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Sonargaon University (SU)
সোনারগাঁও ইউনিভার্সিটি (এসইউ)

"Design and Fabrication of a Short Roller Sugarcane Juice Extractor Machine"

A report submitted to the Department of Mechanical, Sonargaon University of Bangladesh in partial fulfillment of the requirements for the Award of Degree of Bachelor of Science in Mechanical Engineering.

A Thesis

By

MD Rumel Hasan	ID: ME2101023122
MD Rasel Islam	ID: ME2101023131
Bipul Roy	ID: ME2101023237
MD Enamul Hoque	ID: ME2101023128
Tohedul Hassan Emon	ID: ME2101023137

Supervisor

G M Ismail Hossain

Lecturer

Department of Mechanical Engineering

Sonargaon University (SU)

Dhaka-1215, Bangladesh

September 2024

Approval

This is to certify that the project work entitle, **"Design and fabrication of a short roller sugarcane juice extractor machine"** has been carried out by **MD. Rumel Hasan (ID: ME2101023122), Md. Rasel Islam (ID: ME2101023131), Bipul Roy (ID: ME2101023237), Md. Enamul Hoque (ID: ME2101023128), Tohedul Hasan Emon (ID: ME2101023137),** thereby declared that the work presented here is original work done by me and has not been published or submitted elsewhere for the requirement of a degree of Bachelor of Science (B.Sc.) in Mechanical Engineering in the year of 2024 Program in the Department of Mechanical Engineering, Sonargaon University of Bangladesh (SU) has been carried out under by supervisor.

BOARD OF EXAMINERS

G M Ismail Hossain (Supervisor)

Lecturer

Department of Mechanical Engineering

Sonargaon University (SU), Dhaka-1215, Bangladesh

DECLARATION

We do hereby solemnly declare that the work presented here in this project report has been carried out by us and has not been previously submitted to any University/ Organization for award of any degree or certificate.

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Signature of Students

MD Rumel Hasan
ME2101023122

MD Rasel Islam
ID: ME2101023131

Bipul Roy
ME2101023237

MD Enamul Hoque
ME2101023128

Tohedul Hassan Emon
ME2101023137

Signature of Supervisor

G M Ismail Hossain
Lecturer

Department of ME

ACKNOWLEDGMENTS

First and foremost, we want to express our gratitude and humility to Almighty ALLAH for His goodness and mercy in allowing us to finish our project.

We are feeling obliged in taking the opportunity to sincerely thank our honorable supervisor, **G M Ismail Hossain** (Supervisor & Lecturer in Mechanical Engineering Sonargaon University (SU), helped us a lot to implement this project. Without his help and supervision, this could've never been possible. His methodical and rational approach was critical to the project's successful completion. In addition, we would like to thank him for his unwavering enthusiasm and overall human presence, which has always inspired us and without which this project, as well as this study, would have been impossible to complete. **Prof. Md. Mostofa Hossain,** Head, Department of Mechanical Engineering, Sonargaon University (SU), merits special thanks for allowing us to use the department's laboratory facilities.

We would like to express cordial thanks to our loving parents, friends and well-wishers for their cooperation, cheerfulness and inspiration during the course of this study.

Finally, we want to express our gratitude to the ME department staff members who assisted us directly or indirectly in completing the project work.

[Authors]

Md. Rumel Hasan

Md. Rasel Islam

Bipul Roy

Md. Enamul Hoque

Tohedul Hasan Emon

ABSTRACT

Extracting the juice from sugarcane has been a major problem, especially with the use of a Traditional way that could damage the gum of the teeth and putting the human teeth in distress and require much energy. The main objective of the project is to design a sugarcane juice extracting machine, that will extract juice from sugarcane and that will separate the juice from the sugarcane and the bagasse. The crushing unit is made of three rollers These are 90mm,75mm &70 mm thick diameter and length of 102 mm, The machine was constructed by several well-established methods such as methods, such are as follows: Measuring, Marking Out Operation, Cutting Operation, Welding Operation, Grinding Operation. The machine was tested using a given sample of sugarcane weighting 7 kg, the mass of juice extracted was 3.13 kg, while the extraction took about 2 min. From the design an actual speed of the roller of 46 rpm. The design of the sugarcane juice extracting machine possesses simplicity in operation and maintenance as well as affordable with low running and maintenance costs with reliable efficiency.

The Improved Sugar cane juice extractor has short stainless steel removable rollers. The juice extractor includes housing with three compartments, the first for extracting juice and contains the crushing rollers; the third contains the main drive, while the second serves as re-enforcement for the connecting shafts. The first compartment is a closure for accessing the compartment; the closure is preferably a clear plate which permits viewing the compartment during operation and, when removed, allows access to the compartment for removal of the crushing rollers and cleaning of the rollers and the compartment. A safety switch is provided to prevent rotation of the rollers when the closure is displaced. A guide into the compartment is provided to direct the sugarcane and any flavorings into the crushing rollers. A waste channel is provided for the exit of crushed cane pulp.

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CHAPTER 1
INTRODUCTION

1.1 Overview:

The earliest sugar cane mills were probably melted and pestle arrangement operation press by human power, then by animals or water power, and screw press. These were widely used for juice extraction until it was taken over by roller mill, which was invented by a cane grower in Sicily Italy in 1449. Wooden roller mills were not cladded with iron until the mid-1600s animals; water wheel and wind mill steam drive were first used in sugarcane milling in 1768. (Deer, 1974) Juice extraction for small scale, the cane is cut into 2-25 pieces in traverse section before entering a cane juice expeller; the cell breakage takes place due to torsional squeezing and evaporation at high temperature (130º) developed at the exit point of the expeller. (Brain, 1984) Sugarcane juice extractors are often used commercially in a setting where juice is squeezed to order for individual consumers, such as at a fair or in a retail store. Sugarcane juice extractor generally have a plurality of powered crushing rollers, sugarcane stalks are pressed through adjacent pairs of the rollers, crushing the stalks and separating a fresh, drinkable juice from the remaining pulp. The crushing rollers are bulky and positioned closely to each other, making cleaning difficult. The housing is usually made of several assembled parts with many edges and crevice where dirt may accumulate, further rendering cleaning difficult. Improper or incomplete cleaning can lead to unsanitary conditions. Presently available sugarcane juice extractors do not allow observation of the operation of the crushing rollers in the juice extracting compartment. Viewing this operation allows the operator to observe the condition of the rollers and the compartment, alerting the operator when there is a jam or when cleaning is necessary. Further, observation of the operation is an attraction for consumers, who can watch the operation of fresh juice. It is sometimes desirable to enhance the flavor of sugarcane juice by adding fresh ginger, lemon, or some other flavoring. It is difficult, however, to introduce these ingredients to the crushing rollers due to the small relative size and a tendency of the flavoring to fall away from the rollers unless held in place



Figure 1.1: Short roller sugarcane juice extractor machine

1.2 Objective:

The objectives of the project are as follows:

i. To design and fabricate a sugarcane juice extractor with a gear drive mechanism,
ii. To study about design and fabrication of a short roller sugarcane juice extractor machine,
iii. To analyze the performance of the short roller sugarcane juice extractor machine.

