

Design of Sugarcane Juicer Machine

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**INTRODUCTION**

The sugarcane juicing process has traditionally involved manual techniques that are labor-intensive and often yield suboptimal results in juice extraction. With the growing demand for sugarcane juice in both domestic and commercial markets, there is a pressing need for more efficient and cost-effective machinery. This project focuses on designing a sugarcane juicer machine that not only maximizes juice extraction in a single pass but also minimizes noise during operation. By employing advanced engineering techniques and innovative design principles, this machine aims to revolutionize the sugarcane juicing process, making it more accessible and efficient for farmers and vendors alike.

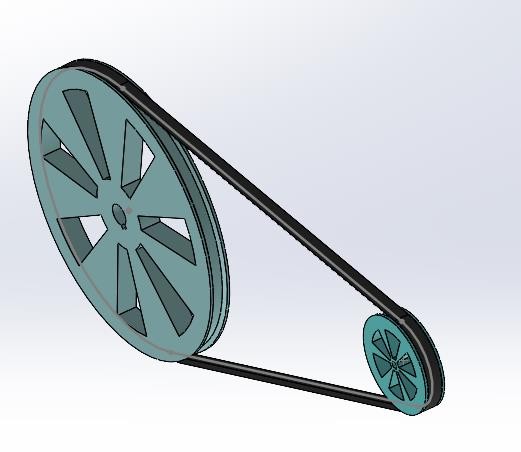
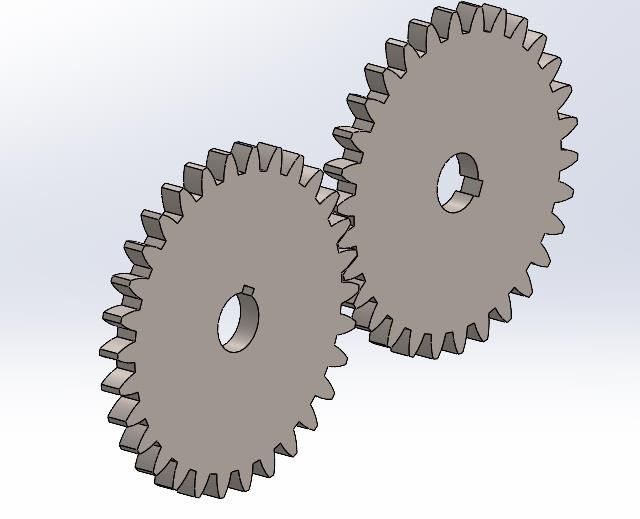
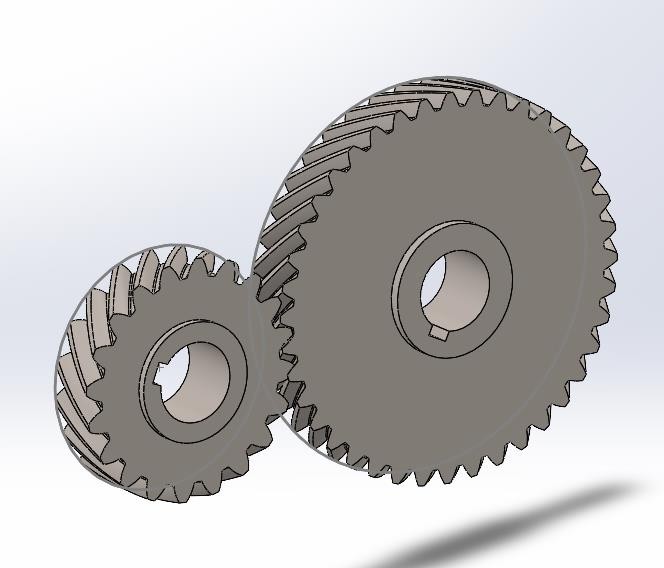
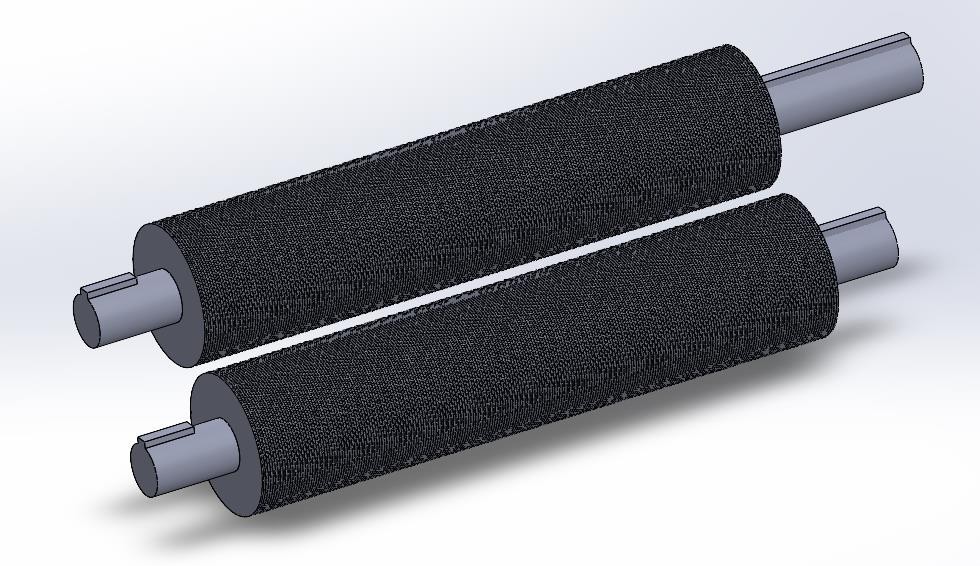
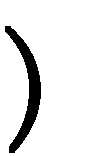
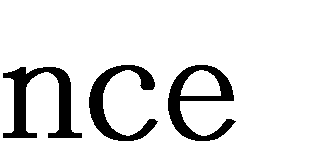
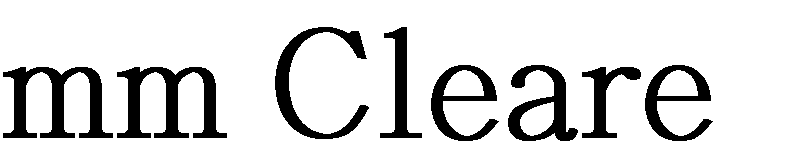
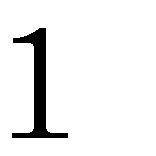
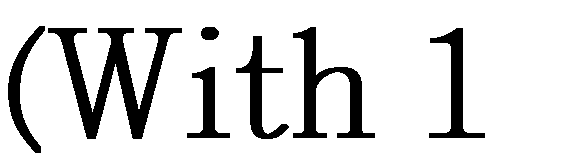
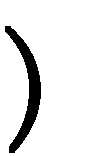
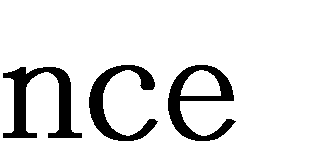
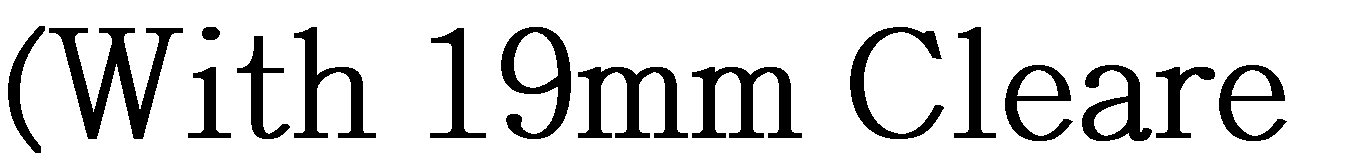
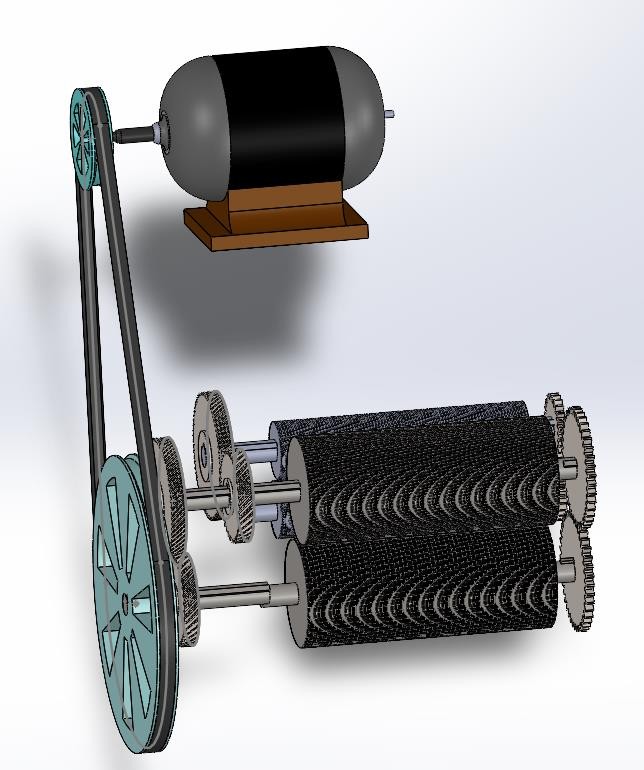
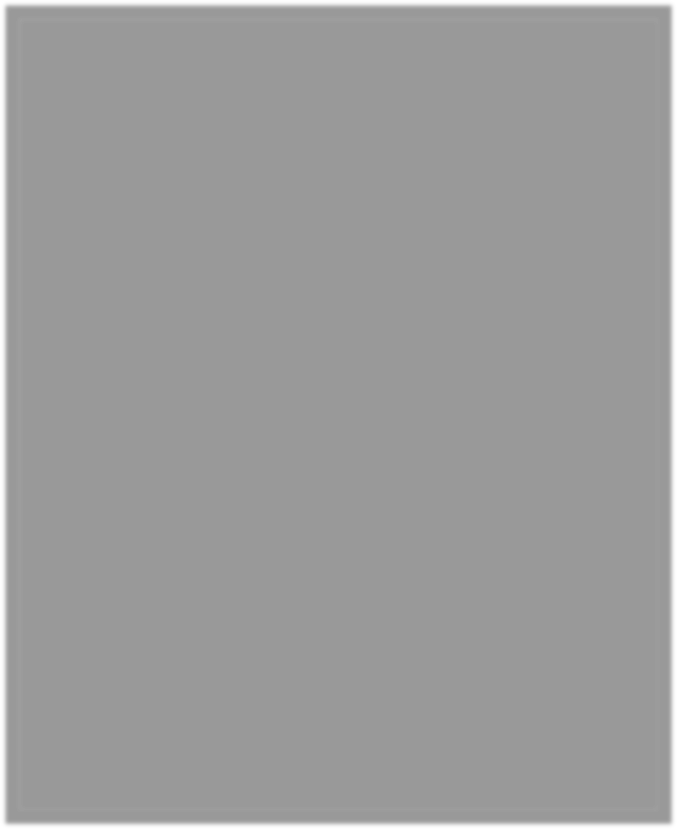
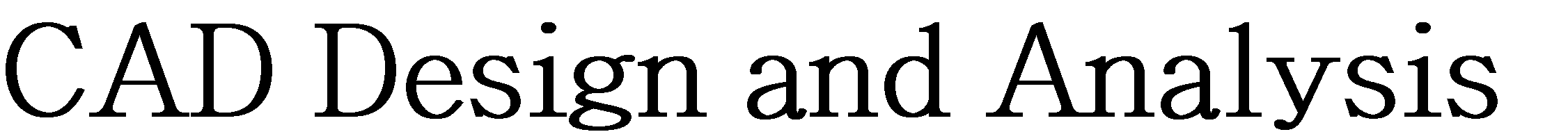
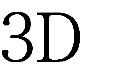
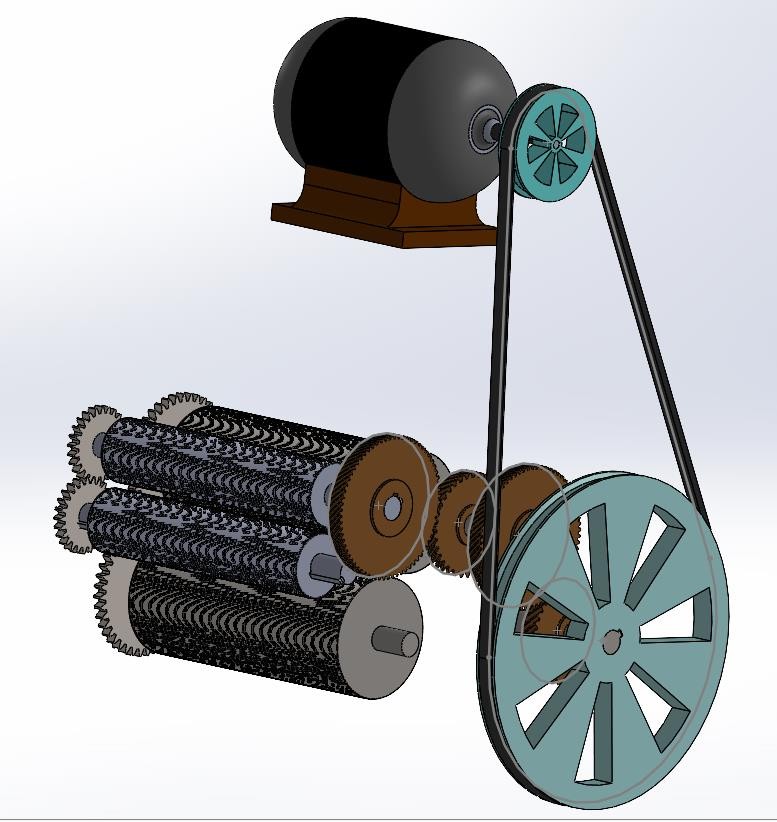
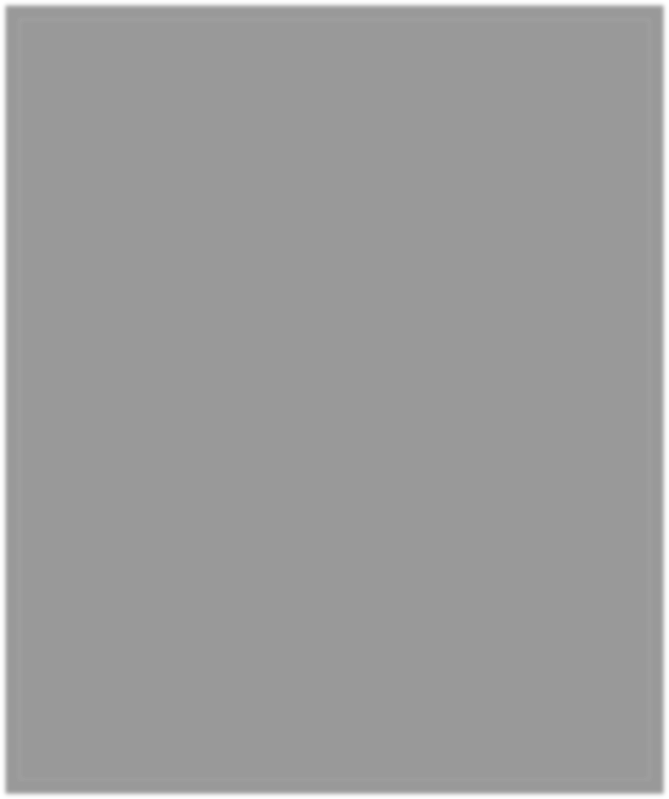


**Aim**

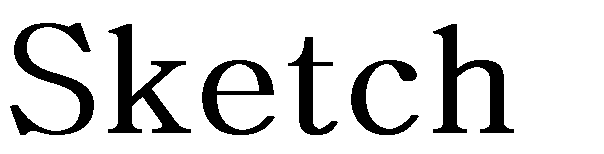
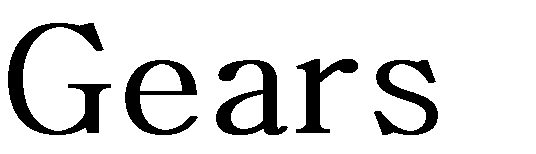
The primary aim of this project is to develop a highly efficient and cost-effective sugarcane juicer machine that maximizes juice extraction while maintaining a user-friendly design. The project will focus on several key objectives:

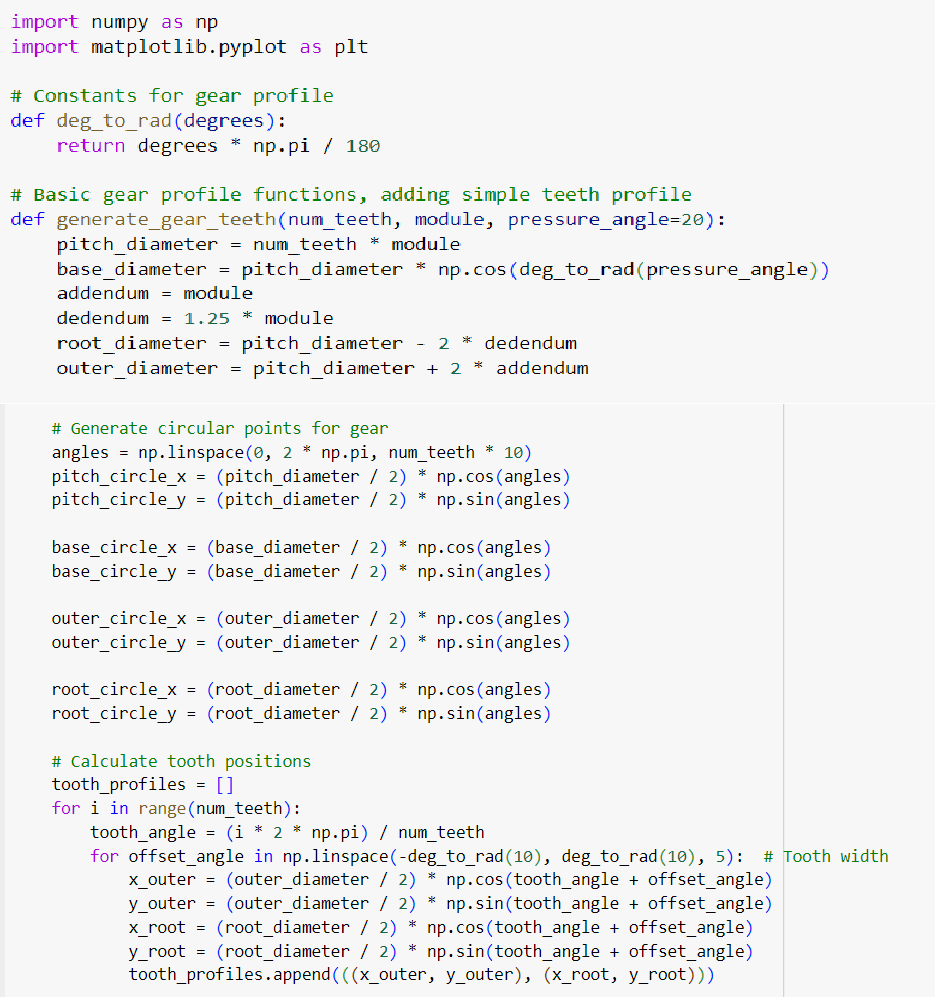
1. **Maximizing Juice Extraction**: Design mechanisms that ensure maximum juice yield in a single pass.
2. **Noise Reduction**: Implement materials and designs that significantly reduce operational noise levels.
3. **User-Friendliness**: Create an intuitive design that is easy to operate and maintain for users of varying technical backgrounds.
4. **Cost-Effectiveness**: Ensure that the machine remains affordable for small-scale farmers and vendors, facilitating wider adoption.

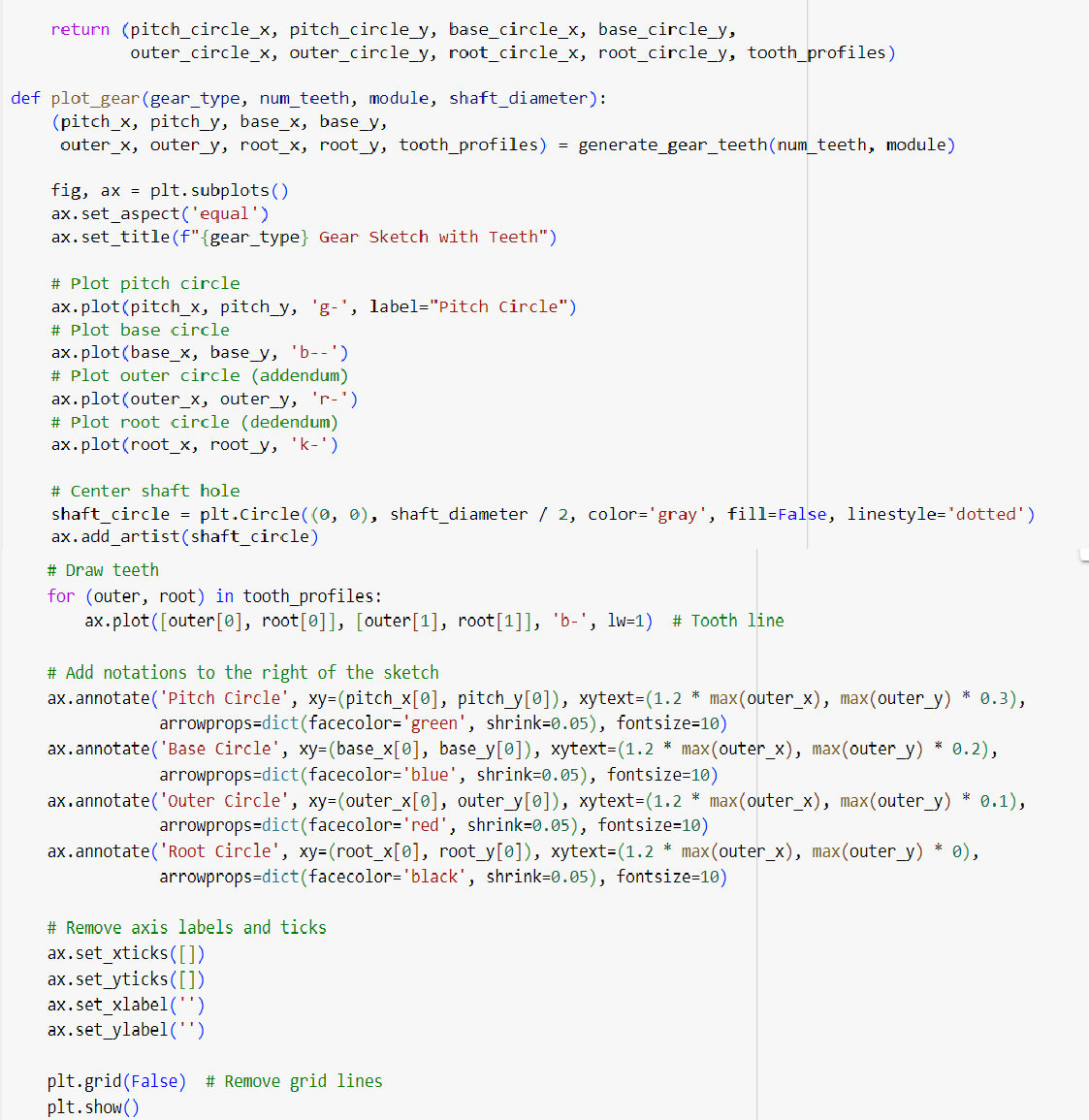
By achieving these objectives, the sugarcane juicer machine will not only enhance productivity for sugarcane farmers but also improve the overall quality of sugarcane juice available in the market.

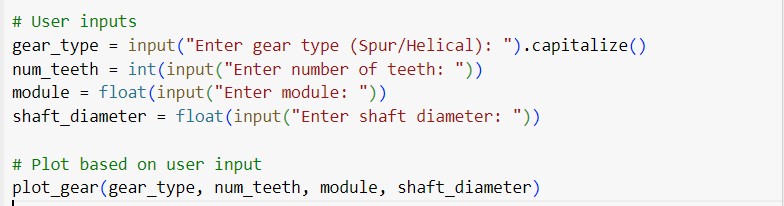


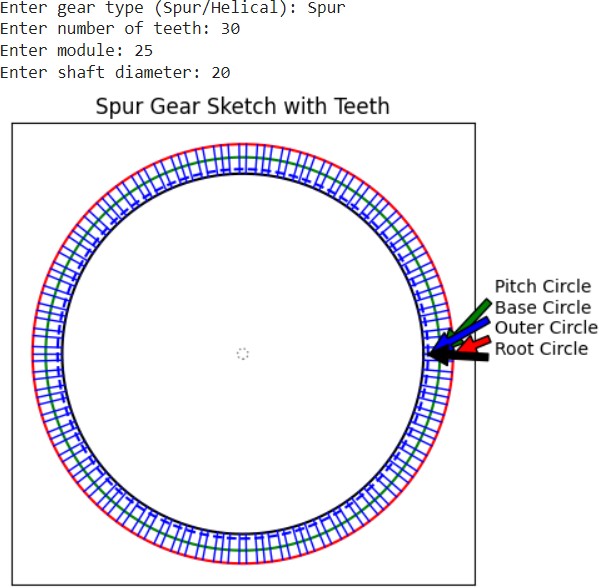
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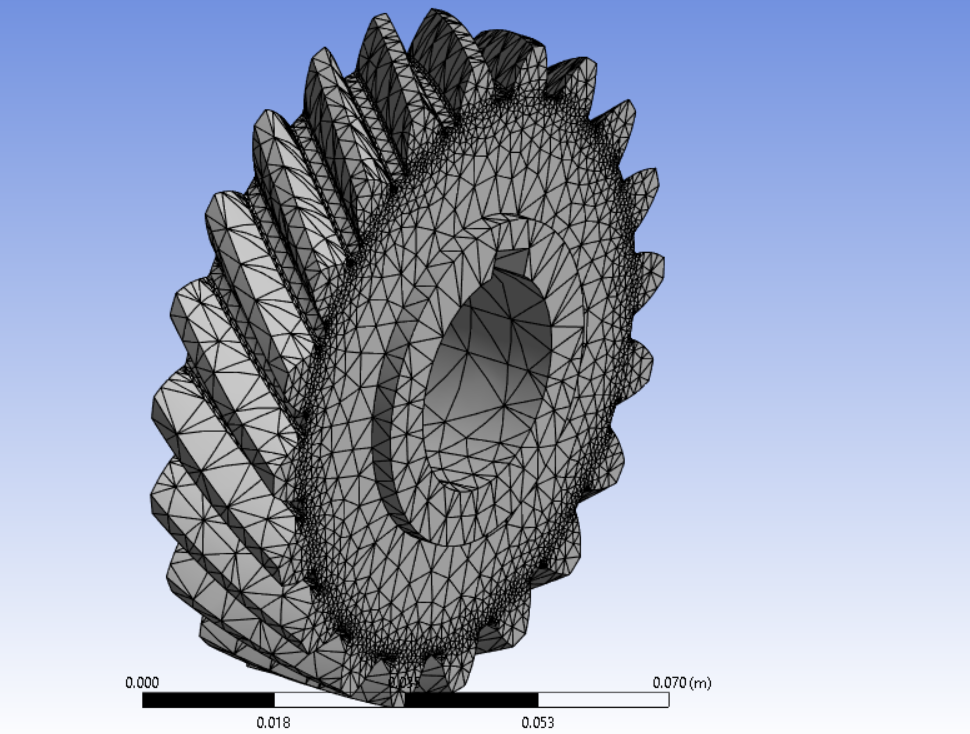




