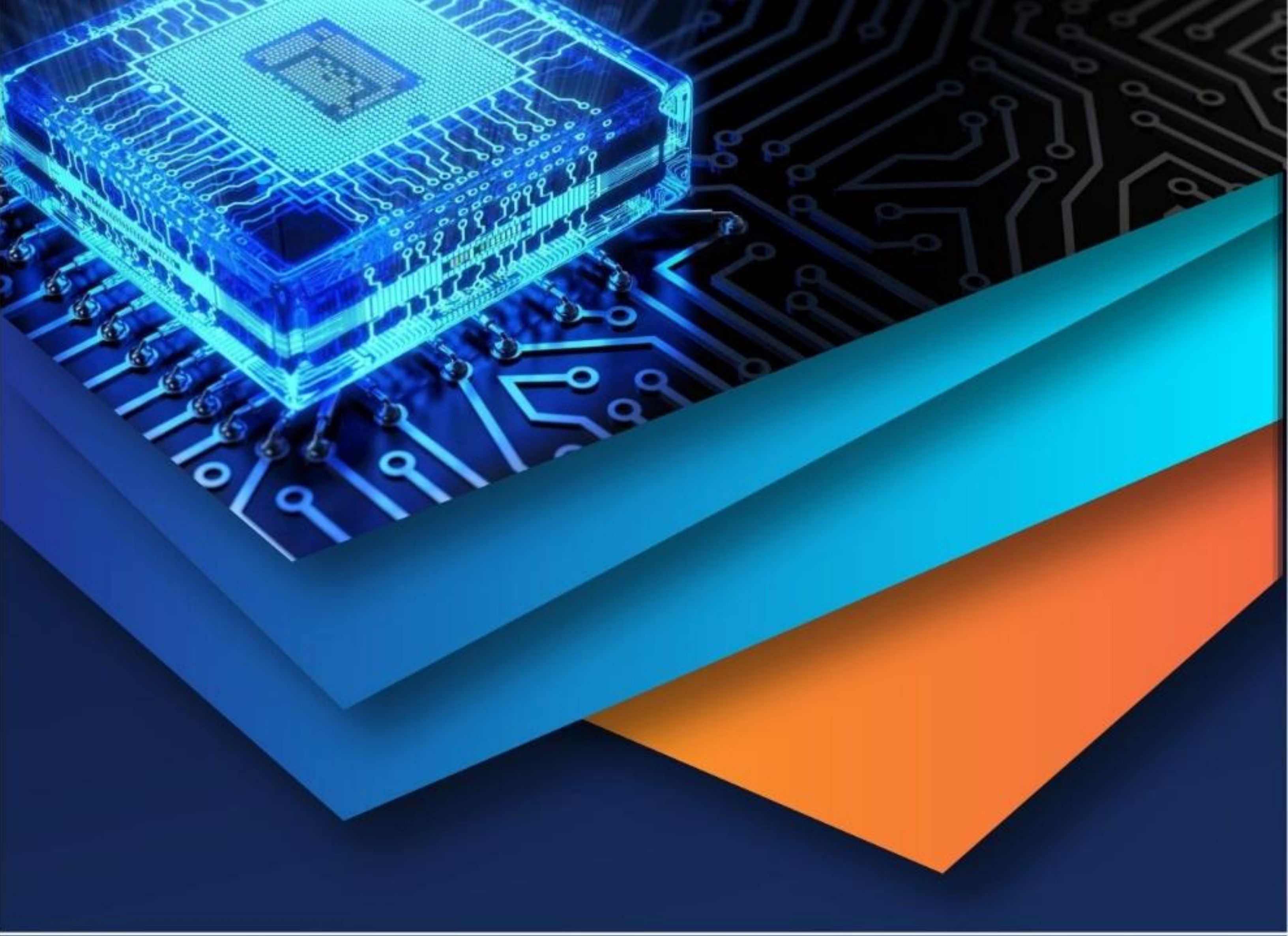
In this present study a seed sowing machine was modelled to meet the key requirements of stability, comfort, and hand control. Seed sowing machine was modelled by using AutoCAD and CATIA, The machine was constructed in six distinct subsections: Main Frame, Dispensing Wheel, Hopper, Plough, Shaft, and UC Bearings. Finite element analysis was performed on plough for the materials high carbon steel, structural steel and mild steel and by using Ansys 2023 student version. From the analysis it was identified that structrural steel plogh was subjected to lower deformation, less amount of Von mises stresses and less strain values. Prototype of seed sowing machine was fabricated by using mild steel. Each subsection was fabricated separately and then assembled to create the final product. This approach ensures that the design can be replicated effectively in the future.