CHAPTER 2
LITERATURE REVIEW

2.1 Literature Review:

The development of sugarcane machines has been started hundreds of years back in many countries. The Trapiche is a traditional wooden roller used by people of Panama and Columbia to extract sugarcane juice, the trapiche is a Spanish word “sugarcane crusher”. It is varying in size which is made up of wood. It has two rollers that are vertically placed and held by a wooden frame. (Rika, 2010). [01]

A sugarcane juice extractor machine is a machine used to extract the juice from sugar cane. These juice extractor machines were built to help human extract the juice from sugar cane through crushing and rolling process. A conventional machine is a simple machine consists of several gears, rollers, and lever attached on a cast-iron chassis body. Most conventional machines are made up of cast iron material which is strong and durable. These machines were made by a simple mechanism of rolling and crushing (Kulkarni, 2005).[02]

(Kulkarni, 2005). Crushing a sugarcane requires strong force due to its strong and hard characteristics. Juice extractor machines were built mostly focused on the mechanical of the machine. The efficiency of the machine depends on the mechanical system that has been designed on the machine. Mechanical power is the most essential needs in these identified areas (Olaoye, 2011).[03]

According to Cesar B.G.C (2004), designed conveyed screw press conveyors that gently squeeze the fiber (sugarcane) in each stage, improving extraction. The performance of a pilot scale screw-press conveyor was tested for dewatering capabilities and power consumption. The un-optimized equipment decreased bagasse moisture from 96 to 89 %.[04]

Olaoye, J. O. (2011), developed a sugarcane juice extractor for small scale industries. The designed is a simple mechanical device for the extraction of sugarcane juice. The output capacities of 10.50, 12.00 and 14.25 kg/h were obtained at operating speeds of 0.25, 0.3 and 0.36 m/s. The extraction efficiency of the machine ranged between 40% and 61% at operating speeds of 0.25 and 0.36 m/s. He observed that this optimum performance of the machine cannot be sustained over a long processing period due to the bluntness development of the perforated grating drum over time.

Depending on the taxonomical system, sugarcane is one out of 6 to 37 species in large, long-term grasses (Naturland, 2010). Sugarcane is a tropical grass in the same family as sorghum, johnsongrass and maize (Purseglove 2018). It is of the kingdom of Planteae, phylum magnoliophyte, Poales, Poaceae and Saccharum L genus. Only rarely can sugarcane make sprouting seeds. It is from the kingdom of Plantea, phylum magnoliophyte, Poales, Poaceae and Saccharum L genus (munocotes, commelinids). Cross-fertilization between S is most of the several hundred used clones. S. sinensis (adjustable), S. officinarum (high sugar content). S. and spontaneous. Strength (resistant disease). The most common clones are octoploid and propagated vegetative (Naturland 2010), with eight corresponding clones, similar in position, structure, function, or characteristics in a cell of chromosome sets. [05]

We tried to do this project by reading the above literature, and we have been able to make our project successful

CHAPTER 3
MATERIALS AND METHODOLOGY

3.1 Machine Working Parts:

The extractor machine working parts consists of gears, crushing rollers, driving shaft and motor with gearbox. The following are the various parts of the extractor of sugar cane juice:

3.1.1 Design Methodology of Crushing Roller:

The crush unit consists of three rollers these are 90mm,75mm &70 mm thick diameter and length of 102 mm. These rollers are made of Stainless steel due to their resistance to compression. The Stainless-steel bars have been coated by a lathe machine and become aggressive, forming a rib-like structure. These provisions ensure that, unless removed, slipping in the case of plain crushing rollers occurring during feeding with sugarcane will be reduced to minimal.

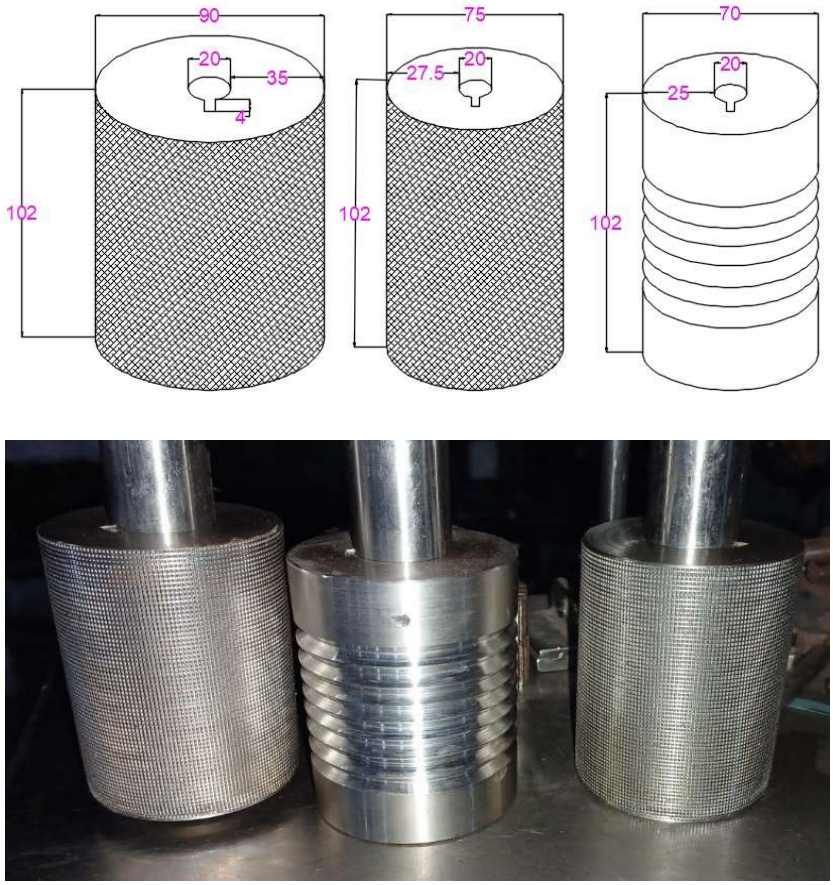


Figure 3.1: The Crushing Unit/Roller

3.1.2 Gears:

The top-mounted roller controls the movement of two bottom-mounted rollers. The roller gears are 52 teeth mesh, which means that the three rollers depend on each other. The two other rollers move at the same speed as the top roller shaft, but in the same direction. The transmission is carried through the gear motor to two more rollers. The dental gear decreases the transmission rate to the broken roller so that the transmission torque on every roller increases. This increases the crushed strength of the roller surface.



Figure 3.2 Gears

3.1.3 Driving Shafts:

The operation of the crushing rollers is provided by suitable drive apparatus. We used three driving shafts for three rollers.

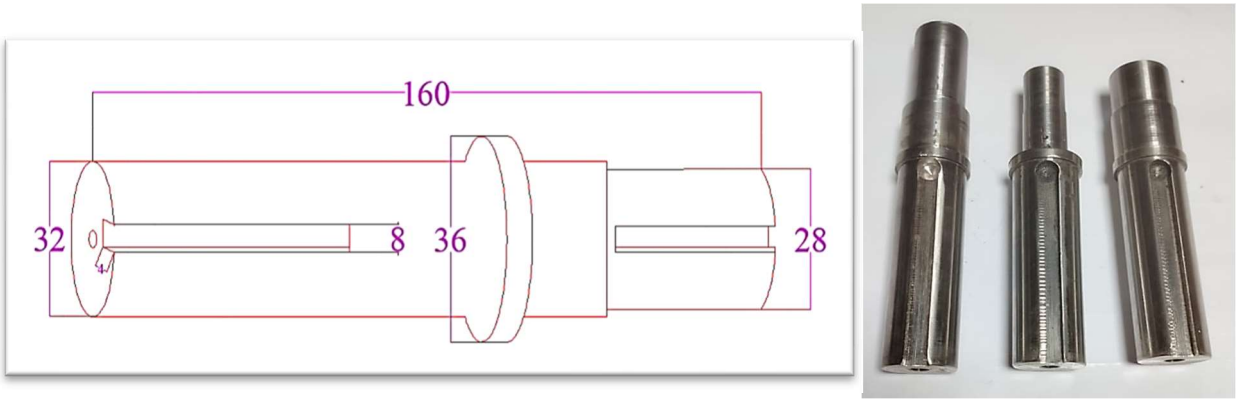


Figure 3.3: Driving Shafts

3.1.4 Motor with Gear box:

The electric Motor is 3.5hp. The input is connected with the input. The motor speed is reduced to 1:61 of the speed reducer from the, motor which is 2800rpm. The gear motor speed is 46 rpm for this power source.



Figure 3.4 Motor with Gearbox

3.2 Materials:

A range of materials are utilized in the construction of sugarcane juice extraction machines to guarantee longevity, effectiveness, and efficiency. Every material has a distinct purpose and needs to be selected taking into account the machine's specifications as well as its operating environment. A variety of materials are used in the design and construction of the short roller sugarcane juice extractor machine. The juice extractor machine is made of the following materials:

3.2.1 Mild steel Plate:

Mild steel plates are a common material choice for constructing and manufacturing sugarcane juice extraction machinery due to its strength, affordability, and versatility. It would be made of mild steel. The purchased bearing base plate measures 300 mm by 300 mm, and the utilized plate has a thickness of 12 mm.

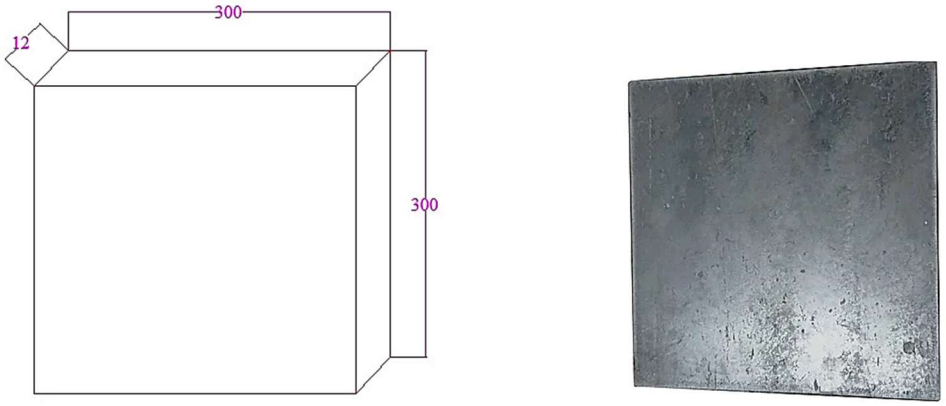


Figure 3.5: MS Plate

3.2.2 Bearing House:

Bearing housing, which give bearings support, protection, and alignment, are crucial parts of sugarcane juice extraction equipment. By ensuring that bearings are correctly placed and protected from impurities, they improve the machine's longevity and performance. For sugarcane machinery to run effectively and dependably, bearing housing must be chosen, installed, and maintained properly. We used plate is 25 mm thick and the buying measurement reaches 100 mm by 100 mm for bearing house:

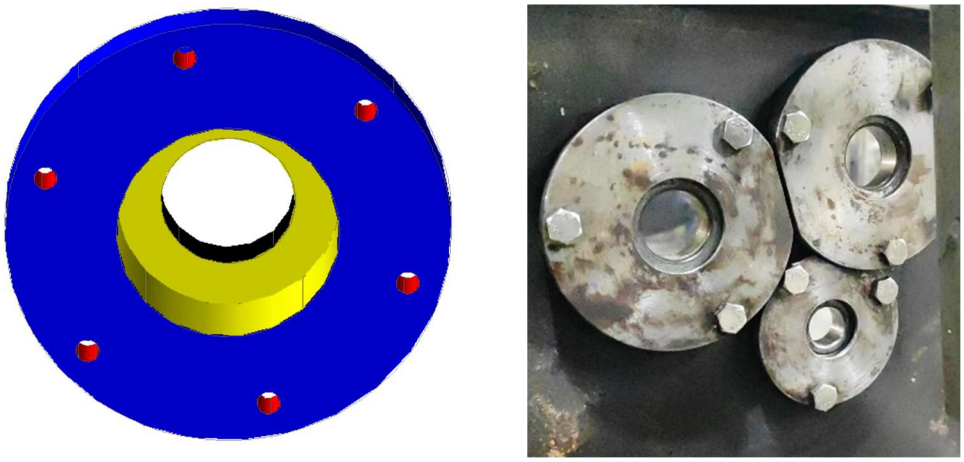


Figure 3.6: Bearing house

3.2.3 Keys:

In sugarcane juice extraction machines, keys play a crucial role in transferring torque, stabilizing spinning elements, and guaranteeing correct alignment. There are numerous fundamental kinds that are appropriate for distinct uses depending on the torque specifications and design factors. For the computer to run effectively and dependably, keys must be installed, maintained, and chosen carefully. We used three driving shafts for three rollers. And each roller has two keys for attach the shaft and roller properly.

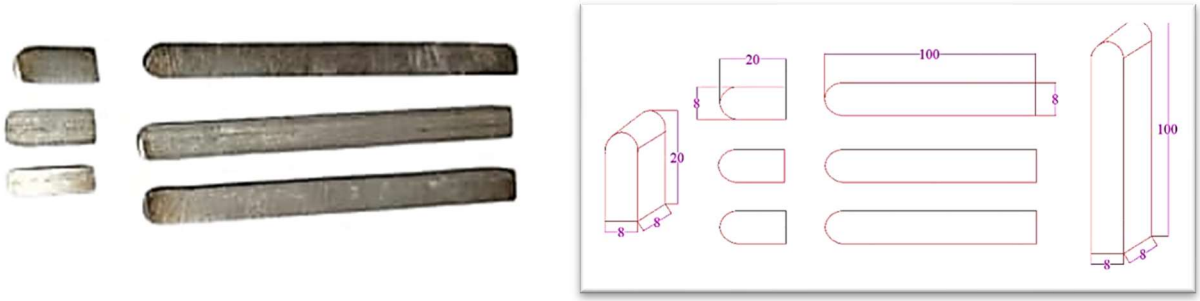


Figure 3.7 Keys

3.2.4 Adjusting Leg:

Leg adjustments are essential to guaranteeing the stability, alignment, and optimal functioning of sugarcane juice extraction equipment. They improve machine longevity and performance by enabling leveling and assistance. The machine will run smoothly and effectively if the correct kind of adjusting legs is selected and maintained. We used to adjust legs for the machine height adjustable system.



Figure 3.8: Adjustable Legs

3.2.5 Bearings:

In sugarcane juice extraction machines, bearings are crucial pieces that support rotating parts, lower friction, and guarantee a smooth, effective functioning. Depending on the precise load and alignment requirements, different types of bearings are utilized; for maximum machine performance and lifetime, careful selection and maintenance are essential. We Used Ball bearing (6203, 6306) for Smooth moving rollers.



Figure 3.9: Bearing

3.2.6 SS Sheet:

Stainless steel sheets (304) are crucial for various components of sugarcane juice extraction machines, including structural elements, juice extraction components, enclosures, and hygiene-related parts. Their properties of durability, corrosion resistance, and ease of maintenance make them an ideal material for ensuring the effective and reliable operation of these machines. We Used Stainless Steel Sheet (304) for Covering the Machine Body.



Figure 3.10: Stainless Steel Sheet

3.2.7 SS Perforated sheet:

Stainless steel perforated sheets (304) are integral to the efficient operation of sugarcane juice extraction machines. They serve multiple functions, including filtration, support, and drainage, while offering durability, corrosion resistance, and ease of maintenance. Their customizable nature ensures they can be tailored to meet specific operational requirements, contributing to the overall effectiveness and longevity of the equipment. We Used Stainless Steel Perforated Sheet (304) for filtering Sugarcane Juice.

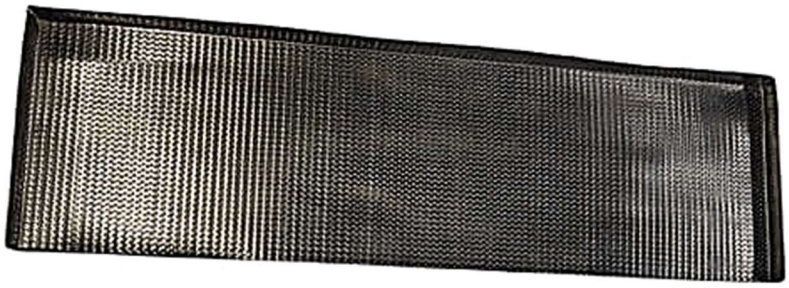


Figure 3.11: Stainless Steel Perforated Sheet

3.2.8 SS Square box:

Stainless steel square boxes play a crucial role in the construction and functionality of sugarcane juice extraction machines. They provide structural integrity, enhance hygiene, and contribute to the overall efficiency and durability of the equipment. For the frame of the sugarcane machine, we used an SS square box.



Figure 3.12: Stainless Steel Square Box

3.2.9 SS Nut and Bolt:

Stainless steel nuts and bolts are versatile fasteners used in a wide range of applications due to their strength, corrosion resistance, and aesthetic qualities. From construction and automotive to marine and food processing industries, they provide reliable and durable solutions for securing and fastening components. To fix the motor and gear box in the sugarcane machine, we used SS nuts and bolts.



Figure 3.13: Stainless Steel Nut & Bolt

3.2.10 Transparent Acrylic Sheet:

Transparent acrylic sheets, also known as Plexiglas's, are versatile materials widely used due to their clarity, durability, and ease of fabrication. To view the machine roller patterns, we used transparent acrylic sheet.

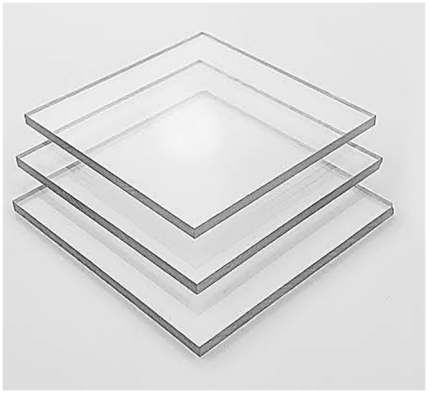


Figure 3.14: Transparent Acrylic Sheet

3.3 Methodology:

3.3.1 Methodologies for the project:

1. Sugarcane juice extractor machine designing a block diagram to know which components need to construct it.
2. Fitting all components in the machine frame. Then assembling the whole machine.
3. To take necessary notes from the project for future improvements.

3.3.2 Block Diagram:

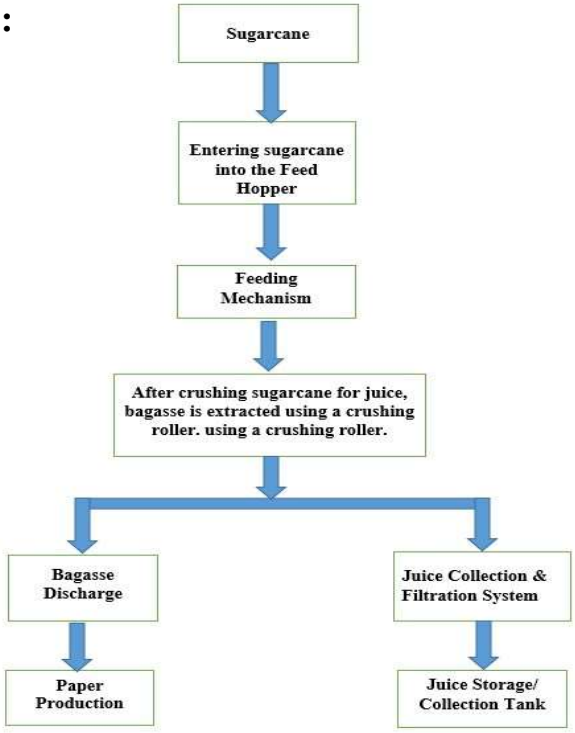


Figure 3.15: The block Diagram of sugarcane juice extractor machine

3.3.3 Working Principle:

A sugarcane juicer machine operates on a fairly straightforward principle. The primary goal is to extract juice from sugarcane stalks efficiently. Here's a basic outline of how it works:

