MAJOR PROJECT

REPORT ON

DESIGN & FABRICATION ON PORTABLE GRAIN PACKING MACHINE

Main-project report submitted in partial fulfilment of the requirements for the award of the degree of

Bachelor of Technology in Mechanical Engineering

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CERTIFICATE

This is to certify that the thesis / dissertation entitled **PORTABLE GRAIN PACKING MACHINE** that is being submitted by **T. Nanda Kishor, B. Chandrakala, N. Srikanth, M. Ravinder, K. Hari Krishna** in partial fulfilment for the award of **Bachelor of Technology in Mechanical Engineering** to the **J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)** is a record of bonafide work carried out by him / her under our guidance and supervision.

The results embodied in this thesis are original work and have not been submitted to any other University or Institute for the award of any degree or diploma

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DECLARATION

We are hereby solemnly affirming that the main project report entitled **PORTABLE GRAIN PACKING MACHINE** being submitted by us in partial fulfilment of the requirement for the award of the degree of Bachelor of Technology in Mechanical Engineering, to the J.B. Institute of Engineering & Technology, is a record of bonafide work carried out by us under the guidance of Mrs VV. Krishna Vandana**.** The work reported in this report in full or in part has not been submitted to any University or Institute for the award of any degree or diploma

ACKNOWLEDGMENT

This work is not an individual contribution till its completion. We take this opportunity to thank all for bringing it close to the conclusion. First, we would like to thank our guide Mrs. VV. Krishna Vandana, for continuously assessing our work providing great guidance by timely suggestions and discussion at every stage of this work. Thanks to, Dr. Anoop Kumar Shukla, HOD Mechanical engineering for providing all facilities without which this Design and Analysis would not have been possible. sincerely thank to Mrs. VV. Krishna Vandana, for her guidance. we would like to express my gratitude towards my parents & other faculty members of J.B. Institute of Engineering & Technology for their kind co-operation encouragement which helped me in this My thanks and appreciations to people who willingly helped me out with their best of abilities.

ABSTRACT

A portable grain packing machine is a device that can pack bags of grains, such as rice, wheat, millet, corn, etc., in a convenient way. It can be used for small-scale production, storage, or transport of grains. There are different types of grain packing machines. They have different features and benefits such as cost, speed, and accuracy. It can reduce the labour and time required for packing grains, and improve quality of the packing process. It is mostly useful in the market yards.

A portable grain packing machine is a useful and innovative device for packing of grain bags in large quantity

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CHAPTER 1

INTRODUCTION

1.1. INTRODUCTION

Grain packing has been an integral part of agricultural practices for centuries, evolving from rudimentary methods to sophisticated techniques. Initially, grains were stored in natural containers like gourds or woven baskets, providing basic protection against pests and the elements. As agriculture developed, the need for more efficient and durable packing solutions became evident, leading to the invention of various storage and packing methods. Today, grain packing not only ensures the safe storage and transportation of grains but also plays a crucial role in preserving their quality and nutritional value. The introduction of machinery in grain packing marked a significant milestone, offering increased efficiency and consistency in packing processes.

1.2. EVOLUTION OF GRAIN PACKING MACHINES

The transition from manual to mechanized grain packing began with simple machines that automated basic tasks. Over time, these machines evolved, driven by technological advancements and the growing demands of the agricultural industry. From bulk filling systems to advanced packaging lines, the evolution of grain packing machines reflects a journey towards greater efficiency, speed, and precision. The introduction of digital technology brought about further refinements, enabling more precise control over packing processes and adaptability to different types of grains and packing materials.

1.3. INTRODUCTION TO PORTABLE GRAIN PACKING MACHINES

Portable grain packing machines represent a revolutionary step in the field of agricultural packaging. Designed to be compact and easy to transport, as needed, making them ideal for use in various locations.

1.4. BENEFITS OF PORTABLE GRAIN PACKING MACHINES

The primary advantage of portable grain packing machines is their mobility. This allows farmers to package grains directly at the harvesting site, reducing the need for transportation to a separate packing facility. It also minimizes grain exposure to external factors that could compromise quality. Moreover, these machines often incorporate advanced technology, offering features like automated weighing and sealing, which enhance packing efficiency and reduce labour costs.

1.5. DESIGN & TECHNOLOGY IN PORTABLE GRAIN PACKING MACHINES

The design of portable grain packing machines focuses on combining functionality with ease of transport. They typically feature components like hoppers, conveyors, weighing systems, and sealing units, all integrated into a compact framework. Recent technological advancements have introduced features such as touchscreen controls, programmable settings, and self-diagnostic capabilities, enhancing the user experience and operational efficiency.

1.6. APPLICATION IN DIFFERENT AGRICULTURAL SETTINGS

Portable grain packing machines are versatile, suitable for various agricultural settings. In small-scale farms, they offer a cost-effective solution for packing grains without the need for large infrastructure. For larger operations, these machines can serve as supplementary units, providing additional packing capacity during peak harvesting periods or in remote field locations.

1.7. CHALLENGES AND LIMITATIONS

Despite their advantages, portable grain packing machines face challenges such as limited capacity compared to larger, stationary systems. Maintenance can also be a concern, especially in remote or harsh environments where repair services might not be readily available. Additionally, the initial cost of investment might be a barrier for some small-scale farmers.

1.8. THE FUTURE OF PORTABLE GRAIN PACKING MACHINES

The future of portable grain packing machines looks promising, with potential advancements in automation, energy efficiency, and integration with other agricultural technologies. The incorporation of artificial intelligence and the Internet of Things (IoT) could lead to smarter, more adaptable machines capable of optimizing packing processes based on real-time data.

1.9. MATERIAL SELECTION

1.9.1. Cast iron

Mechanical properties :

The tensile strengths are dictated by the class of the material. Grey irons are brittle, and have little plastic deformation and thus the yield strength and tensile strengths are almost identical. Further to this, grey irons exhibit little if any strain under tensile loadings and do not follow Hooke’s law very well. This is because microslip is experienced due to the presence of the graphite in the structure.

As these materials do not obey Hooke’s law, the stress-strain curve is not linear, making it difficult to calculate the modulus of elasticity.

The small amount of elastic and plastic deformation these materials exhibit is indicative of low ductility. This in turn leads to low toughness.

Compressive strengths of grey irons are their strong points. It is not uncommon for the compressive strength to be up to five times the tensile strength, while the shear strength may only be 1 to 1.5 times the tensile strength.

Grey irons are also generally quite hard and increase in hardness with increasing class (i.e. from 20 to 60).

Fatigue properties are like carbon steels and are typically about 40% of the tensile strengths.

Wear Resistance :

Wear resistance is another key design property of grey irons. While they are comparable to medium carbon steels in terms of abrasion, fretting and some forms of corrosive wear, the graphite helps resist metal to metal wear. This is indeed the case when the mating material is a hardened steel, where the graphite provides lubrication and a low wear interface. Consequently, they resist seizing in applications such as screw thread and the like.

Physical Properties :

The graphite present in the grey irons is influences damping capacity. This is the ability to suppress elastic deformations or vibrations. In this case, the graphite is thought to absorb vibrations.

Dimensional stability is also somewhat unstable due to the presence of the graphite. Mechanisms responsible for this include pearlite transforming into ferrite resulting in growth, internal oxidation of graphite also resulting in growth. Maintaining operating temperatures below approximately 400°C minimize these effects

Thermal Properties :

As their structures are like those of plain carbon steels, properties such as thermal conductivity and thermal expansion are very similar.

Electrical Properties :

The presence of graphite influences electrical properties of grey irons, and all grey irons will have higher electrical resistivity’s compared to steels. Grey irons with coarse graphite’s in their structures have higher resistivity is compared to those with finer graphite’s.

CHAPTER 2

LITERATURE REVIEW

Prof. S. B. Mandlik, Patole et. Al [1] titled as ‘Automatic Packing Machine’. This invention concerns developing a machine which automatically weighs and packs food with the help of sensors and microcontroller. The idea is to place the bag manually and automatically weighing, filling, and packaging is carried out. The electrical DC motors are used as actuators for the entire process to move the upper and lower conveyor belt, and sensors are used to feed the conveyor system by system information. The control system for the hardware project is to be controlled by Arduino. They developed an automation technique using Arduino uno board which increases speed and accuracy of the process of production. The purpose of the project is to reduce time for manually packing and reduce human efforts.

M. R. Saraf et. Al [2] titled ‘Design and Development of Cost-Effective Automatic Machine for Powder Packaging ‘. The paper presents a low-cost pouch filling machine which has a weighing and pouring mechanism to increase accuracy of the system. The low-cost automated system uses simple pneumatic, mechanical, and electric systems. A mechatronics system is developed for the machine which takes feedback from sensors and controls the manipulator. Additional weighing and pouring mechanism are added to increase accuracy. Also, a cost comparison is presented between conventional machine and the one developed. The project aims to develop Low-cost Automated Pouch Packing Machine for small industries or enterprises.

Prajakta Hambir et. Al [3] titled ‘Automatic Weighing and Packing Machine’. The project aims to develop a machine which automatically weighs and packs food with the help of microcontroller and sensors. The idea is to manually place the bag and then automatic weighing, filling, and packaging is done. It can wrap 10-100 grams of pouches, sachets, and bags. The sealing is based on the drawbar mechanism or belt drawdown mechanism. The entire weighing and packaging process is done with the help of electro pneumatics and motors. The control for hardware is done by programmable logic controllers. Weight calculation is done using a load cell sensor. The purpose of the project is to reduce human efforts and time consumption.

Md. Mushfiqur Rahaman et. Al [4] titled ‘Analysis and Design of Different Astable Multi vibrator Circuits for Various Applications in Communication Circuits ‘. The aim of the paper is to design and implement a stable multidirector in many applications of communication systems. Here the multi-vibrator circuit design is done by using different IC such as IC timer 555, V741 as an optional amplifier. Different software packages such as PSPICE, SIMETRIX, Tina Pro are used to develop and harmonize the concept of IC 555. The circuits were tested using the software’s whose values resembled the theoretical value. Thus, the simulation results can be used to test different circuits to decide whether they can be implemented in the real world.

2.1. PROBLEM DEFINITION

In the agricultural sector, small to medium-scale grain producers often face significant challenges in the packing stage of their operations. Traditional grain packing methods, which are manual or utilize large, stationary equipment, are not always suitable due to limitations in space, infrastructure, and resources. These methods are labour-intensive, time-consuming, and can lead to inconsistencies in pack quality, which in turn affects the marketability and shelf-life of the grains.

Moreover, the lack of accessibility to efficient packing solutions can result in increased operational costs and decreased productivity for small-scale farmers who need to quickly adapt to fluctuating market demands and maintain the integrity of their grains from the field to the market. The transportation of unpacked or poorly packed grains often leads to spillage and contamination risks, adding to the post-harvest losses.

The need for an innovative solution is evident—one that encapsulates efficiency, portability, and adaptability in a cost-effective manner. A portable grain packing machine could address these issues by providing a versatile and convenient way to package various types of grains directly at the harvesting site. Such a machine would need to be designed to optimize labour usage, enhance packing speed and accuracy, and ensure the preservation of grain quality throughout the packing process.

This problem definition sets the stage for the development of a portable grain packing machine that is not only aligned with the operational needs of small and medium-scale grain producers but also offers an innovative approach to grain packing that could significantly reduce waste and improve overall efficiency in the agricultural supply chai

2.2. AIM OF THE PROJECT

The primary goal of this project is to design and develop a Portable Grain Packing Machine that is versatile, efficient, and suitable for agricultural industries. This machine will incorporate materials such as cast iron, steel, and aluminium alloy to achieve a balance between durability, cost-effectiveness, and lightweight design for easy portability. The specific objectives are:

- To create a compact and mobile solution for grain packing that can be used in various field conditions, enhancing the convenience and efficiency of the packing process for small to medium-scale farmers.
- To conduct a comparative analysis of the mechanical properties of different materials—namely cast iron, steel, and aluminium alloy—to determine the most suitable material for each component of the machine based on criteria such as strength, durability, weight, and cost.
- To utilize simulation software's solid works and Ansys to model stress, strain, and deformation responses of the machine components under typical operating conditions, ensuring that the design can withstand the demands of regular use without failure.

- To optimize the design for ease of manufacturing and assembly, while also considering sustainability in the choice of materials and the potential for recycling at the end of the product's life cycle.

The project endeavours to bridge the gap between the need for robust agricultural equipment and the practical limitations of on-field grain handling and packaging, ultimately contributing to more streamlined post-harvest processes.

CHAPTER 3

METHODOLOGY

3.1. STATUS OF THE EXPERIMENTATION

Developing a manual grain packing machine requires a meticulous and systematic approach to ensure its efficiency, reliability, and practicality for users. This introduction outlines the methodology that will guide the design, development, and implementation of such a machine. Once initial designs are formulated, prototypes of the manual grain packing machine are developed. These prototypes undergo iterative testing and refinement to validate the functionality, performance, and usability of the machine

3.2. RAW MATERIAL USED FOR THE FABRICATION

Cast iron was used for this project. Cast iron has the total deformation of 2.88mm and equivalent stress was 32.032MPa which is better than steel and Aluminium. This leads to a better manufacturing condition for this project.

Three different shapes of cast iron were used for this project.

1. Square tubes – 25 mm
2. Circular tubes – 25 mm
3. Flat sheet – 1.5 mm

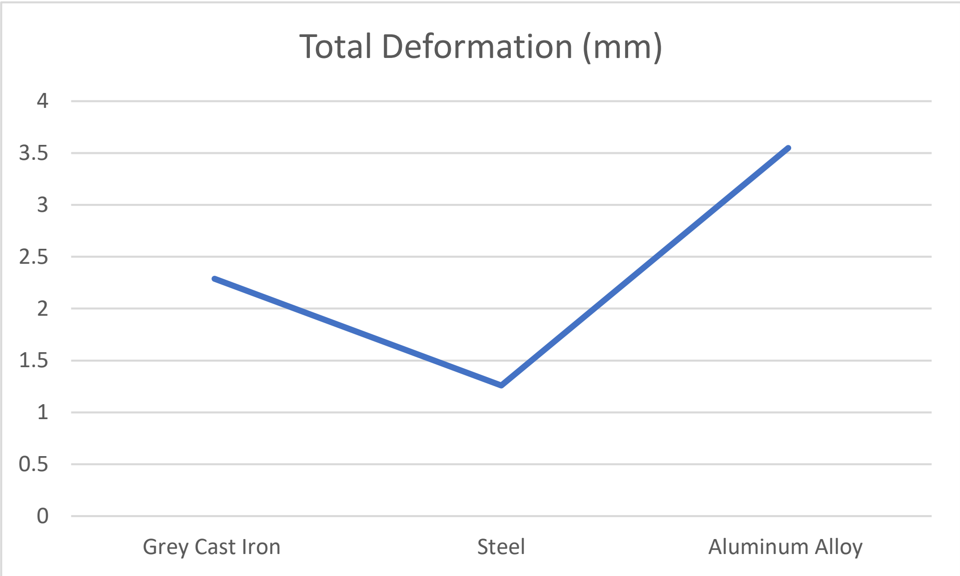
Cast iron, an alloy of iron that contains 2 to 4 percent carbon, along with varying amounts of silicon and manganese and traces of impurities such as sulphur and phosphorus. It is made by reducing iron ore in a blast furnace. The liquid iron is cast, or poured and hardened, into crude ingots called pigs, and the pigs are subsequently remelted along with scrap and alloying elements in cupola furnaces and recast into Molds for producing a variety of products.

Its other main advantages over cast steel include ease of machining, vibration dampening, compressive strength, wear resistance and corrosion resistance. Corrosion resistance of cast iron is improved via the addition of minor elements such as silicon, nickel, chromium, molybdenum and copper.

Material analysis

Material	Total Deformation (mm)	Equivalent Elastic Strain	Equivalent Stress (MPa)
Grey Cast Iron	2.288	0.00051594	32.032

Table 1, 3.1. Material nature



Graph 1. 3.1. Material Graph

Grey cast iron

- Density: 7200 kg/m³
- Young's Modulus: 1.1e+11 Pa (110 GPa)
- Poisson's Ratio: 0.28
- Tensile Yield Strength: 2.4e+08 Pa (240 MPa

3.3. MATERIALS REQUIRED

1. Cast iron
   - Square tubes of size 25mm
   - Circular tubes of OD 25mm
   - Circular rods of Diameter 10mm
   - Circular rod of Diameter 20mm
2. Sheet of thickness 1.2mm
3. Bearing OD 60mm & ID 20mm
4. Wheels – 2

3.4. EQUIPMENT REQUIRED

1. Cutting machine :
   - Blade size – 14 inches
   - Motor power – 15 amps
   - Cutting capacity - 100 x 196 mm
   - Speed – 3800 rpm

2. Welding machine: [MIG Welding]

- Output current: 600A
- Voltage: 220V
- Wire diameter: 1.20mm
- Shielding gas: CO2

3. Grinding machine

- Wheel diameter: 100mm
- Grinding wheel speed: 12000rpm
- Power 660w

3.5. OPERATIONS REQUIRED

1. Marking
2. Cutting
3. Welding
4. Grinding

3.5.1. Marking

Marking was done for the sheet metal to cut in a required size and shape. A 2000mm×1000mm×1.5mm sheet was used for making the Bucket. This sheet was marked in a different shape with the help of Tape and Scriber. Tape was used to measure the dimensions and scriber was used to mark the measured dimensions. Square tubes and circular tubes were also measured and marked through this tape and scriber. With the help of punch tool and scriber a mark is done for Drilling the hole which is used for fixing the hooks.

Sheet marking refers to the process of adding identification marks, labels, or other information to metal sheets or plates. This is often done to facilitate tracking, sorting, or identification of the sheets throughout the manufacturing process or during subsequent use. There are several methods commonly used for sheet marking.

Fig 3.1 Marking

Measurements of Base

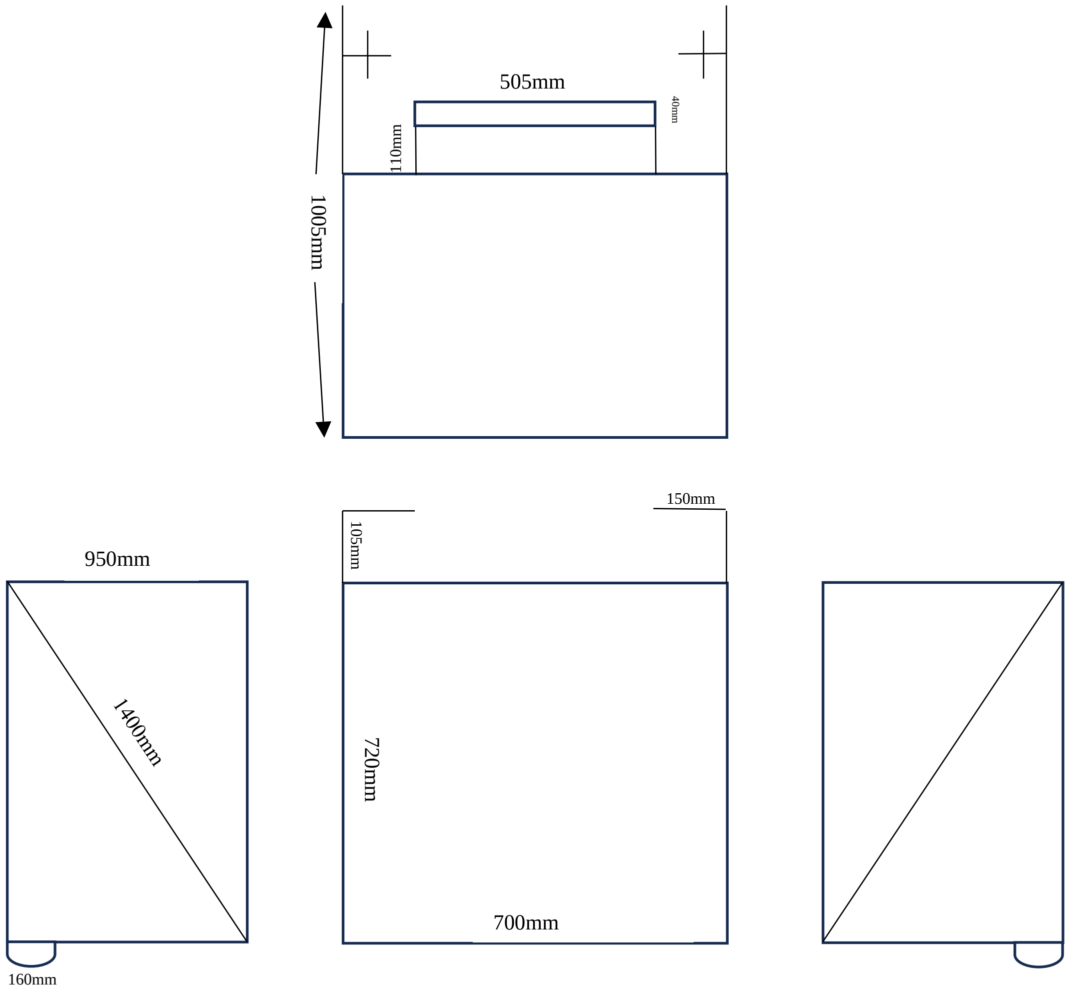


Fig 3.2. Line diagram of Base

Measurements of Bucket

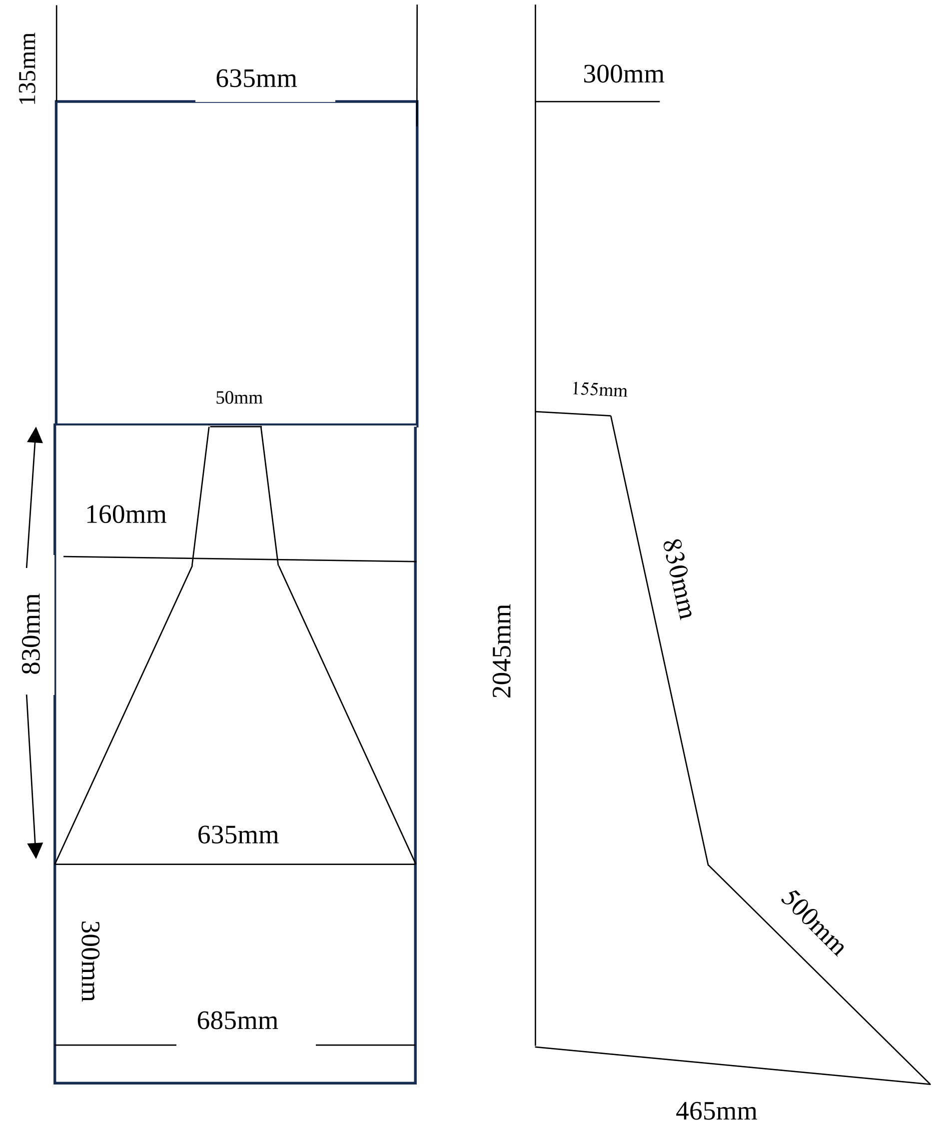


Fig 3.3. Line Diagram of Bucket

3.5.2. Cutting

Cutting operation was done in two different processes. One operation is with Chop saw cutting machine and the other operation is with Gas cutting machine. Chop saw cutting machine was used to cut the square pipes and circular pipes. A 14-inch blade was used to cut these pipes. Gas cutting operation was done to cut the metal sheet in to a required size and shape. Oxyfuel gas cutting technique is used to cut the sheet. Gas cutting technique is one of the simple ways to cut the 1.5 mm thickness sheet.

1. Chop saw cutting operation: A chop saw is essentially a lightweight circular saw mounted on a spring-loaded pivoting arm, and supported by a metal base. Chop saws are considered the best saw to get very exact, square cuts.

Fig 3.4. Chop saw cutting machine

2. Gas cutting operation: Oxyfuel gas cutting (also referred to as oxyfuel cutting or gas cutting) is a rather popular variation of thermal cutting process applied at industrial level. There are several different variations of gas that can be used to perform this process, with a noticeable variation of the end results. One of the biggest reasons for why it is so popular is the range of materials that it can cut – the material thickness that gas cutting can work with ranges from 0.5mm to 250mm. The equipment costs for gas cutting are also relatively cheap by industry standards, and the entire process can be performed mechanically, and not just manually.