During sowing the fabricated seed sowing machine controls seed rate, control the seed depth and proper utilization of seeds can be done with less wastage. The fabricated seed sowing machine perform the various simultaneous operations and hence saves labour requirement so as labour cost, labour time and also save lots of energy.

## REFERENCES

[1] Adisa A F, Braide F. G, "Design and Development of Template Row Planter", Transnational Journal of Science and Technology, vol. 2, No.7, 2012.
[2] Aditya Kawadaskar1, Dr. S. S. Chaudhari2, Aditya Kawadaskar, Review of methods of seed sowing and concept of multi-purpose seed sowing machine‟ by, IJPRET, 2013; Volume 1(8): 267-276, ISSN: 2319-507X.
[3] Calvin Hung, Juan Nieto, Zachary Taylor, James Underwood and Salah Sukkarieh,"Orchard Fruit Segmentation using Multi-spectral Feature Learning", IEE/RSJ International Conference on Intelligent Robot System Tokyo,Japan,3-7,November 2013.
[4] D. Ramesh and H. P. Girishkumar, "Agriculture Seed Sowing Equipment: A Review", International Journal of Science, Engineering and Technology Research, Volume 3, Issue 7, Pp-1987-1992, 2014.
[5] Enhanced agriculture robotic system‟ by Mr.Sagar R. Chavan , Prof. Rahul D. Shelke, Prof. Shrinivas R. Zanwar, International journal of engineering sciences & research technology, ISSN: 2277-9655 Scientific Journal Impact Factor: 3.449 2015.
[6] Kyada, A. R1*, Patel, D. B., Design and development of manually operated Seed planter machine‟ , 5th International & 26th All India Manufacturing Technology, Design and Research Conference (AIMTDR 2014) December 12th–14th, 2014.
[7] Laukik P. Raut, Smit B. Jaiswal and Nitin Y. Mohite, "Design, development, and fabrication of agricultural pesticides with weeder", International Journal of Applied Research and Studies, Volume 2, Issue 11, Pp-18 .2013.
[8] Mahesh R. Pundkar":-"A seed sowing machine: A review" IJESS volume 3, Issue 3. ISSN: 2249-9482, International journal of engineering and social science.
[9] Mahesh. R. Pundkar and A. K. Mahalle, "A Seed-Sowing Machine: A Review" International Journal of Engineering and Social Science, Volume3, Issue3, Pp-68-74
[10] P.P. Shelke:-"frontline demonstration on bullock-drawn planter enhances yield of soya bean crop." International journal of farm science 1(2):123-128, 2011.
[11] Pranil V. Sawalakhe, Amit Wandhare, Ashish Sontakke, Bhushan Patil, Rakesh Bawanwade and Saurabh Kurjekar, "Solar Powered Seed Sowing Machine", Global Journal of Advanced Research, Vol-2, Issue-4, Pp-712717 .

[12] PrasannaRaut, PradipShirwale, AbhijeetShitole "A Survey On Smart Famer Friendly Robot Using Zigbee", International Journal of Emerging technology and Computer Science ,Volume: 01, Issue: 01, February 2016
[13] Rolando P, Automatic Seed Planter Punching Type", "International Journal of Emerging Technology & Research Volume 1, Issue 3, (www.ijetr.org) ISSN (E): 2347-5900 ISSN (P): 2347- 6079. Mar-Apr, 2014.
[14] Shivaraja kumar. a1, parames waramurthy, Design and development of wheel and pedal operated sprayer" by, Volume 2, Issue 6, June 2014.
[15] Sridhar H .S "Development of Single Wheel Multi-Use Manually Operated Weed Remover", International Journal of Modern Mahesh. R. Pundkar and A. K. Mahalle, "A Seed-Sowing Machine: A Review" International Journal of Engineering and Social Science, Volume3, Issue3, Pp-68-74
[16] Shrinivas R. Zanwar, R. D. Kokate, "Advanced Agriculture System", International Journal of Robotics and Automation (IJRA), Vol. 1, No. 2, pp. 107~112 , June 2012.
[17] Swetha S. and Shreeharsha G.H., "Solar Operated Automatic Seed Sowing Machine", Cloud Publications International Journal of Advanced Agricultural Sciences and Technology 2015, Volume 4, Issue 1, pp. 67-71, Article ID Sci-223, 26 February 2015.




10.22214/IJRASET

INDEX COPERNICUS 45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429


# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY