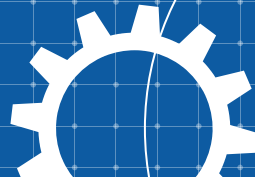


# TahinaPlus – Final Design Project

By: Ivan Polyakov





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01

# Dehulling Process

A solid white horizontal rectangular bar positioned below the title.



# Raw Sesame Cleaning & Preparation

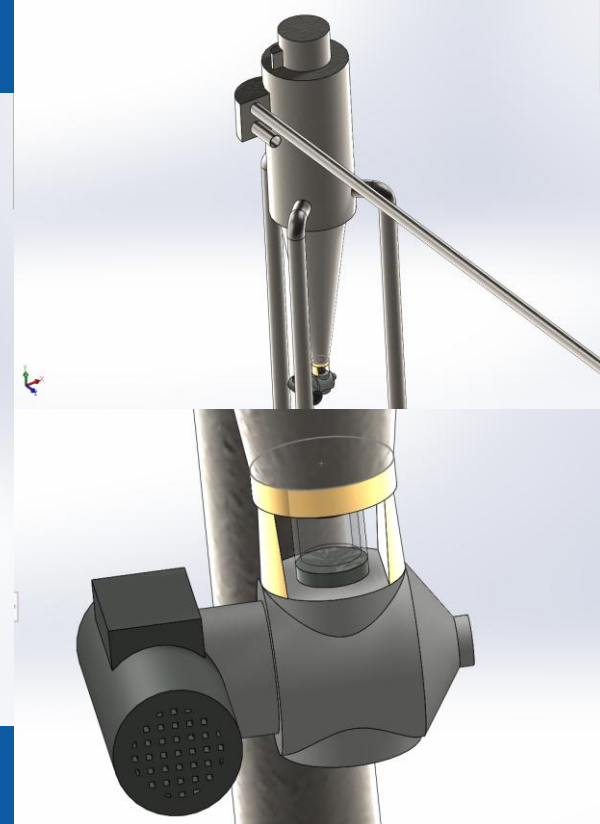
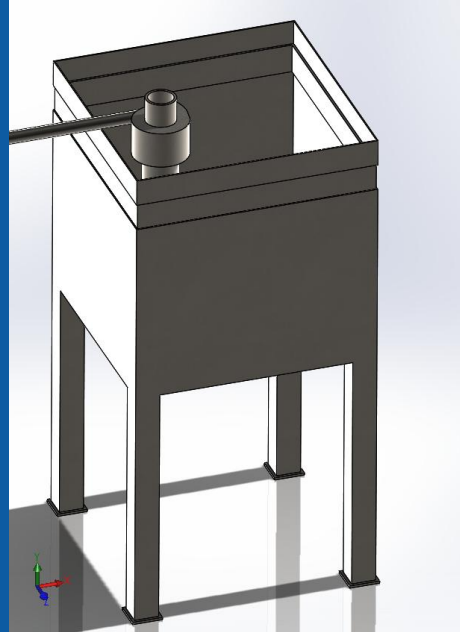
- Sesame seeds are first cleaned to remove impurities, dirt, and foreign particles.
- This is done using a helical separator and circular sifter (instead of a sieve).





# Dehulling (Hulling) Process

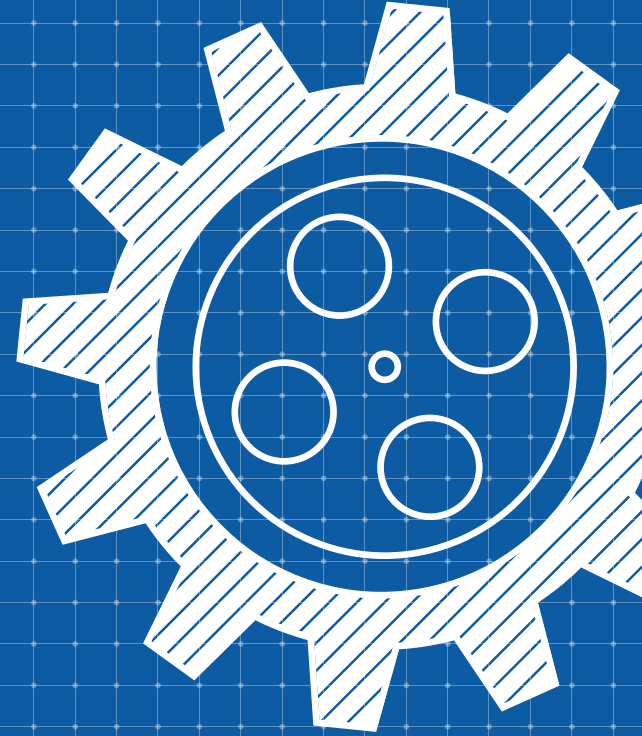
- The cleaned sesame seeds enter the dry hulling system.
- A steam process raises the temperature, allowing efficient dehulling.
- The shaft runs at 450 RPM, significantly higher than traditional machines at 75 RPM.
- The high-speed causes friction, breaking the shells into small bits.
- Less water is used, making the process more efficient.
- An aspirator system removes the husks, connected to: vacuum system, cyclone separator, rotary lock (discharges husks).