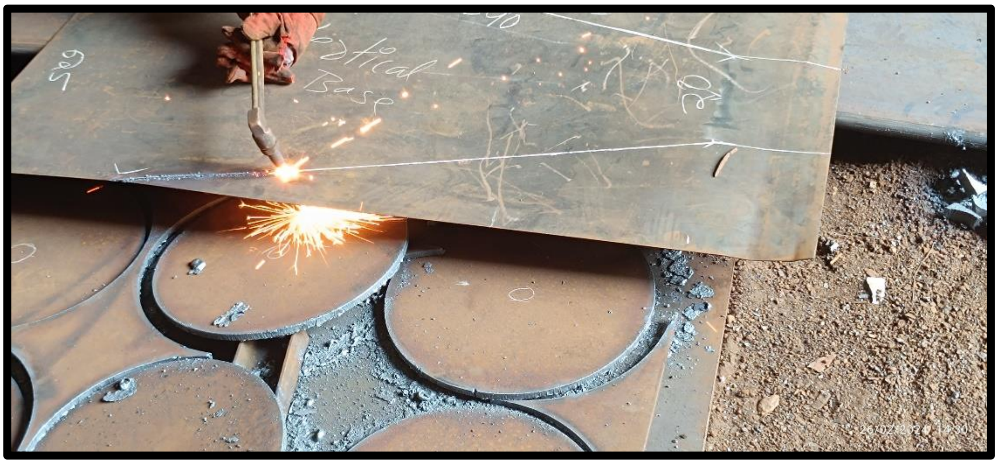


Fig 3.5 Gas cutting

3.5.3. Welding

After cutting the raw material in to required dimensions it need to weld to get the required size and shape. We used MIG welding process to weld the different parts of this project. This MIG welding machine uses 0.80mm to 1.60 mm wire electrode for welding. We used 1.20mm wire electrode to weld the machine parts. MIG welding was used to fabricate the base frame, bucket, and bucket frame. 1mm electrode was used to weld the 1.5mm thick sheets.

MIG welding uses a constant voltage power supply to create an electric arc that fuses the base metal with a filler wire that is continuously fed through the welding torch. At the same time, an inert shielding gas is also fed through the gun, to protect the weld pool from atmospheric contamination. (Inert gases do not react with the filler material or the weld pool.)

Fig 3.6. Welding 1

Fig 3.7. welding 2

3.5.4. Grinding

Grinding is done to remove material from a workpiece, to produce a smooth finish on the surface of the workpiece or to remove burrs from the surface. After gas cutting and welding it makes a rough surface and excess material formed so to remove these extra material grinding was done at gas cutting edges and at welded parts. We used a 100mm grinding wheel to grind the welded parts and gas cutting parts.

Grinding is an abrasive precision machining method that uses a lapping tool and abrasive to grind off a thin layer of metal from the surface of the workpiece based on fine machining.

the grinding surface of the grinder tool is evenly coated with abrasive. If the material hardness of the grinding tool is lower than that of the workpiece, when the grinding tool and the workpiece move relative to each other under pressure, the abrasive has sharp edges and corners.

Fig 3.8. Grinding

3.6. STAGES OF THE PROJECT

3.6.1. Stage 1: Raw material

We used Cast iron as a raw material for this project. Cast iron shows less deformation as compared with steel and aluminium so, for this reason we selected cast iron for the manufacturing of this project.

We used 4 different types cast iron material. They are:

1. Square tubes
2. Circular tubes
3. Circular rods
4. Plain sheet

Fig 3.9. Raw material

We used square tubes of size 40mm. The square tubes were used for the whole-body structure of the project.

We used Circular tubes of size 40mm external diameter. The circular tubes were used for handling and applying the load on the bucket handle to lift the feed filled bucket.

We used Circular rods of size 10mm diameter. They were used for holding the bag.

We used plain sheet of the size 1.2mm thickness. The sheet was used for making bucket and base.

4.1.1. Stage 2: Marking

After buying the raw material, we make the material into required dimensions with the help of measuring tools and marking tools. We used the Tape for measuring the dimensions. After measuring the dimensions, we used the scriber for marking the measured dimensions. Scriber is a metallic marking tool which is used for marking the dimensions. All the 4 types of materials were measured and marked in to required size and shape.

Fig 3.10. Marking the sheet

Fig 3.11. Marking the Tubes

4.1.2. Stage 3: Cutting

After marking the dimensions, we cut the material according to the markings with the help of cutting procedures. We used two different cutting techniques to cut the material.

1. Chop saw cutting technique – In chop saw cutting machine we cut the square tubes, Circular tubes and Circular rods. It is an easy process to cut these materials on the chop saw cutting machine. Chop saw cutting machine has long cutting wheel which is used to the material easily.

The whole material [other than sheet] which is used to fabricate the project was cut in this machine.

Fig, 3.12. Chop saw cutting machine

2. Gas cutting technique – in Gas cutting process we cut the sheet material. These sheets were not possible to cut in other process because of the sheet thickness. It is easy to cut in gas cutting, so we used gas cutting technique to the sheet in a required dimension. By this cutting stage was completed.

Fig, 3.13. Gas cutting process

4.1.3. Stage 4: Grinding the cut edges

In gas cutting the material edges get uneven edges these edges were need to be grind to get the smooth and even edges. So, we used grinding process to remove the extra material at the cutting edges. We grind every edge of the cut material to get the smooth surface edges. We used hand grinding machine for this purpose.

Fig 3.14. Grinding the cut edges

4.1.4. Stage 5: Fabricating the Base

After cutting the raw material into required dimensions we fabricated the base part of the project. Base part has square tubes, circular tubes and sheet. These three different types of material were used to fabricate the base part.

First, we prepared a square shaped box with square tubes and made a tap weld on the edges. For getting exact square shape [90 degrees angle between the 2 edges] we used magnetic angle clamps. At the next step we prepared a vertical tube at the 2 edges of the square box as perpendicular to the square box.

Two more tubes were prepared in opposite side of the square box. At the next step few required parts were fixed to these vertical tubes which makes a base part. Then a sheet was placed on the base and adjacent side. Wheels are also fixed to the base at two sides. By this base part was completed.

