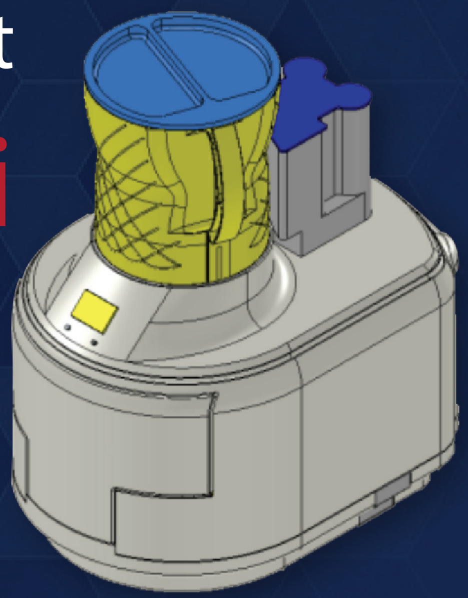
New Product Development

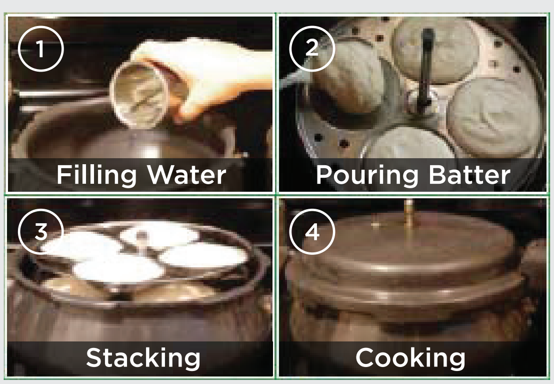
Quidli



Our Goal

Our goal was to develop a product that would automatically produce Idlis, a breakfast staple consumed by most of South India. Today, Idlis are produced by a conventional process that is time consuming, inefficient and wastes water and energy. We successfully designed and built a working prototype of a product named Quidli that is 4 times faster, consumes a quarter of the energy and one-fifth of water of the conventional process.

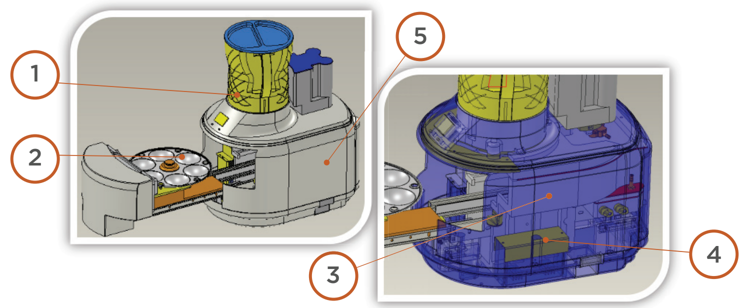
Conventional Cooking



Process	Conventional	Quidli
Cooking Time	20-25 mins	6.5 mins
Energy	400 Watt Hr	100 Watt Hr
Water	500 ml	100 ml

Building the perfect Idli machine wasn't easy, we combined intuition and innovation to perfect the design to international standards. This countertop machine does its magic with less than 1 square foot footprint.

Major Subsystems

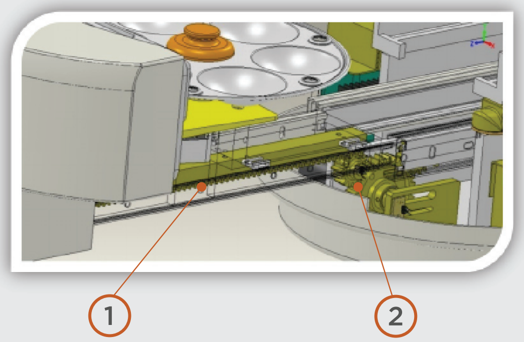


1. Batter Feed Arrangement
2. Tray Carriage System
3. Cooking Chamber
4. Thermal and Electronics Control Systems
5. Monocoque (Housing System)