**02**

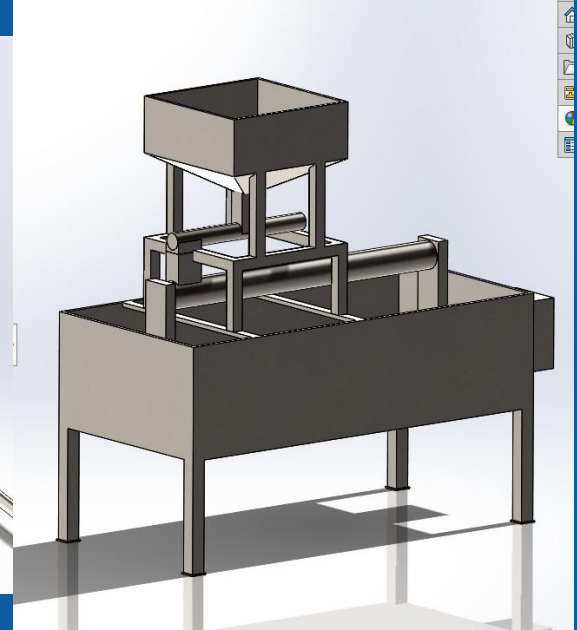
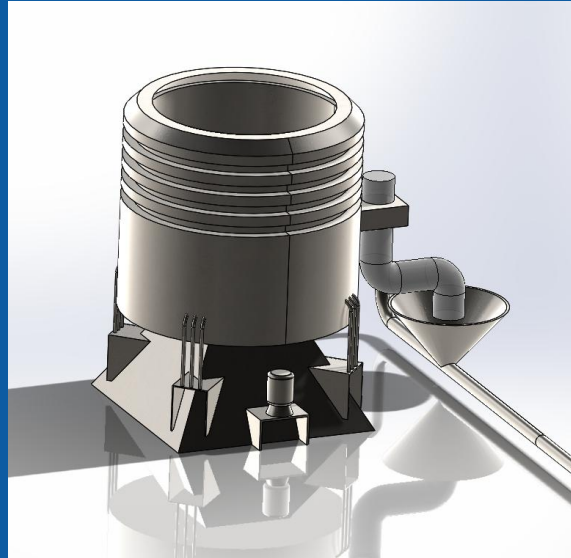
## Sifting & Brushing Process