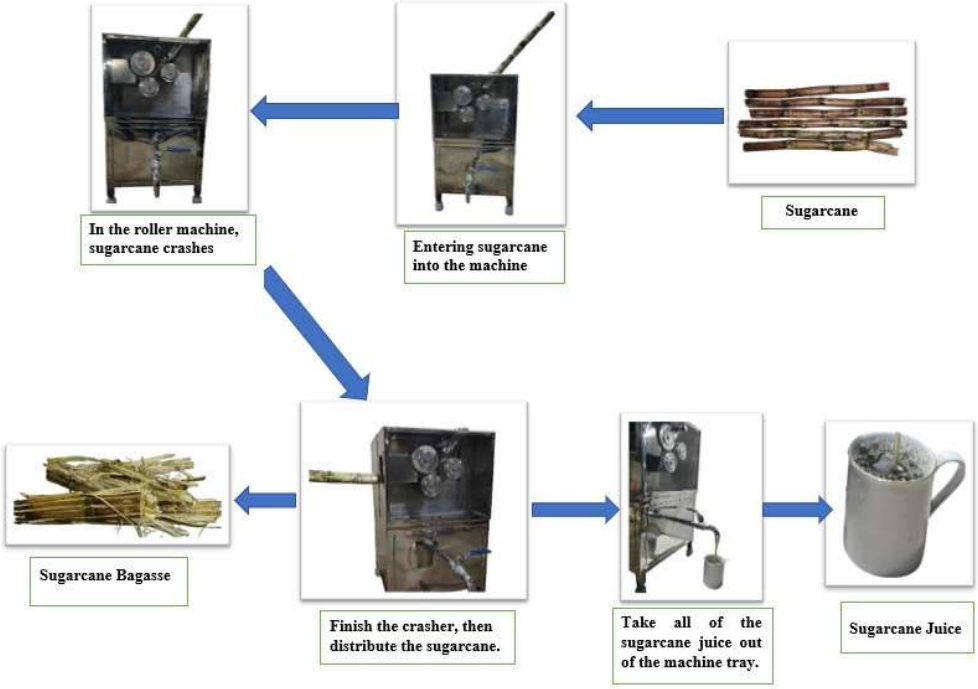


Figure 3.16: Working Principle

Feeding the Sugarcane: The sugarcane stalks are fed into the machine through a feed chute or hopper. These machines are often equipped with rollers or a feeding mechanism that helps guide the stalks into the juicing area.

Crushing and Grinding: Inside the machine, the sugarcane stalks are crushed between a series of rollers. These rollers are typically made of heavy-duty materials and are positioned in such a way that they can exert a significant amount of pressure on the sugarcane. As the stalks pass through these rollers, they are crushed and squeezed, which helps to break down the tough fibers and release the juice.

Juice Extraction: The juice extracted from the sugarcane flows through a series of channels or pipes. This juice is collected in a reservoir or container for further processing or direct consumption.

Fibers and Residue Removal: After the juice is extracted, the remaining fibrous material, known as bagasse, is expelled from the machine. The bagasse is typically discarded or used for other purposes, such as animal feed or biofuel.

Filtering and Purification: In some machines, there may be an additional step where the extracted juice is filtered to remove any remaining impurities or fine particles before it is ready for consumption or further processing.

Different models of sugarcane juicers might have variations in design and additional features, but the basic principle of crushing the stalks to extract the juice remains consistent across most machines.

3.3.4 Final Machine:

Final look of our short roller sugarcane juice extractor machine

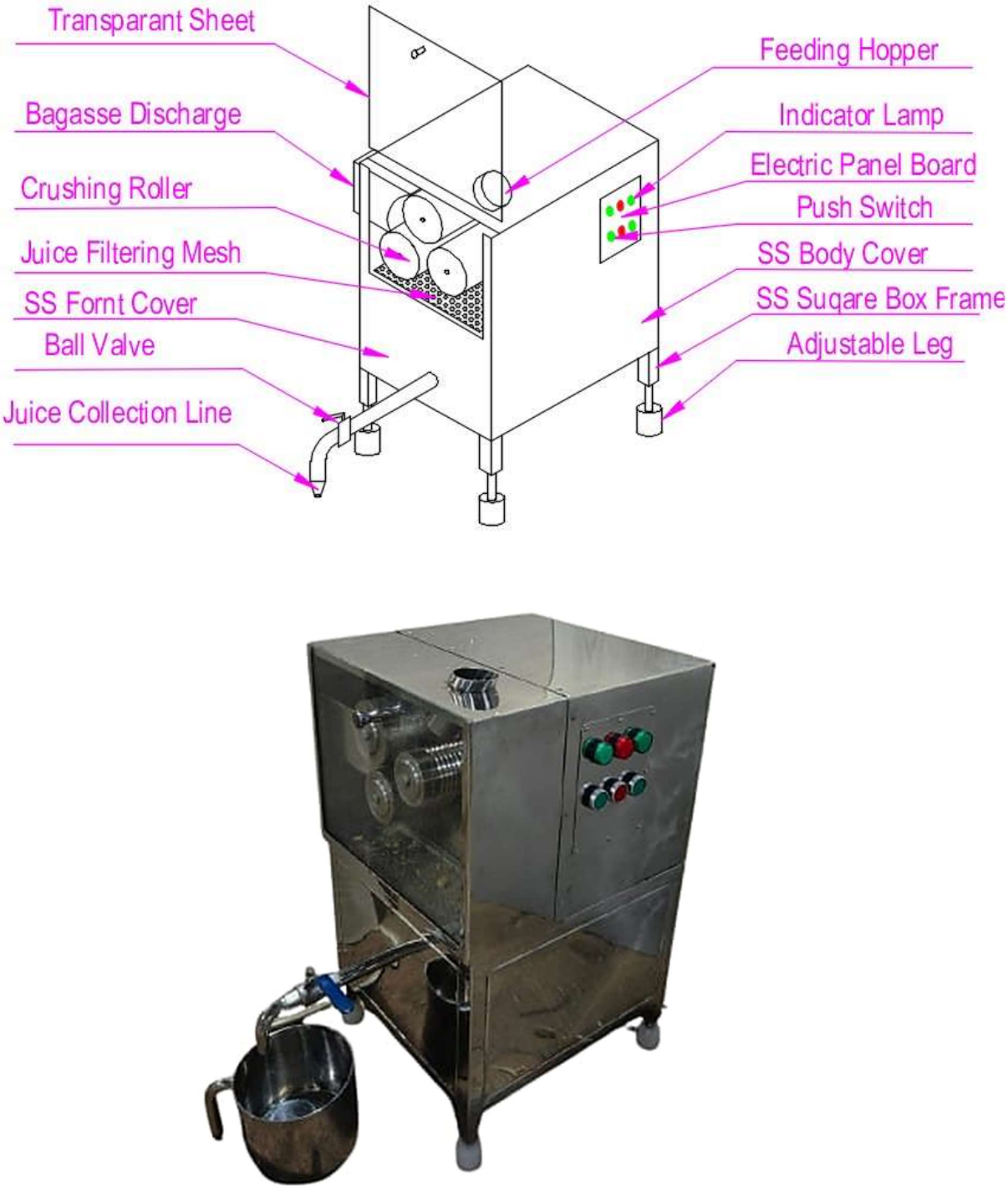


Figure 3.17: Short roller sugarcane juice extractor machine

3.4 Operation:

3.4.1 Welding Operation:

For all joints of the single component of the sugarcane juicer, the welding machine was used.



