

Design and Manufacturing of a Date Palm Trees Waste Milling Machine

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Abstract

Date palm, the most important tree in Saudi Arabia and the middle east, produce huge amount of waste yearly in form of fibrous materials, dried fruits, and seed. Such waste is a great source of excellent degradable biomass that can be used in numerous applications as natural fiber composites, active carbon precursor, and even nano-featured sheets. That rich resource is yearly burned in date palm farm due to the lack of effective processing machines. This project aims to propose date palm waste processing machine.

Problem

Saudi Arabia alone generates more than 200,000 tons of date palm biomass each year in the forms of fronds, Offshoots, dried fronds base (karab), and date pits. This huge waste is not used properly and might cause a pollution problem (Figure 2).

Objectives

- Study the economical feasibility of date palm fronds decorticating.
- Design date palm fronds decorticating machine.
- Manufacture the decorticating machine.



Figure 1: Died fronds removing.



Figure 2: Died fronds piles

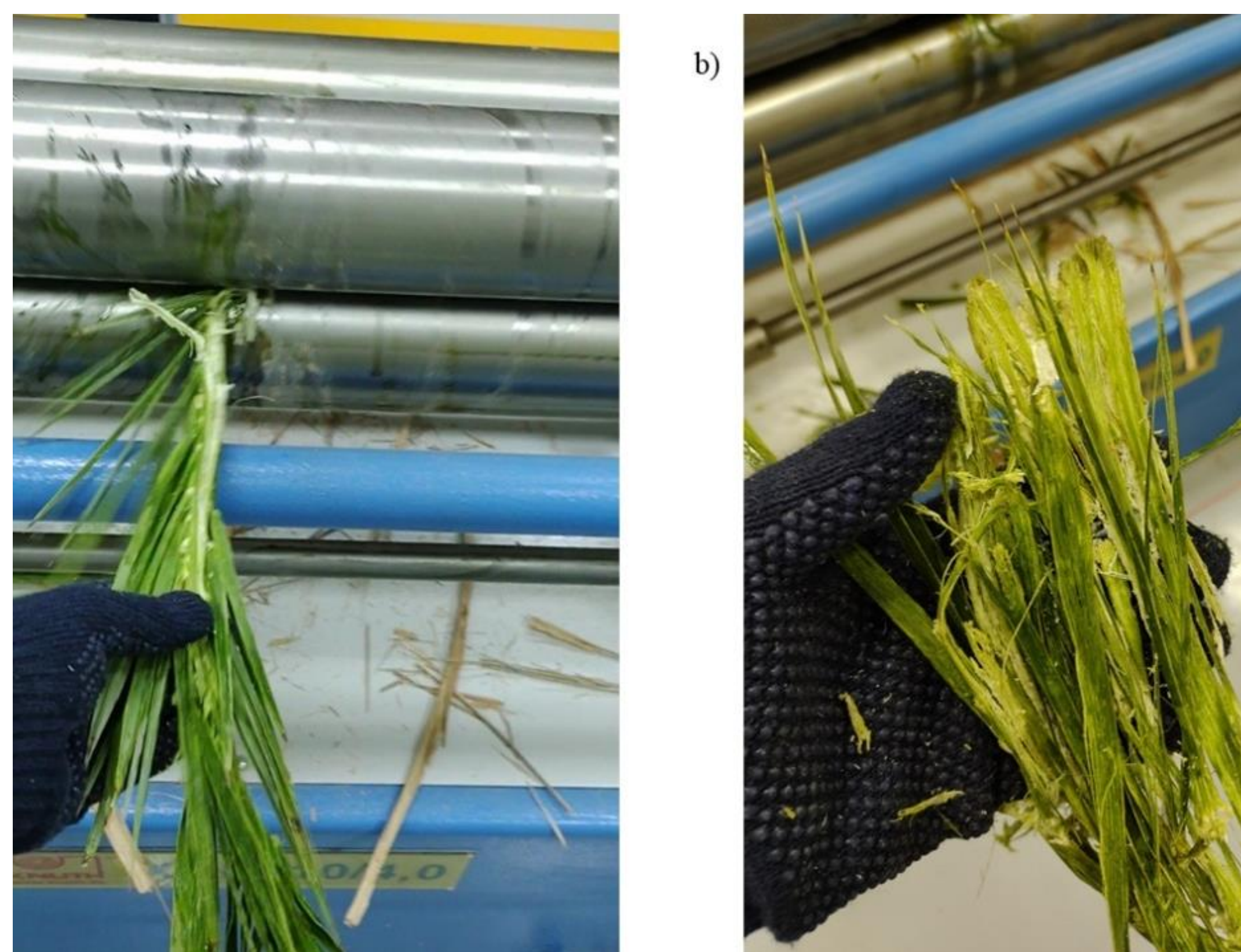


Figure 3: Fronds Fiber Extractability Test

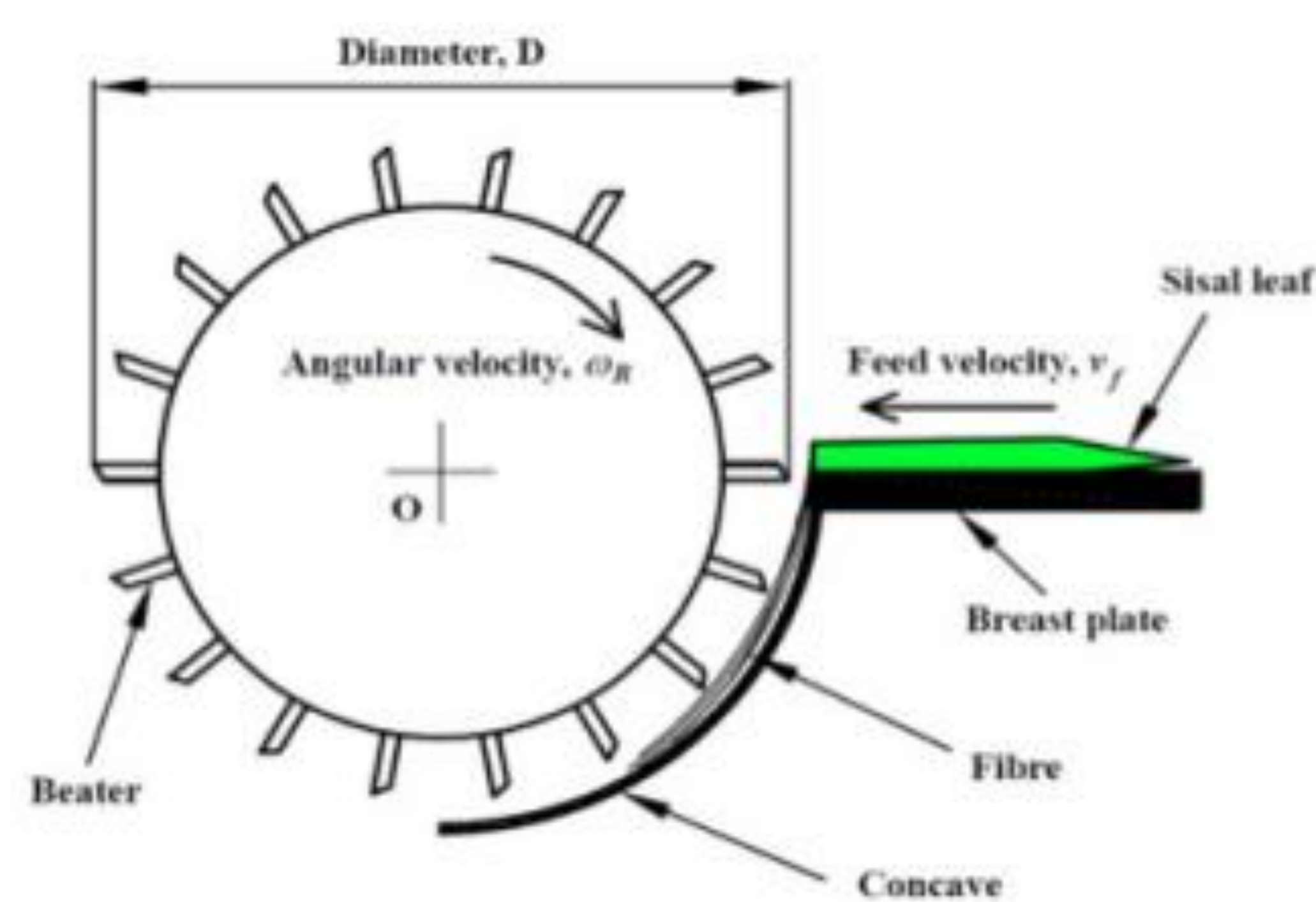


Figure 4: Roll and Concave decorticating mechanism



Figure 5: Rendered image of the final design.