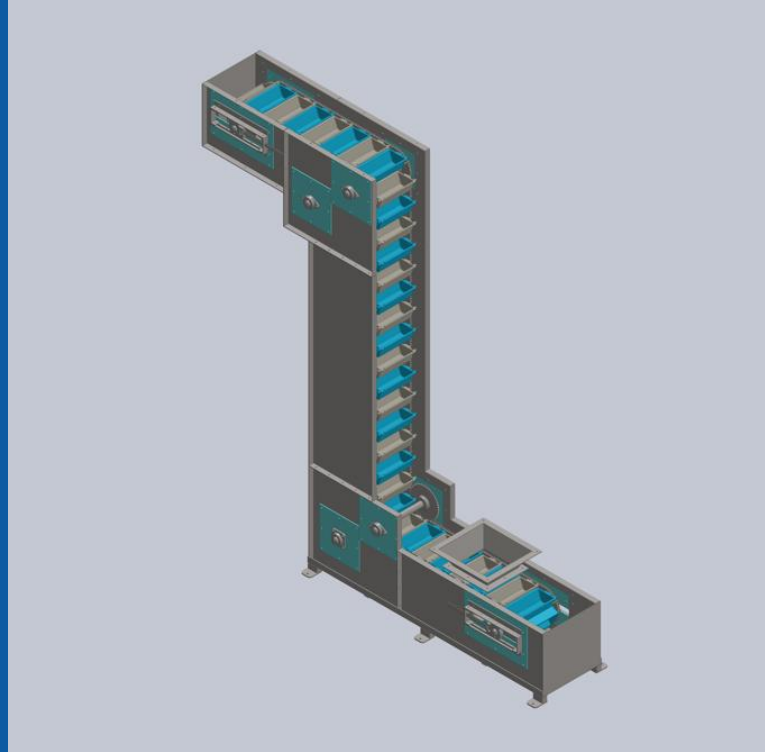
# Sifting & Brushing

- The dehulled sesame seeds still contain bits of skin, which are separated using a circular sifter.
- The seeds then move into a brusher (perforated drum) that rotates and removes more skin.
- A Z-elevator is used to transport the cleaned sesame seeds into the sifter for further processing.
- Key Issue: Oozing
  - At 450 RPM, heat and pressure cause sesame oil to leak out—this is known as oozing.