Fig 3.15. Fabricating the Base

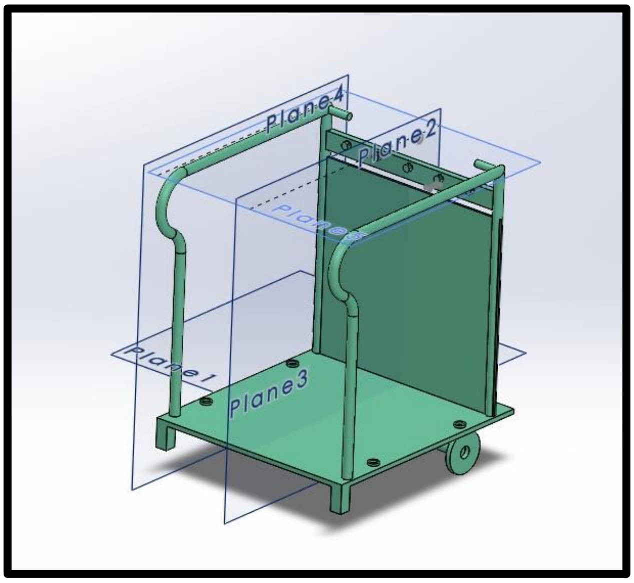


Fig 3.16. Base part Design

Fig 3.17. Base part Fabrication

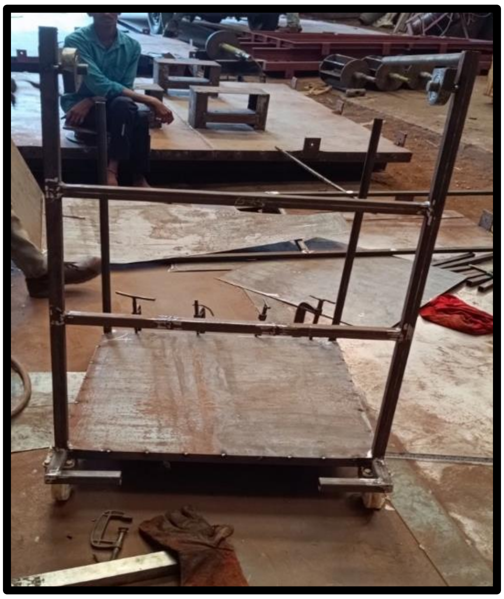


Fig 3.18. Base part

4.1.5. Stage 6: Fabricating the Bucket

Before fabricating the Bucket, we fabricated the bucket frame which is used to pull the load. We fabricated the bucket with the sheet material. First, we fixed the side portion of the bucket with base portion of the bucket at required dimensional distance and locations then placed top portion of the bucket. At last, we fixed the bottom portion of the bucket. This completes the fabricating the bucket. We used TAP weld while fixing each portion of the bucket. The completed Bucket was attached to the bucket frame and fixed to it.

Fig 3.19. Fabricating the Bucket frame

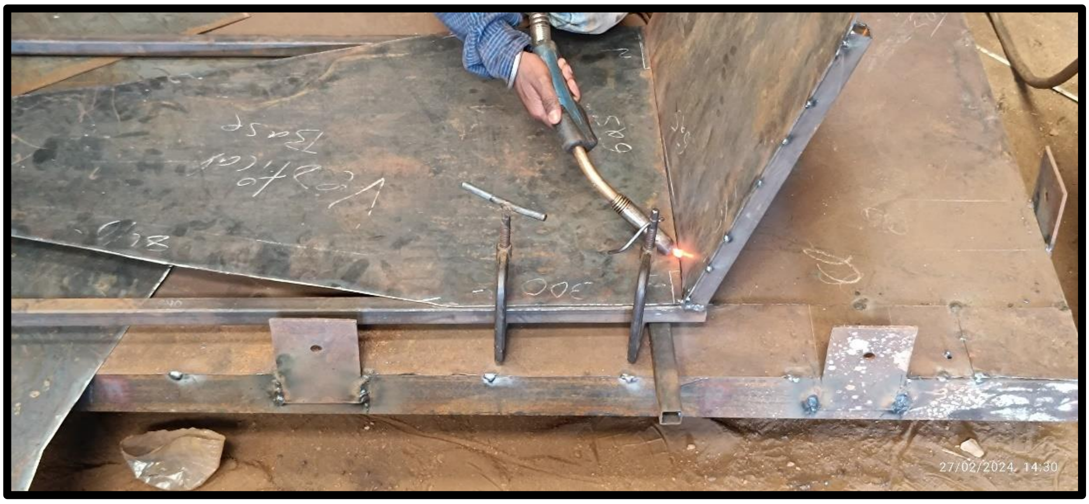


Fig 3.20. Fabricating the Bucket 1

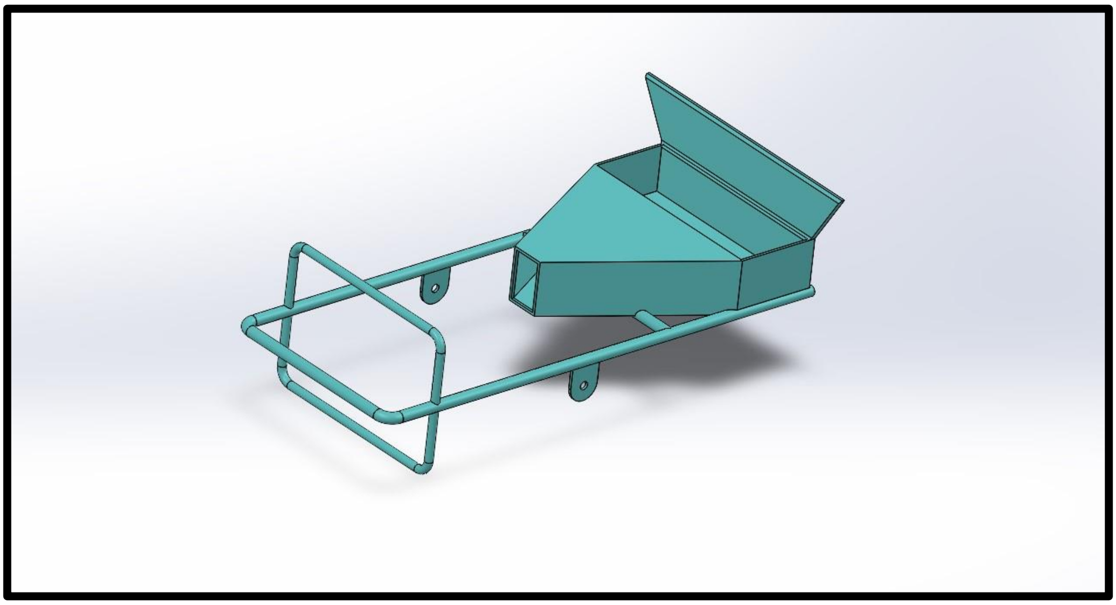


Fig 3.21. Bucket design

Fig 3.22. Fabricating the bucket 2

Fig 3.23. Fabricating the bucket 3

4.1.6. Stage 7: Fabricating the additional parts

Additional parts include preparing hooks, bearings and bearing holder.

Hooks were prepared with circular rods. These were used to hold the Bag. Hooks were fixed to the hook's holder. Hooks holder was prepared with square tubes and a thin 5mm sheet. On this 5mm thickness sheet we drilled 5 holes at equal interval distance. These holes were used to fix the hooks. The reason of 5 holes was to adjust the hooks according to the bag size. Hooks were fixed to the holder with the nuts and bolts.

Fig 3.24. Drilling the holes for Hooks

Bearings were used in this project at the top edge corner of the base and at middle portion of the bucket frame. This bearing is used to lift the bucket frame upside down easily. To hold the bearing, we prepared a bearing holder which is in the shape of semi-circle. This bearing holder was prepared with scrap material. We used 2 techniques to cut the scrap material into required size and shape. To cut this we used gas cutting and to make it to fit bearing in it we used lathe machine. Then we placed the bearing in the bearing holder and this was welded to the bucket frame at the middle of it.