Design

The machine consists of 8 components: Motor, Roll, Housing, Clearance modification mechanism, Bearings, Motor-Shaft coupling, Casing, Table. (Figures 6 and 7)

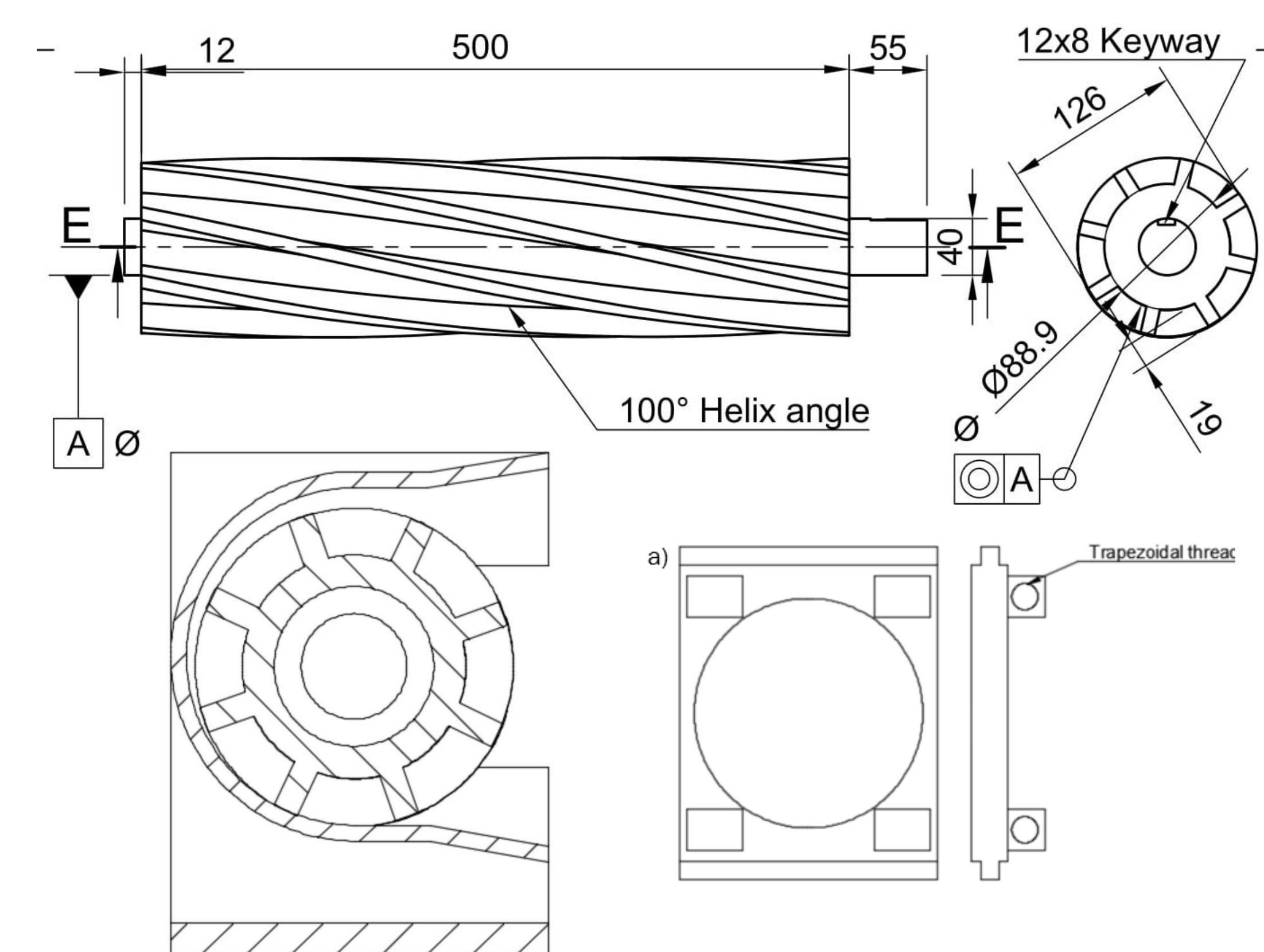


Figure 6: 2D drawing of some machine parts

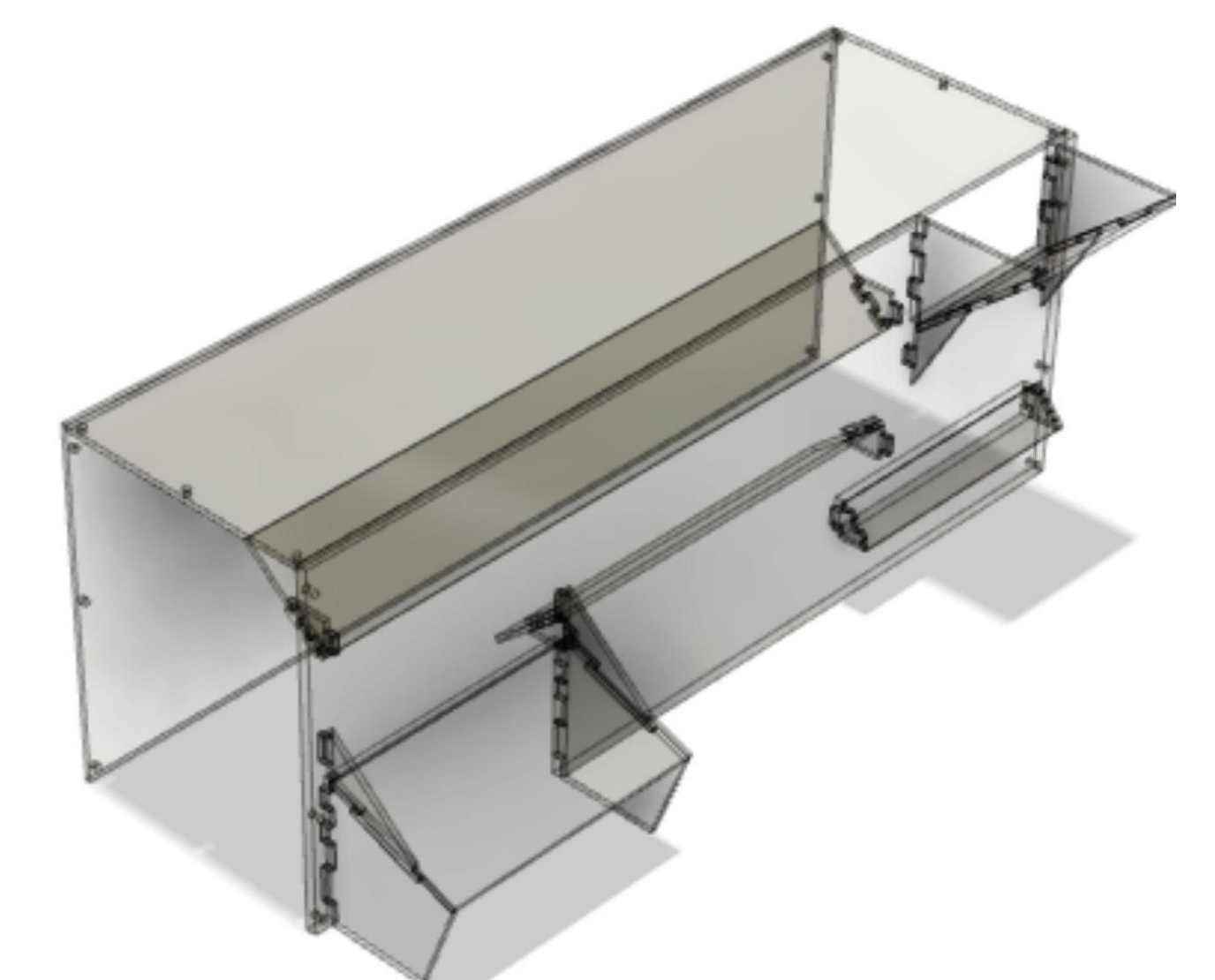


Figure 7: Casing Design.

Manufacturing:

The machine is manufactured (Figure 8) at Shams Al-Riyadh factory, Riyadh city, Saudi Arabia. Due the complicity of the design and process and the need for numerous and versatile manufacturing machine in addition to trained technician and engineers experienced in manufacturing.



Figure 8: The manufactured machine.

Conclusion

This decorticating machine is a prototype made to prove the concept and calculate the optimum clearance and speed for industrial applications.