# Z-elevator AutoCAD Drawing



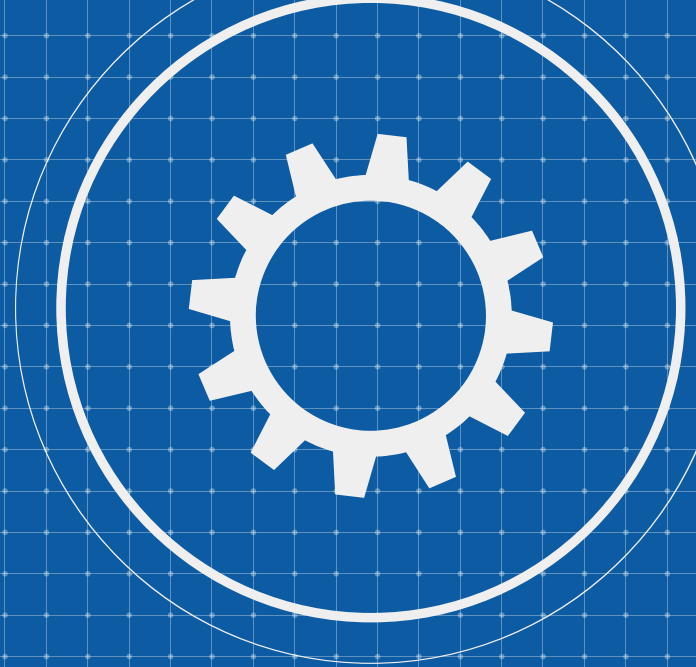




**03**

# Washing & Rinsing Process

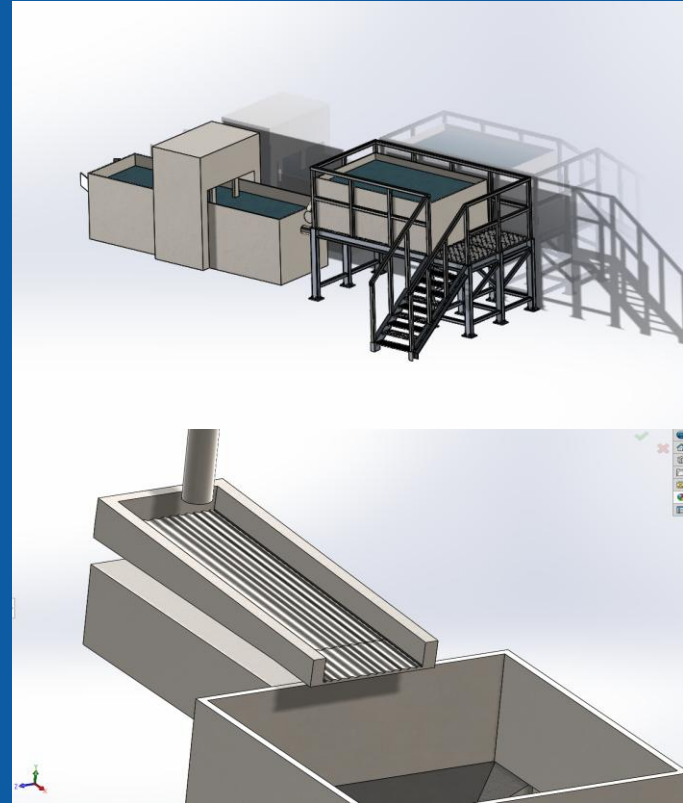
Salt Brine Solution & Reverse Osmosis





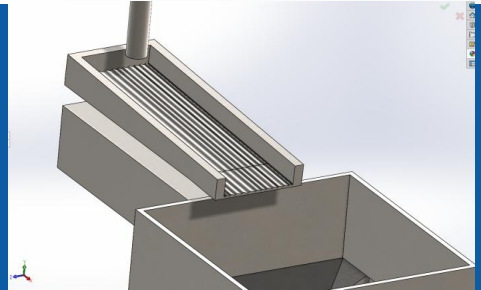
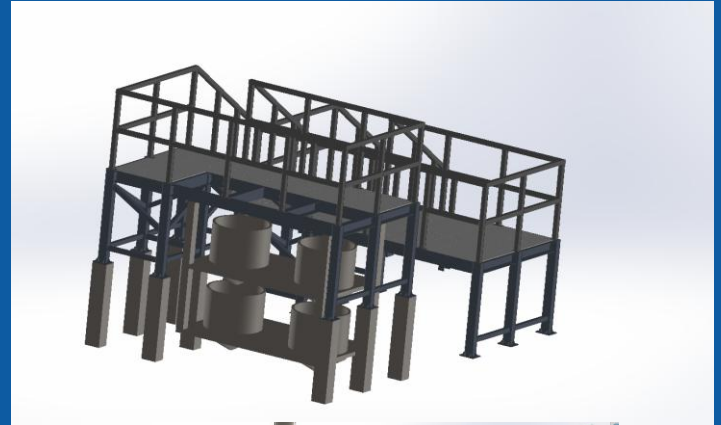
# Washing & Rinsing Process

- Sesame enters a saltwater pool (19% salt saturation).
- The seeds float to the top due to density differences.
- The system recycles water to optimize efficiency.
- A vibrating bed moves the seeds forward.



# Freshwater Rinse & Moisture Removal

- Four cylinders rinse out remaining salt and debris.
- The washing process includes two washes, but no drying occurs at this stage.
- Freshwater is used to flush out any remaining salt.
- The saltwater cylinder creates visible foam during this process.
- Another vibrating bed releases moisture, and seeds move forward via an auger system.





04

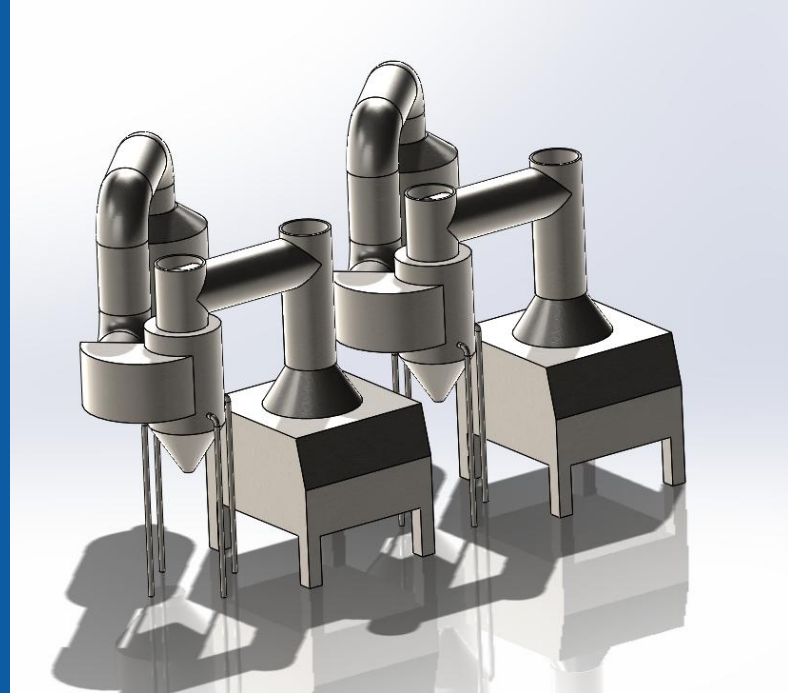
# Air Drying Process





# Air Drying

- The sesame is dried using an air-blown drying system.
- Moist air cannot be reused, making this step expensive due to energy loss.
- Air pressure is regulated using a radiator.
- Once dried, the sesame moves from the air dryer to the roaster for the next stage.
- Z-elevator transfers to roasting system.
- Key Challenge: High Cost
  - Since moist air cannot be recycled, this step consumes a lot of energy.