Top 5 Engineering Challenges

- Footprint for a kitchen countertop appliance
- Optimal use of water and energy
- Automatic batter feeding
- Sequencing the sensor operation right from the Batter flow to cooked idlies in the shortest time
- Integration of mechanisms & Electronics sub-systems within 1 square foot footprint

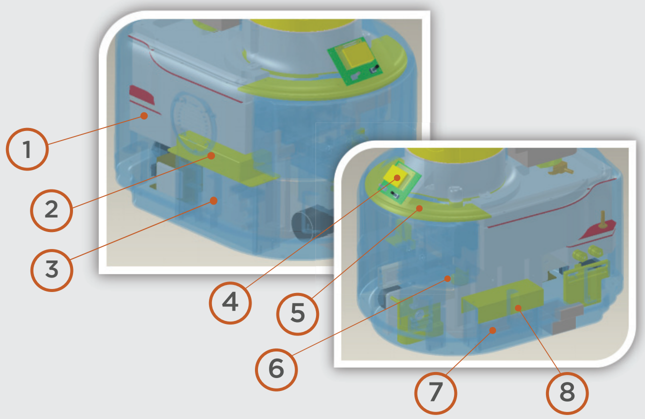
Drivetrain Design



1. Rack
2. Pinion

- Rack positioning was controlled by monitoring the states (on/off) of IR sensors
- A geared motor was used to start and stop the movement of the rack and pinion
- Two pinion design was used to increase the extension length of the drive mechanism for the defined length of the rack

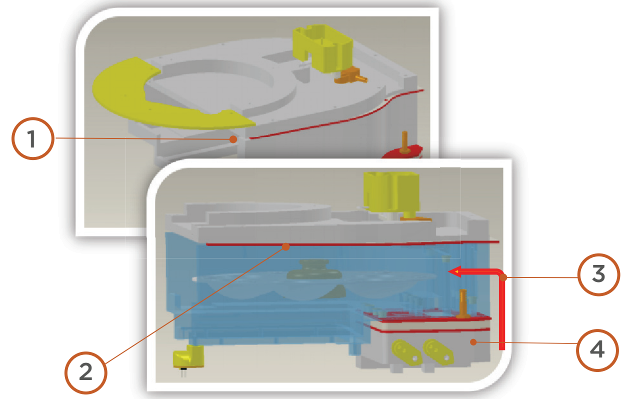
Electronics Packaging



1. Heater
2. Control PCB Cover
3. Control PCB
4. Display PCB
5. Steam Protector
6. IR Holder
7. Heater PCB
8. Heater PCB Cover

- PCB (Control and Heater) placement was finalized after analyzing the mechanical assembly design
- PCBs and IR sensors covered to avoid heat & liquid spills due to condensation

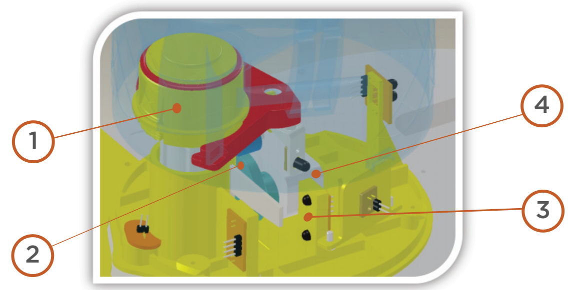
Cooking Chamber Optimization



1. Cooking Chamber
2. Stainless Steel Separator
3. Steam Entry Path
4. Heater

- Volume around the tray (inside the cooking chamber) was optimized by conducting flow analysis
- A convection heat analysis was done on steam flow. This analysis led us to identify the steam entry point and minimize steam loss due to condensation
- To reduce the heat loss due to conduction, a stainless steel separator was used

Controlling the Batter Pour



1. Non Return Valve (NRV)
2. Cam
3. NRV Open/Close IR's
4. D.C. Motor

- NRV actuation controlled by a motor that operates cam & roller
- IR sensors monitor the stroke length of the NRV thereby controlling the NRV open/close
- Batter volume in the Jar controlled by opening an NRV for a defined time by sensing (using IR sensors) whether the cavities are filled

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