Figure 3.18: Argon Welding Machine

3.4.2 Shaping Operation:

The shaping machine was used to cut and shape the spur gear of 3 Nr 4(involute) module, outer diameter of 99mm, depth of 7mm, width of 20 and the number of teeth of 31

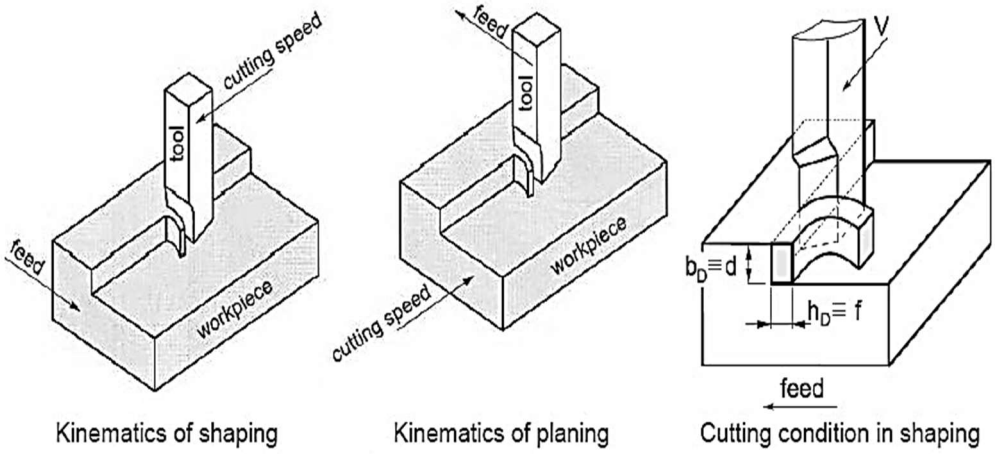


Figure 3.19: Shaping Operation

3.4.3 Grinding Operation:

The grinding machine was used to mow the joint, component surface in deburr, and the sharp ripples in order to have a smooth surface before painting the body.





Figure 3.20: Grinding Operation

3.4.4 Drilling Operation:

The pillar drilling machine is used to drill 12mm thick plate and bore to the diameter of 32mm. The hand drilling machine was also used to drill the body for easy fastening.

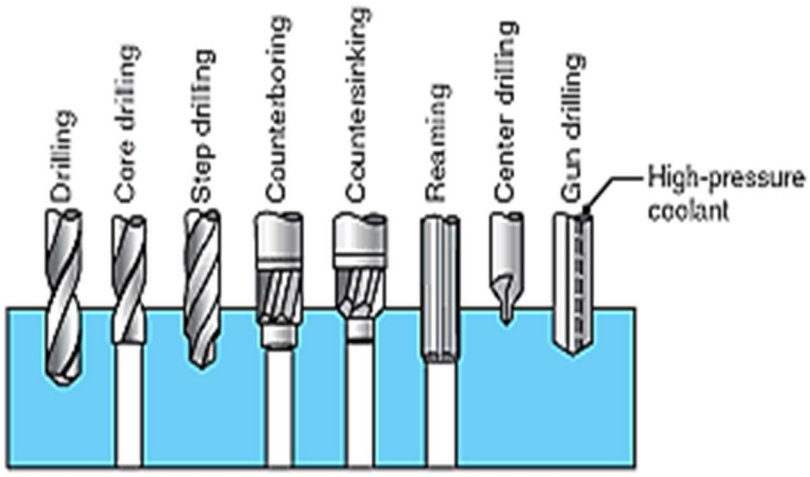




Figure 3.21: Drilling operation

3.4.5 Lathe Operation:

The Lathe machine used to manufacture roll shaft turning steps in both ends; the first stage with 30 mm and 58 mm diameter and length, the second step with 100 mm and 150 mm diameter and length, and the next step with diameter and length, 30 mm and 132 mm. Last step with 30 mm diameter and 77 mm length, from the end of second end. Twists of 50 mm diameter and 50 mm length coupling and the bore and boiling of the coupling also produce a diameter of 229 mm.



Figure 3.22: Lathe Operation

3.4.6 Cutting and Grinding Disk:

These are attached to the angle grinder to power its operation. The cutting disc when it is attached it would be used to cut the plate metal to the desired shape and orientation, while the grinding disc would also be used to smoothed the roughness on the cut detail.



Figure 3.23: Cutting and Grinding Disk

3.4.7 Polisher:

A polisher is a versatile tool used to smooth, shine, and finish surfaces. Polishing involves using abrasives, pads, or compounds to remove imperfections, scratches, and oxidation, and to enhance the surface's appearance. To polish the welding spot and sheet, we used polisher.



Figure 3.24: Polisher

3.4.8 Iron Brush/Cup Brush:

Iron brushes, including cup brushes, are specialized tools designed for cleaning, deburring, and surface preparation tasks across various applications. It would be used to brush off the corroded surfaces. This would prepare the surface for painting.



Figure 3.25: Iron Brush/Cup Brush

3.5 Electrical Operation:

3.5.1 Electrical Motor:

An electric motor is a machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft. An electric generator is mechanically identical to an electric motor, but operates in reverse, converting mechanical energy into electrical energy.



Figure 3.26: Electrical Motor

3.5.2 Magnetic Contractor:

A magnetic contactor is an electromechanical switch used in applications that require a circuit “on and off” process, such as starting motors, heaters, and lighting applications. Through the switch contacts, the magnetic contactor takes care of transferring energy from one place to another.

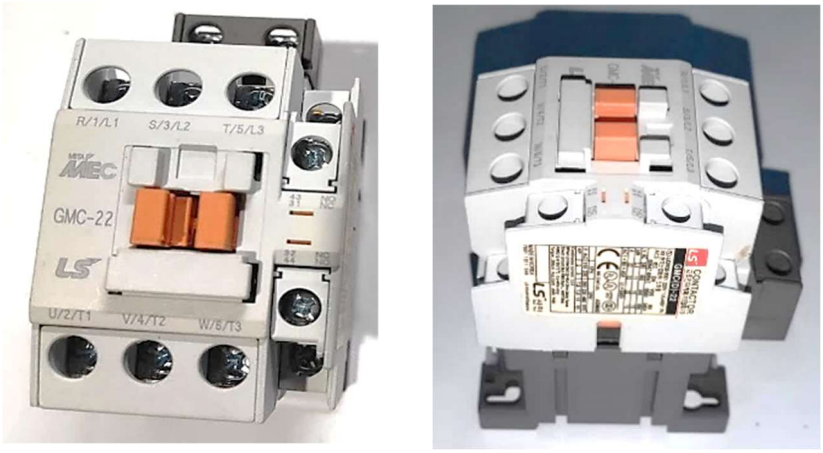


Figure 3.27: Magnetic Contractor

3.5.4 Push Switch:

The machine's numerous functions are controlled by push switches in a sugarcane extractor machine. For on/off operation, we used push switches.