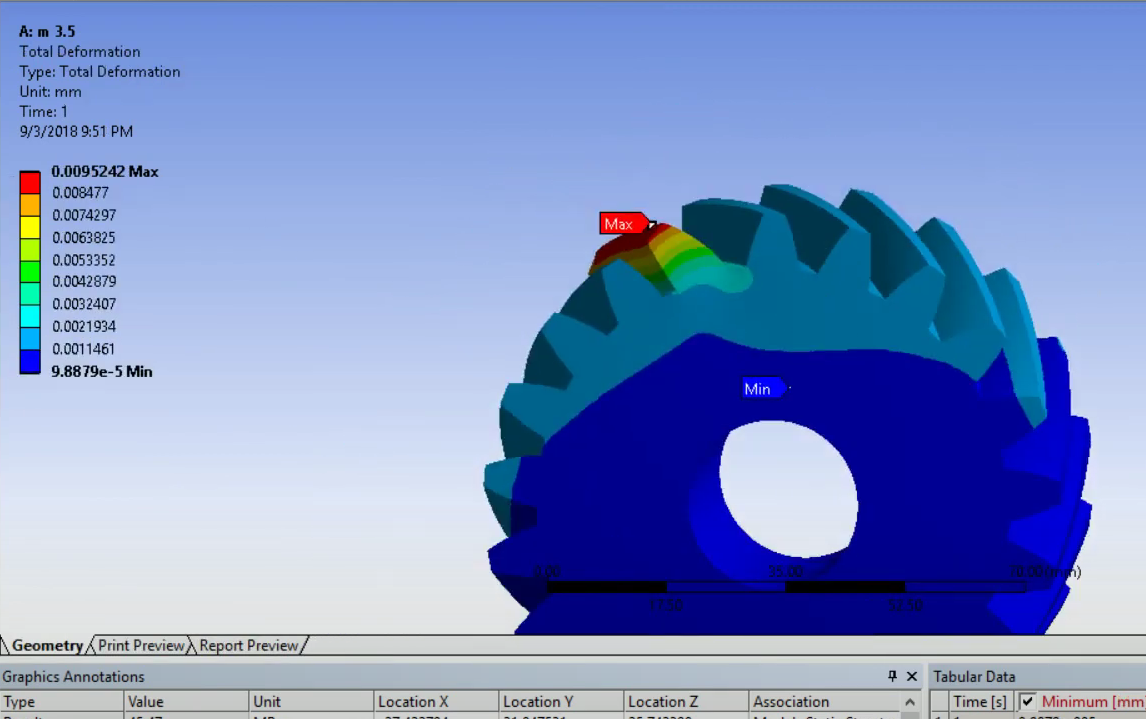


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| **Analysis on Ansys** |

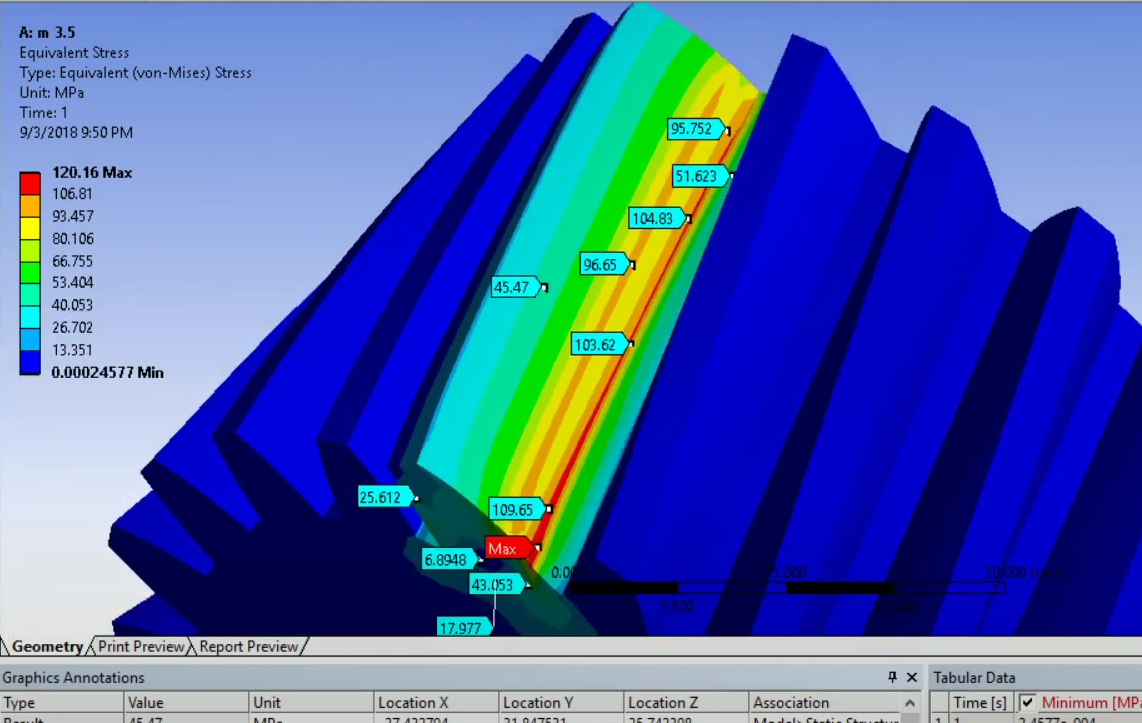
Helical gear (mesh):-

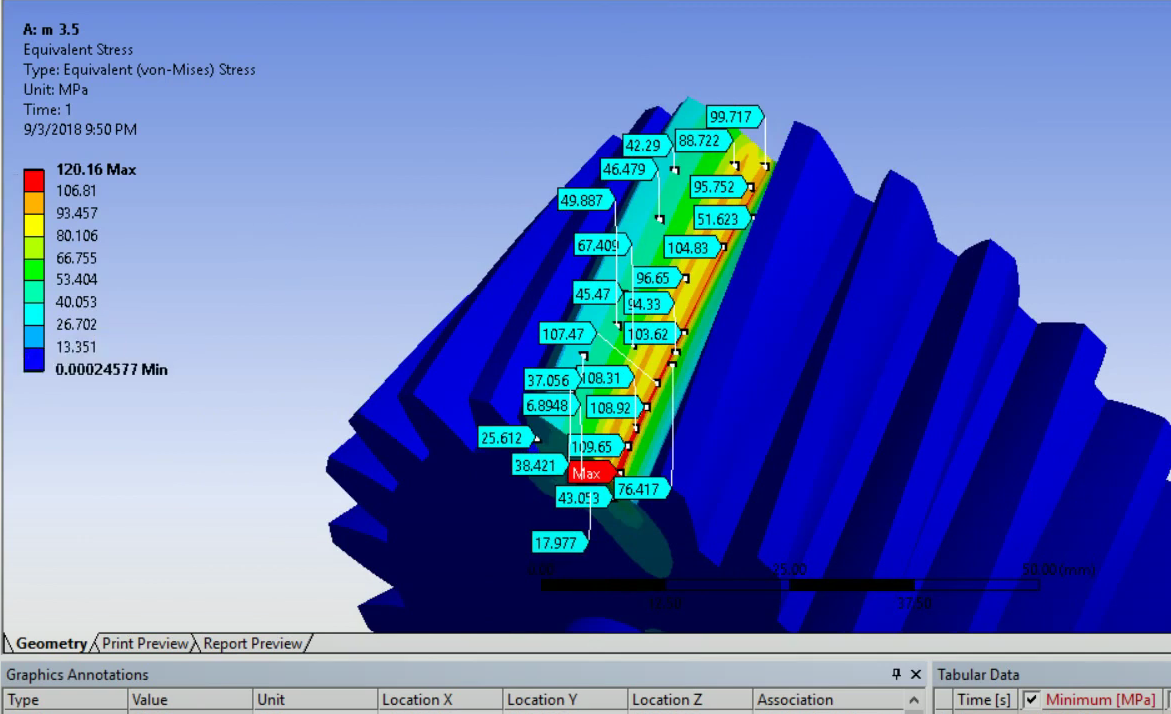


Total deformation of helical gear

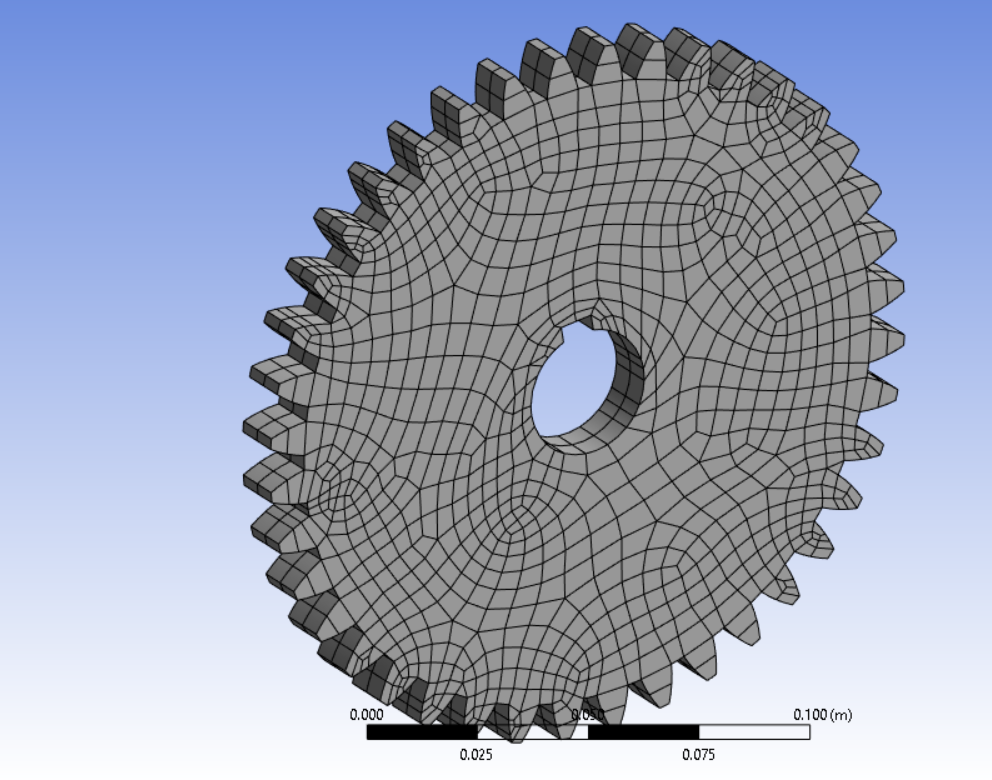


Equivalent (Von mises) stress: -

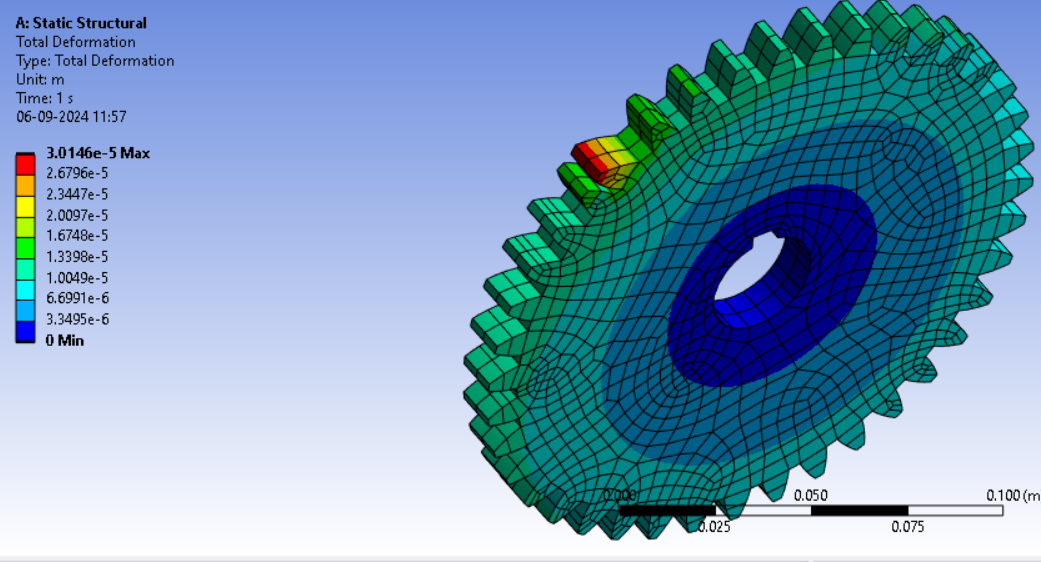




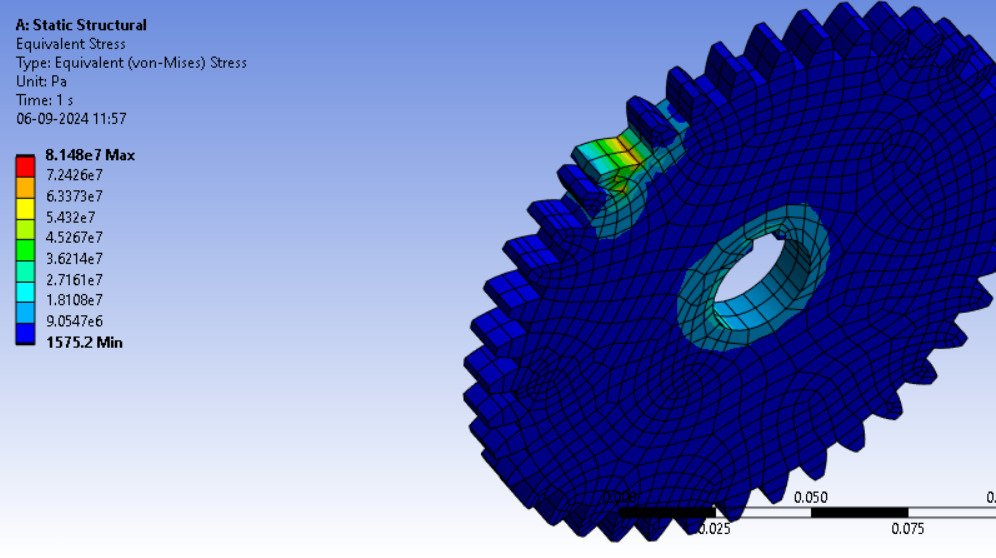
Spur Gear (mesh):-



Total deformation :-



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| --- |
| Equivalent (von mises) stress:- |



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| For Spur Gear |

|  |  |
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| **PROPERTIES** | **Values obtained (max value)** |
| Material used for Spur gear | Grey cast iron |
| Equivalent stress | 66.984 ( MPa) |
| Total deformation | 0.045533 (mm) |
| FOS | 2.37 |

|  |
| --- |
| For Helical gear: - |