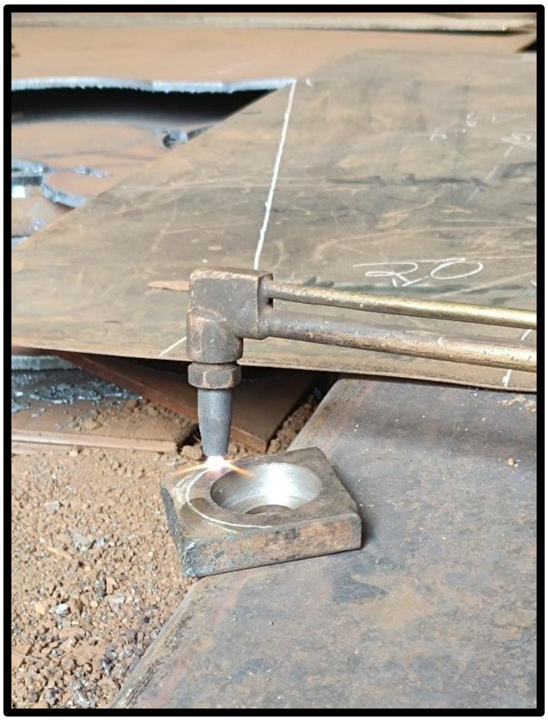


Fig 3.25. Making the Bearing Holder

Fig 3.26. Bearing

Fig 3.27. Bearing Holder

4.1.7. Stage 8: Welding

After the fabricating of all the parts and confirming all the parts are in a required size and shape then we made full welding for all the parts. We used MIG Welding for this purpose with a wire diameter of 1.5mm.

Fig 3.28. welding

4.1.8. Stage 9:Grinding

After full welding at some of the places and at welded parts it forms an uneven structure or extra material so, to remove this we made a full grinding on every part to make it smooth finishing.

Fig 3.29. Grinding 1

Fig 3.30. Grinding 2

4.1.9. Stage 10: Assembling the parts

The main parts in this project were only two. They are Base and Bucket frame. A 20mm diameter circular rod was welded on top of base part at which bearing was inserted in to it. The bucket frame which has bearing holder contained bearing was inserted in to it. By these two parts were assembled each other with the bearing.

Fig 3.31. final project

3.7. WORKING PROCESS OF THE MACHINE

The working principle of a manual portable grain packing machine involves a series of simple mechanical processes that facilitate the packaging of grains. The operator manually fills the hopper or feeding mechanism of the packing machine with the grains to be packaged. This can be done using a manual force applied on the machine towards the grain source by these grains are filled in the bucket section. The packaging material, usually in the form of bags or pouches, is placed onto a holder or platform within the machine. These bags are typically made of materials like plastic, paper, or woven fabric. The operator manually controls the release of grains from the hopper into the packaging material. This can be achieved through a lifting mechanism. when the bucket frame was pulled down, the bucket was lifted up then the grains in the bucket slides down in to the bag placed on the base with the help of hooks. The process was repeated until the bag is filled. Finally, the filled and sealed bags are removed from the packing machine by the operator and stacked or placed into containers for storage or transportation.