Figure 3.28: Push Switch

3.5.4 Indicator Lamp:

The operator can properly monitor and operate the sugarcane machine by using the critical information these indicator bulbs supply them. They provide scheduled maintenance, efficient problem solving, and seamless functioning.in and out of service. To indicate the machine one or off, we used indicator lamp.



Figure 3.29: Indicator Lamp

3.6 Design Calculation:

Based upon research, on this two 2 mm average sugar cane squeeze its juice manually at a thickness of 2.5 - 3.5 mm, the thickness with assumed thickness was used with these 90 mm, 75 mm and 70mm rollers.

3.6.1 Design Analysis:

The maximum force of failure (Mf) = 120 N

Safety factor (SF) of 1.6

RPM=2800 rpm Gear motor Ratio: 1:61

Gear motor rpm: 46 rpm

Force requires to crush the sugarcane= 120n

Crushing force for the design $Fc = M\ f$ x Sf

Fc = 120 x 1.6 = 192N

3.6.2 Design of Roller Size:

Diameter of big roller, D = 90 mm=0.09 m, r = 0.045m

Angular velocity (ω) =2 πN/60= 3.142 x 2 x 2800/60 = 293.21 rad/s

Velocity (v) = ω x r = 293.21 x 0.045 = 13.2 m/s

3.6.3 Power Selection for Motor:

Torque transmitted to the big roller

$T = F\ x\ r$

T= 192 x 0.045= 8.64Nm

Power required P = Tω

P= 8.64 x 293.21 = 2500.33w= 2.53Kw

1hp = 746w ---------- constant

x = 2500.33

x = 1 x 2500.33 / 746 = 3.35= 3.5hp

i.e. 3.5Hp motor of 2800 rpm is required

3.6.4 Determination of Actual Motor Torque:

The angular velocity of motor,

ω = 293.21 rad/s

Motor torque, $Tm = motor\ power\ (Pm)$ An$gular\ velo(\omega)$

3.6.5 Gear Mechanism:

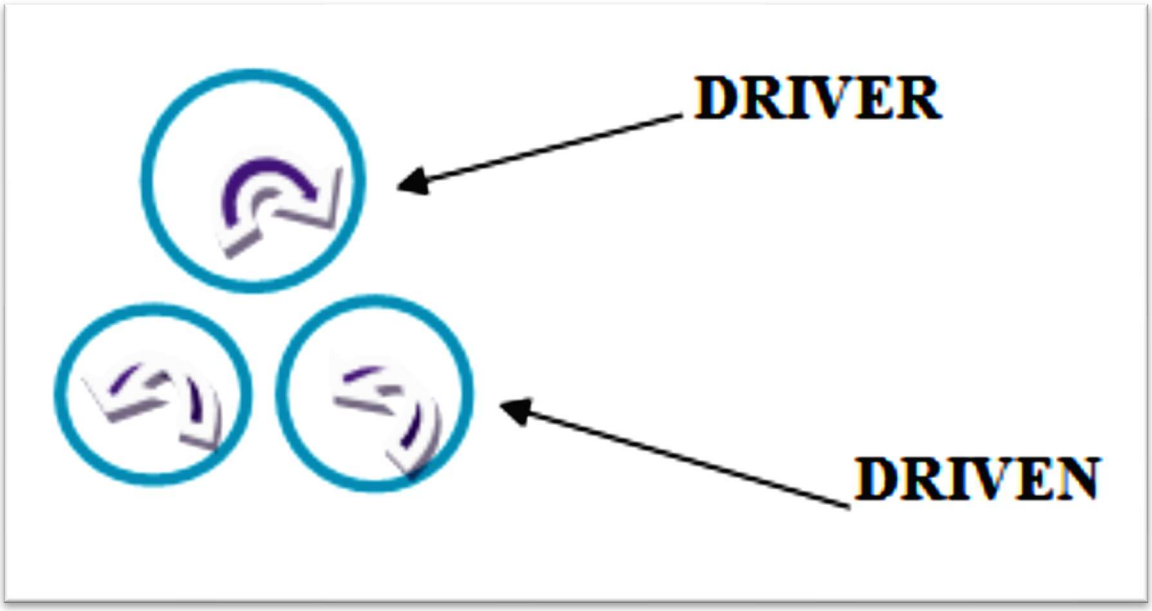


Figure 3.30: Gear Movement and Direction of Rotate

3.6.6 Gear Data:

Driver:

Depth = Circular pitch /5

Number of Teeth = 36

OD = 75 mm

Width = 25 mm

Bore diameter = 20 mm

Driven:

Depth = Circular pitch /5

Number of Teeth = 52

OD = 125 mm

Width = 25 mm

Bore diameter = 30 mm

3.6.7 Axles Shaft:

The axles shall be finished to close tolerance at the bearing and shall be properly aligned. Allowable shearing stress shall be 30% of the elastic limit, but not more than 10% of the ultimate strength in tension for axle without keyway. The value shall be reduced by 25%, if keyway present.

$d^3 = (16/\pi S_s \sqrt{(K_b M_b)^2 + (K_t M_t)^2}$

Where:

d = axle diameter in cm

S_s = allowable Shear Stress in N/cm2

K_b = combine shock and fatigue factor applied to bending moment (1.5 to 2)

M_b = bending moment in Ncm

K_t = combine shock and fatigue factor applied to torsional moment (1.0 to 1.5) and

M_t = torsional moment in Ncm

CHAPTER 4
RESULT & DISCUSSION

4.1 Result:

After making our project we observe it very careful. It works as we desire. Our project give output perfectly and all equipment are work perfectly. We check how much it works and we get perfect output from this project.

- At First, we activate the push switch, after which the motor will start.
- Then a switch will work to start the motor.
- Than the Rollar Moving.
- Than we feed the Sugarcane in the Machine..s
- At last we Collect sugarcan Juice.

4.2 Data Analysis:

The dimensional characteristics of the purchased specimen of sugarcane were highlighted in the previous chapter.

Table 4.1: Experimental data of the sugarcane specimens.

Sugarcane specimen	Head diameter(mm)	Middle diameter(mm)	Tail diameter(mm)	Average diameter (mm)	Length (mm)	Weight (g)
A	30	28	25	27.67	1493	1004
B	34	30	28	30.67	2435	1516
C	34	32	28	31.33	3065	2020
D	36	32	29	32.33	3940	2525

Table 4.2: Result of Performance Test

Specimen	Length (mm)	Initial weight (g)	Bagasse weight (g)	Weight of juice extracted (g)	85% of initial weight (g)	Extraction Percentage (%)
A	1493	1004	530	457	853.4	53.55
B	2435	1516	862	632	1288.6	49.05
C	3065	2020	1203	826	1717	48.11
D	3940	2525	1385	1098	2146.25	51.16
					Mean/Average	50.47

4.3 Discussion:

The total weight of the extracted sugar cane juice (wj) is calculated to be 3013 g, parameter as shown in Table 4.2 above. The total time required for the removal process (tj) is 120 seconds. The machine extraction rate of the juice extraction rate is measured.