**05**

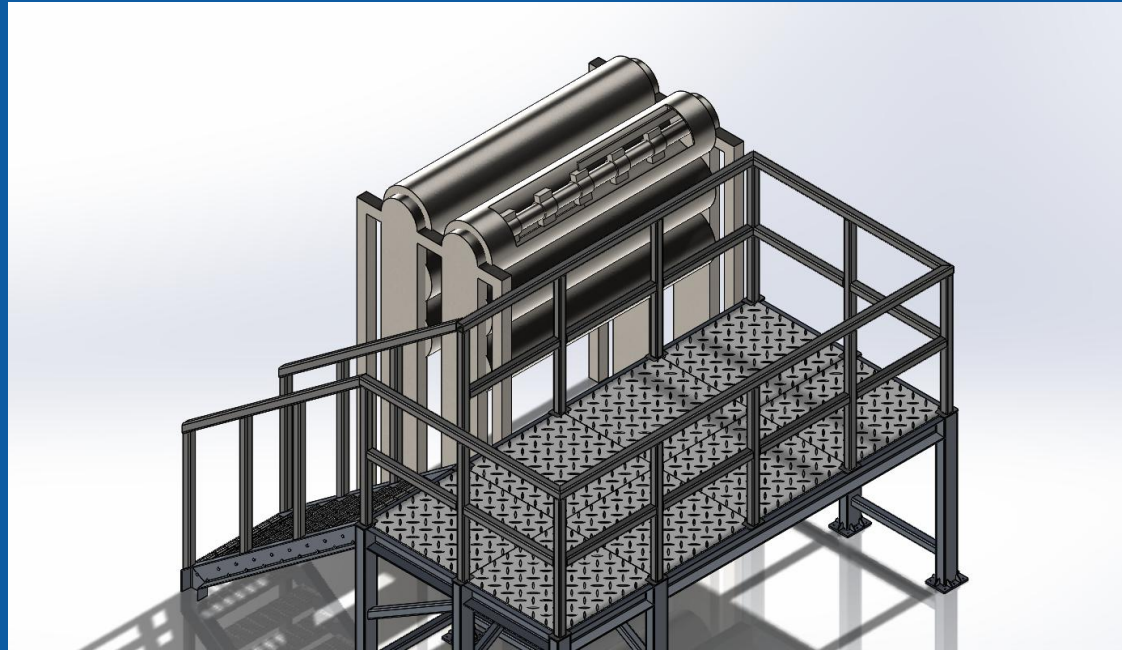
# Roasting





# Sesame Roasting

- Water usage is limited to prevent sesame from sticking inside the double-jacketed roaster.
- Roasting machines are made of steel, and wet sesame would adhere to the surface, causing problems.
- The double-jacketed roaster is angled and consists of six roasters arranged in stages.
- The seeds cook gradually, moving from one roaster to the next, ensuring even roasting.





