Cacao Grinder and Winnowing Machine

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Mission Statement

"Our machine helps cacao farmers assess bean quality, boost income, promote sustainability, and strengthen the global cacao supply chain."

Background

- A winnower and grinder that separates husks from nibs
- Optimized design via testing
- Designed for easy usability
- Only fan-based winnower on the market
- Adjustable fan speed for calibration
- Cost-effective & efficient

Requirements

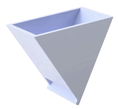
- Length <= 18"
- Height <= 18"
- Depth <= 10"
- Weight <= 40 lbs
- Manufacturing cost <= $600
- Batch size up to 5 kg
- Noise level <= 80 dB

Winnowing Process

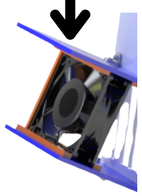
Hopper
Whole roasted cacao beans are stored

Grinder
Cracks the cacao beans

Internal Funnel
Slows travel speed of husks and nibs

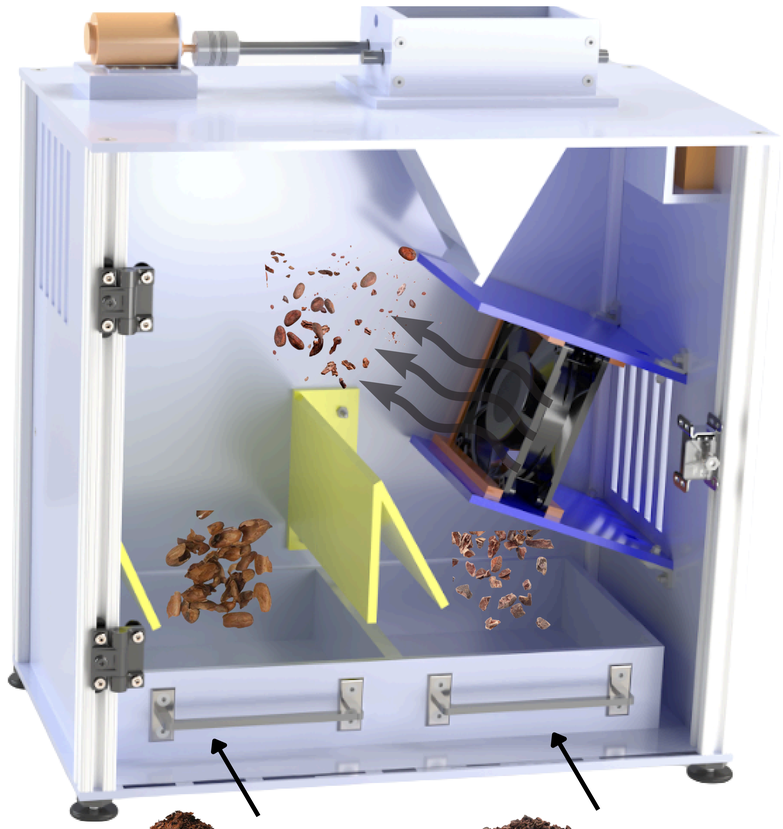


Fan
Separates the husks from the nibs



Separation Chamber
Guides cacao beans into Bins

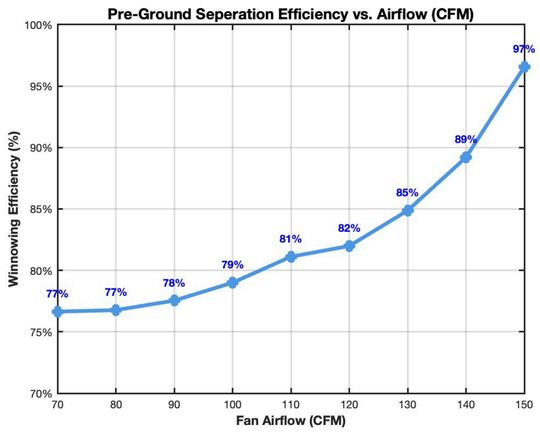
Bins
Husks and nibs are separated

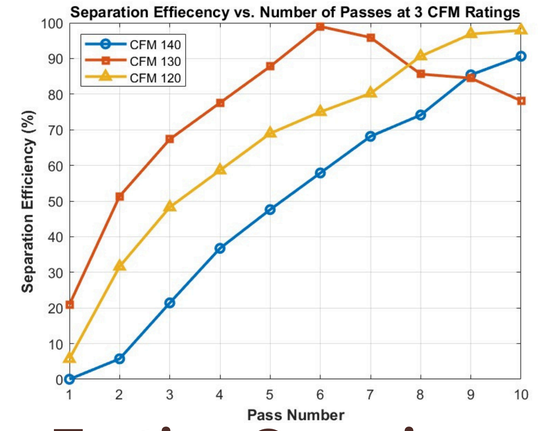


Husks: Shells

Nibs: Inside the bean which chocolate is made from

Testing Results





Testing Overview

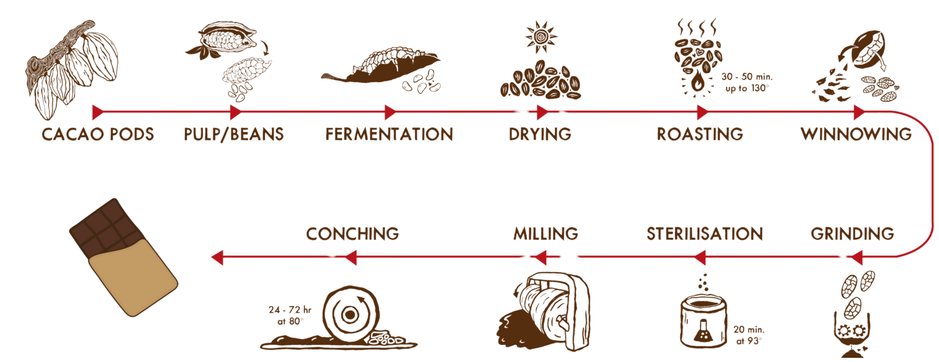
- Select Batch - 2.5 pounds of cocoa
- Hand Separate - Manually separate and weigh nibs & husks
- Record Masses – Note the exact mass of nibs and husks
- Remix – Combine nibs and husks back together
- Winnow – Run the mix through the winnowing machine
- Analyze Output

CFM	Total Mass (oz)	Nib Mass	Mass Loss (oz)
70	20.8	19.5	0.4
80	20.5	19.2	0.3
90	20.2	18.8	0.3
100	19.9	18.3	0.3
110	19.7	17.8	0.3
120	19.4	17.4	0.2
130	19.2	16.8	0.3
140	19	16	0.2
150	18.7	14.7	0.5

Objectives

- Winnowing efficiency
  - Nib and husk turnout efficiency of > 70%
- Grinder pin spacing
- Adjustable fan speed
- Electronic components function within proper voltage and amperage ranges:
  - Motor: 24 volts; < 1 amp
  - Fan: 24 volts; < 1 amp

Bean- to- Bar Process



Market

- One unit cost: $725
- 1.2 billion dollar industry
- Break-even 4 years
- Sell 600 units in year one

Future

- All-in-one bean-to-bar machine
- Smaller
- More affordable
- Household safety

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