3.8. LINE DIAGRAM OF THE PROJECT

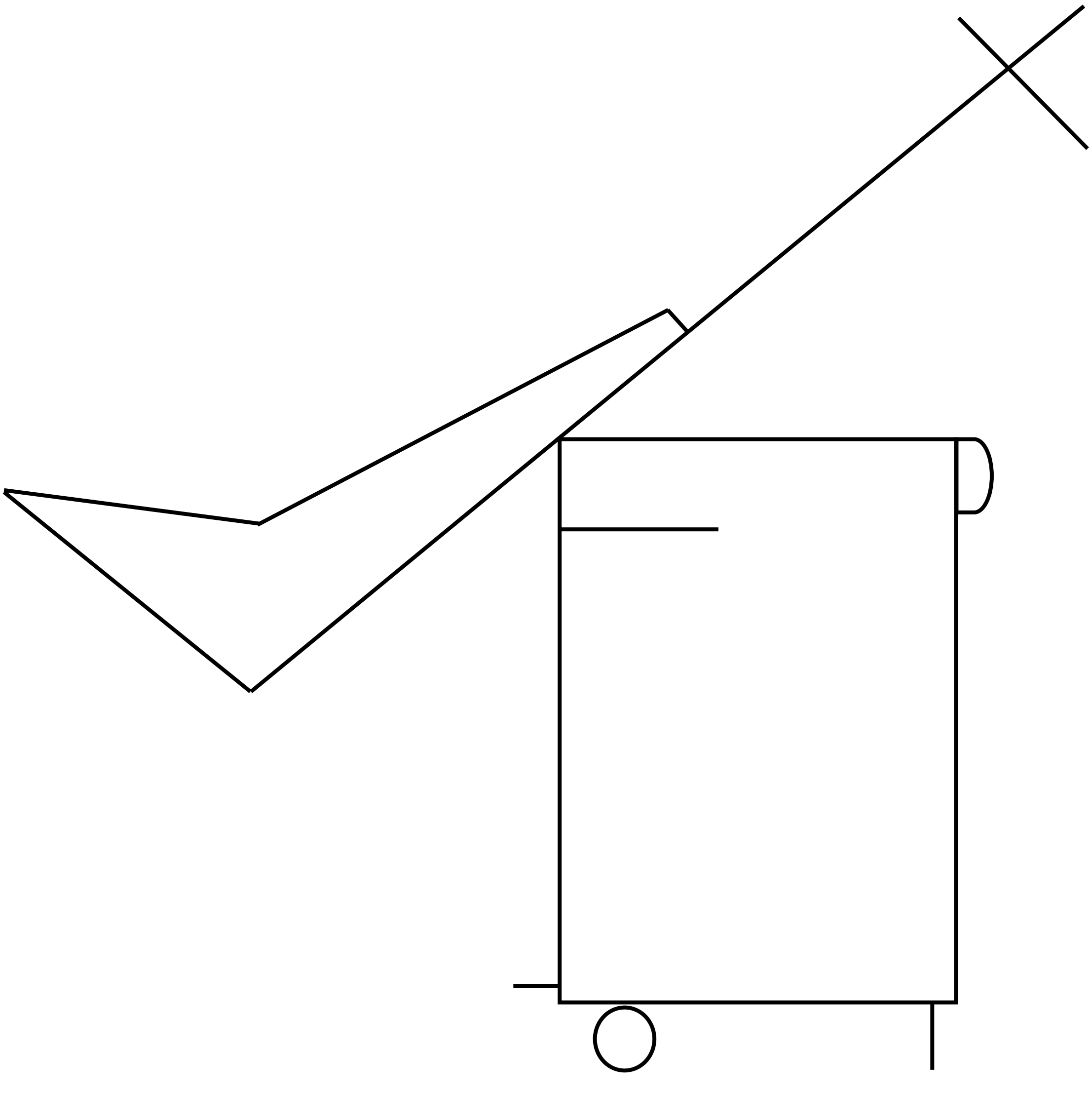


Fig 3.32. Line Diagram of project

3.9. ADVANTAGES AND DISADVANTAGES OF THIS MACHINE

Advantages

- Portability: Being manual and portable, these machines can be easily moved around, allowing for flexibility in packaging operations. They can be used in various locations without requiring fixed infrastructure.
- Cost-effective: Manual machines tend to be more affordable compared to their automated counterparts. This makes them accessible to small-scale businesses or farmers who may not have the budget for larger, automated machinery.
- Simple operation: Manual machines are often designed to be user-friendly and easy to operate. They typically require minimal training for personnel to use effectively.
- Suitable for small batches: These machines are ideal for packaging small quantities of grains or products. They are suitable for businesses with low production volumes or those dealing with specialty or niche products.
- Low maintenance: Manual machines generally have fewer components and moving parts compared to automated machinery, resulting in lower maintenance requirements and costs.

Disadvantages

- Limited capacity: Manual machines typically have lower packaging capacities compared to automated systems. This can result in slower packaging speeds and may not be suitable for large-scale production needs.
- Less efficiency: Manual packaging processes are generally less efficient compared to automated systems. This inefficiency can result in higher production costs per unit and may limit scalability.
- Limited automation: While manual machines offer some level of automation for packaging tasks, they lack the advanced features and capabilities of fully automated systems. This can limit the range of packaging options and customization available.

3.10. FUTURE MODIFICATIONS

The future modifications of manual portable grain packing machines are likely to focus on enhancing efficiency, usability, and versatility while keeping the machines cost-effective and user-friendly. Here are some potential modifications that could be implemented in the future:

- Automation Integration: While manual machines are operated by human labour, future modifications could integrate certain automation features to improve efficiency. This might include adding automated feeding mechanisms, weighing systems, or sealing mechanisms to reduce the need for manual intervention and minimize human error.
- Digital Controls and Monitoring: Incorporating digital controls and monitoring systems into manual packing machines could improve accuracy and provide real-time data on packaging performance. This could include features such as digital displays for weight measurement, sensors for detecting packaging faults, and remote monitoring capabilities for operational oversight.
- Modular Design: Future manual packing machines could be designed with modular components that allow for easy customization and upgrades. This would enable users to adapt the machines to different packaging requirements, such as varying grain types, bag sizes, or packaging materials, without the need for significant redesign or investment in new equipment.
- Improved Ergonomics: Enhancements to the ergonomic design of manual packing machines could reduce operator fatigue and improve user comfort during extended periods of operation. This could involve optimizing the layout of controls, adjusting the height or angle of loading and sealing mechanisms, or incorporating ergonomic features such as padded handles or adjustable seating.
- Enhanced Durability and Reliability: Future modifications could focus on improving the durability and reliability of manual packing machines to withstand harsh operating conditions and extended use. This might involve using more robust materials, reinforcing critical

components, or implementing advanced maintenance features such as self-diagnostic systems or predictive maintenance algorithms.

- Energy Efficiency: Incorporating energy-efficient components and technologies into manual packing machines could reduce operational costs and environmental impact. This could include using energy-efficient motors and drives, optimizing power consumption during standby or idle periods, or integrating renewable energy sources such as solar panels for portable applications.
- Remote Connectivity and Control: Future manual packing machines could be equipped with remote connectivity features that allow for remote monitoring, control, and troubleshooting. This would enable users to access machine data and diagnostics from anywhere, improving responsiveness to issues and reducing downtime.
- Safety Enhancements: Enhancements to safety features could make manual packing machines safer to operate, reducing the risk of accidents or injuries. This might include incorporating safety interlocks, emergency stop mechanisms, or protective guards around moving parts.

3.11. EXPENDITURE TABLE

Sl No	Material	size	No. of components	cost
1	Square tubes Circular tubes Circular rods	25mm 25mm 10mm	3 1 1	2,000
2	Sheet	2000mmx1000mm	2	1,000
3	Bearing	20 ID x 60 OD	2	600
4	Wheels	6 inches	2	500
5	Other			1,000
6	TOTAL			5,100

Table 3.2. Expenditure table

CHAPTER 4

CONCLUSION

Portable grain packing machines offer a convenient and flexible solution for small-scale grain packaging operations. These machines provide several benefits, including portability, cost-effectiveness, and simplicity of operation. However, they also come with limitations such as lower capacity and the potential for human error.

Despite these limitations, portable grain packing machines play a crucial role in various industries, particularly for small businesses, farmers, and niche product markets. With ongoing advancements in technology and design, these machines continue to evolve, with future modifications focusing on improving efficiency, usability, and sustainability.

To maximize the benefits of portable grain packing machines, it is essential for organizations to set clear objectives, prioritize quality assurance, and consider factors such as versatility, reliability, and regulatory compliance. By doing so, businesses can enhance their packaging processes, meet customer demands, and remain competitive in the market.

CHAPTER 5

FUTURE SCOPE OF PROJECT

The future scope for portable grain packing machines is promising, with several opportunities for innovation and development. Here are some potential future directions for these machines:

- Advanced Automation: Integration of advanced automation technologies, such as robotics and machine learning, could enhance the capabilities of portable grain packing machines. Automated feeding, weighing, filling, and sealing processes could improve efficiency and accuracy while reducing the need for manual labour.
- Smart Packaging Solutions: Future portable grain packing machines could incorporate smart packaging solutions, such as RFID tags or QR codes, for improved traceability and supply chain management. This would enable better monitoring of product information, batch tracking, and quality control.
- Motor fixation to avoid the manual operation
- Fabricating it with the synthetic Fiber to decrease the weight and increase the efficiency.
- Energy Efficiency: Focus on enhancing the energy efficiency of portable grain packing machines using renewable energy sources, energy-efficient components, and optimized operating processes. This would reduce environmental impact and operating costs while improving sustainability.
- Modular Design: Adoption of modular design principles would allow for greater customization and flexibility in portable grain packing machines. Users could easily interchange components or add modules to accommodate different grain types, packaging sizes, and production requirements.
- Remote Monitoring and Control: Integration of IoT (Internet of Things) technologies would enable remote monitoring and control of portable grain packing machines. Operators could

access real-time data, receive alerts for maintenance or operational issues, and adjust settings remotely, improving efficiency and reducing downtime.

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