06

# Cooling & Grinding

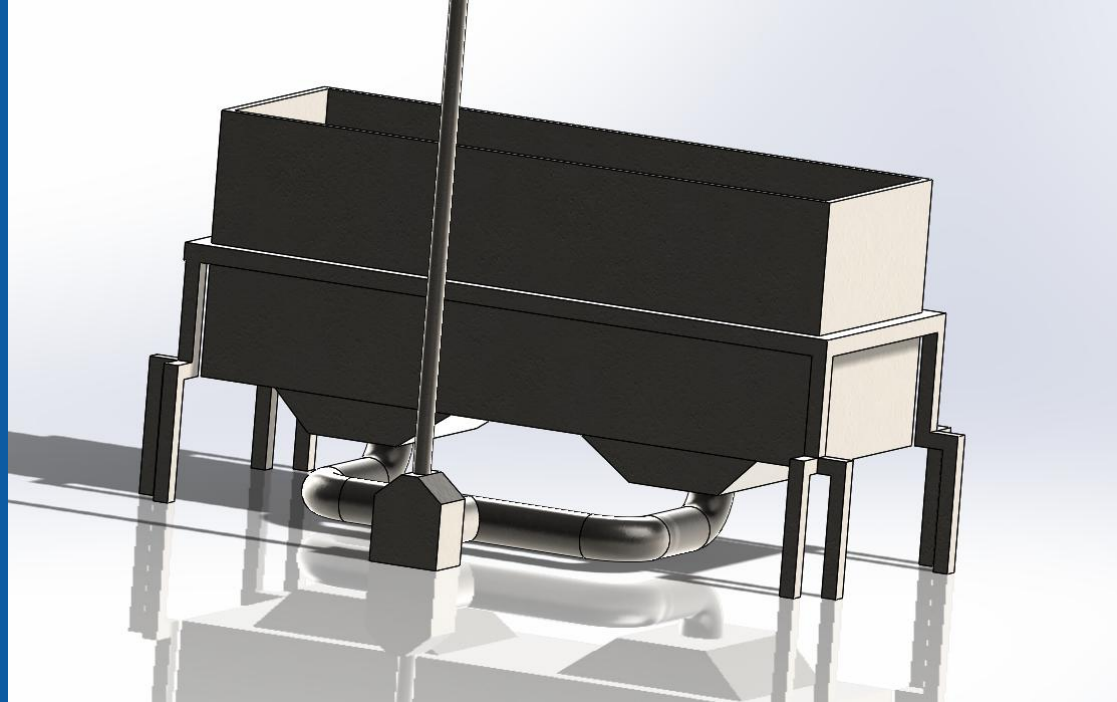






# Cooling & Transportation

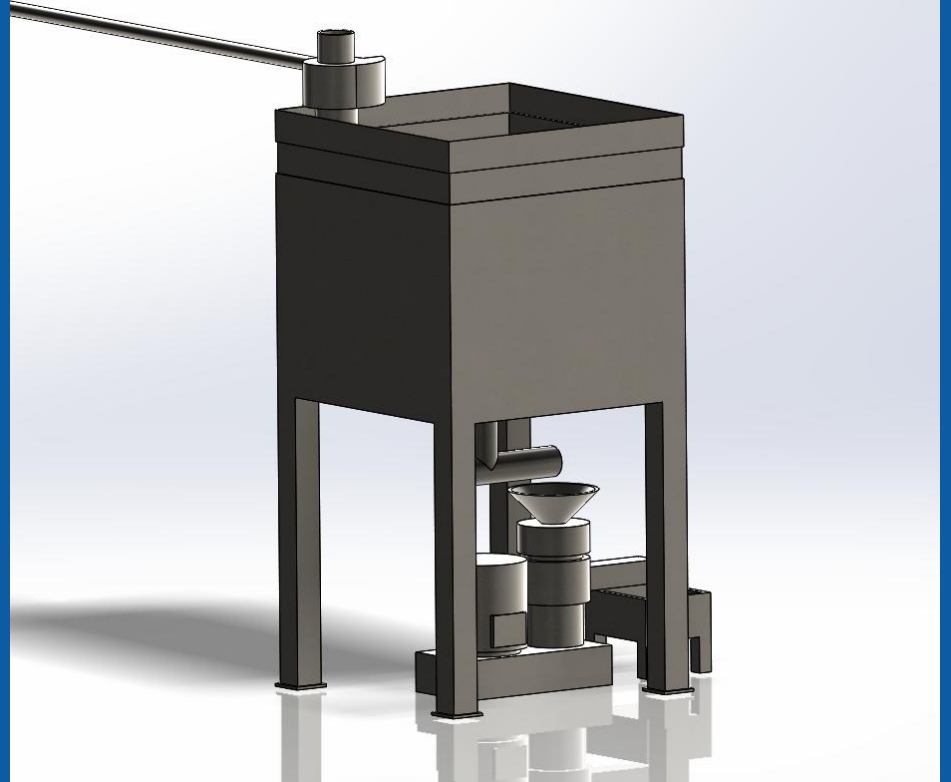
- Cooling only happens after roasting.
- A suction process removes excess heat from the sesame.
- The air transfer system moves cooled sesame forward without overheating.





# Grinding (Milling) Process

- First Grinding – Stone Mill  
Sesame enters a stone mill, where it undergoes initial grinding into a paste.
- Fine Grinding – Bead Mill  
The partially ground tahini moves into a bead mill for fine grinding. Zirconium oxide beads help refine the tahini to a 50–60-micron consistency.
- Key Challenges – High cost:  
The zirconium oxide beads and fine grinding process are very expensive.





# Important Points to Know From This Project

- Efficient dry hulling using high-speed friction (450 RPM vs. 75 RPM in traditional machines).
- Minimal water usage, but high energy consumption during air drying.
- Multi-stage roasting prevents sesame from sticking.
- Fine grinding process achieves smooth tahini but is expensive and hard to clean.
- High energy consumption due to non-recyclable moist air in the drying stage.
- The bead mill, while achieving fine grinding, is a major cost factor due to cleaning challenges.
- A Z-elevator is used to transport sesame through various processing stages, from sifting to roasting.



**Thank You**