Thus, the rate of extraction ηr = $\frac{3013g}{120}$= 25.10g/sec or 90.36kg/h

120 (Rate of extraction in liters) = 0.0251 l/s or 90.36 l/h

Therefore, this sugarcane juice extractor can produce 0.0251 liters /seconds

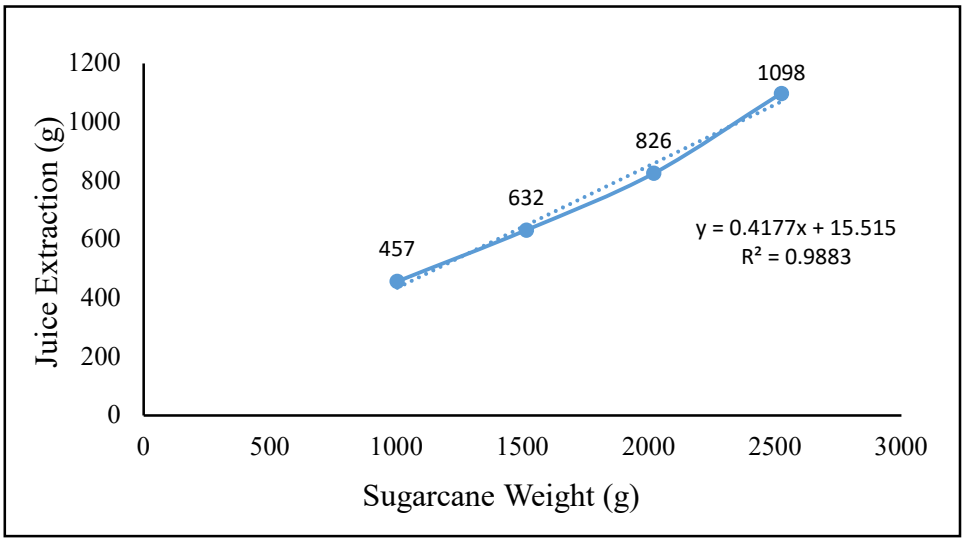


Figure 4.1: Juice Extraction Ratio

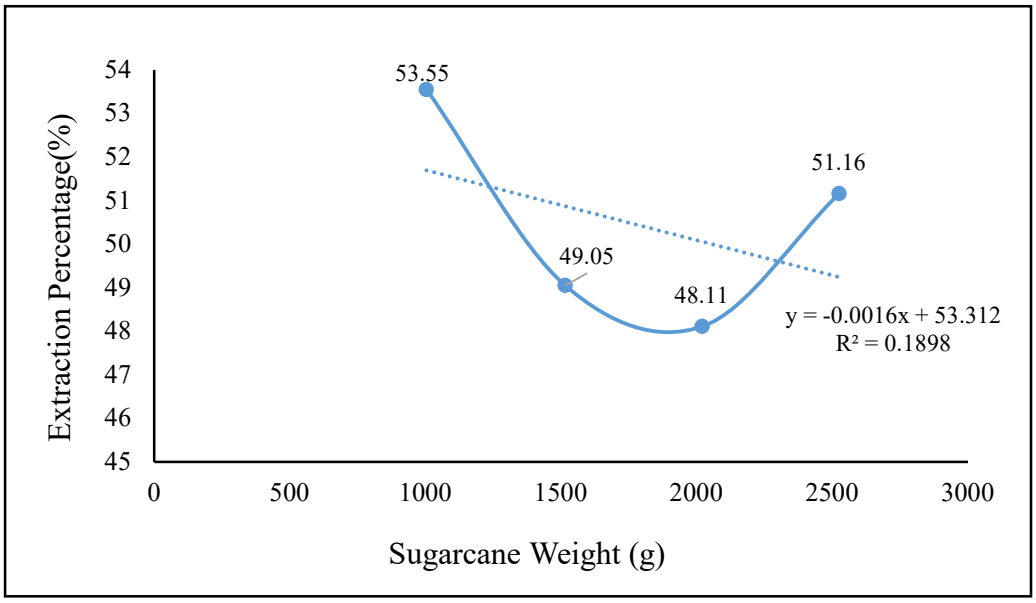


Figure 4.2: Juice Extraction Percentage

4.4 Total Dissolved Solids (TDS):

When we compared our juice to that of the local juice that was extracted outdoors, we discovered that the total dissolved solids (TDS) levels were closer to 800 mg/l to 1200 mg/l in their case, and closer to 500 mg/l to 800 mg/l in ours. This suggests that our juice must be purer than theirs.

4.5 Advantage:

Advantages of a Sugarcane Juicer Extractor Machine

Higher Juice Yield: Maximizes extraction from each stalk, reducing waste.

Faster Processing: Speeds up juice production, handling large volumes quickly.

Consistent Quality: Ensures uniform taste, clarity, and sweetness of juice.

Reduced Manual Labor: Automates extraction, lowering labor costs and effort.

Cost-Effective: Efficient production reduces cost per liter and increases ROI.

Improved Hygiene: Minimizes direct handling and contamination risks.

Enhanced Safety: Features safety mechanisms to protect operators.

Versatile Operation: Can process various sizes of sugarcane and sometimes other fruits.

Environmental Benefits: Reduces waste and can be energy-efficient.

Ease of Use and Maintenance: User-friendly design with minimal maintenance needs.

CHAPTER 5
CONCLUSION & LIMITATIONS

5.1 Conclusion:

In conclusion, a short roller sugarcane juice extractor machine offers a practical and efficient solution for extracting juice from sugarcane. Its compact design and roller mechanism are particularly advantageous for small to medium-sized operations, providing reliable performance with enhanced juice yield and consistent quality. The machine's streamlined operation minimizes manual effort and reduces labor costs, making it a valuable addition to businesses seeking to improve their productivity and profitability.

While the machine is effective, it does come with some limitations, including a potentially higher initial investment, maintenance requirements, and space considerations. Additionally, its versatility may be limited to sugarcane, with less adaptability for other fruits or vegetables. Noise and energy consumption are also factors to consider.

Despite these limitations, the short roller sugarcane juice extractor machine's benefits—such as efficiency, ease of use, and consistent juice quality—make it a worthwhile investment for businesses focused on optimizing their juice extraction processes and meeting consumer demands.

5.2 Limitations:

These limitations should be considered when evaluating the feasibility of a sugarcane juicer machine for your business. Here are some key limitations of a sugarcane juicer machine:

High Initial Cost: The upfront investment for purchasing a quality machine can be substantial.

Maintenance Requirements: Regular cleaning and maintenance are essential to prevent clogging and ensure efficient operation.

Energy Consumption: Some models can consume significant amounts of electricity, leading to higher operational costs.

Bulky Size: Many machines are large and require considerable space, which can be a constraint in smaller facilities.

Noise Levels: Operation can be noisy, which might be disruptive in certain environments.

Limited to Sugarcane: Most machines are specifically designed for sugarcane and may not be suitable for extracting juice from other fruits or vegetables.

Pulp Disposal: Managing and disposing of the leftover pulp can be challenging and may require additional handling or processing.

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