|  |  |
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| **PROPERTIES** | **Values obtained (max value)** |
| Material used | Nylon |
| Equivalent stress | 120.16 ( MPa) |
| Total deformation | 0.0095242 (mm) |
| FOS | 2.95 |

Innovations in Design:

Sugarcane juicer machine incorporates several innovative elements:

Four-roller design: The use of four rollers, with varying clearances, allows for more efficient extraction of juice from sugarcane. This can lead to increased yield and reduced wastage.

Helical gears: The use of helical gears instead of spur gears helps to reduce noise and vibration, resulting in a smoother and quieter operation.

Nylon gears: Nylon gears offer advantages such as lower weight, reduced noise, and potential cost savings compared to metal gears.

Three-stage reduction design: This design provides flexibility in adjusting the speed of the rollers, allowing for optimization based on different sugarcane varieties and desired juice consistency.

V-belt drive: V-belt drives are known for their efficiency and ability to transmit high torque. This is beneficial for sugarcane juicing, where significant force is required to crush the sugarcane.

Conclusion

Sugarcane juicer machine designed demonstrates a thoughtful approach to improving efficiency and affordability. The four-roller design, combined with the use of helical gears and nylon materials, offers several advantages in terms of performance and cost. The three- stage reduction design and V-belt drive system further enhance the machine's capabilities.

By incorporating these innovations, this design has the potential to contribute to more efficient and cost- effective sugarcane juicing processes. It is recommended to conduct further testing and analysis to validate the performance of the machine and identify any areas for further optimization.



