

DRAGONFLY DYNAMICS™

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AGENDA

Hedgehog
Concept

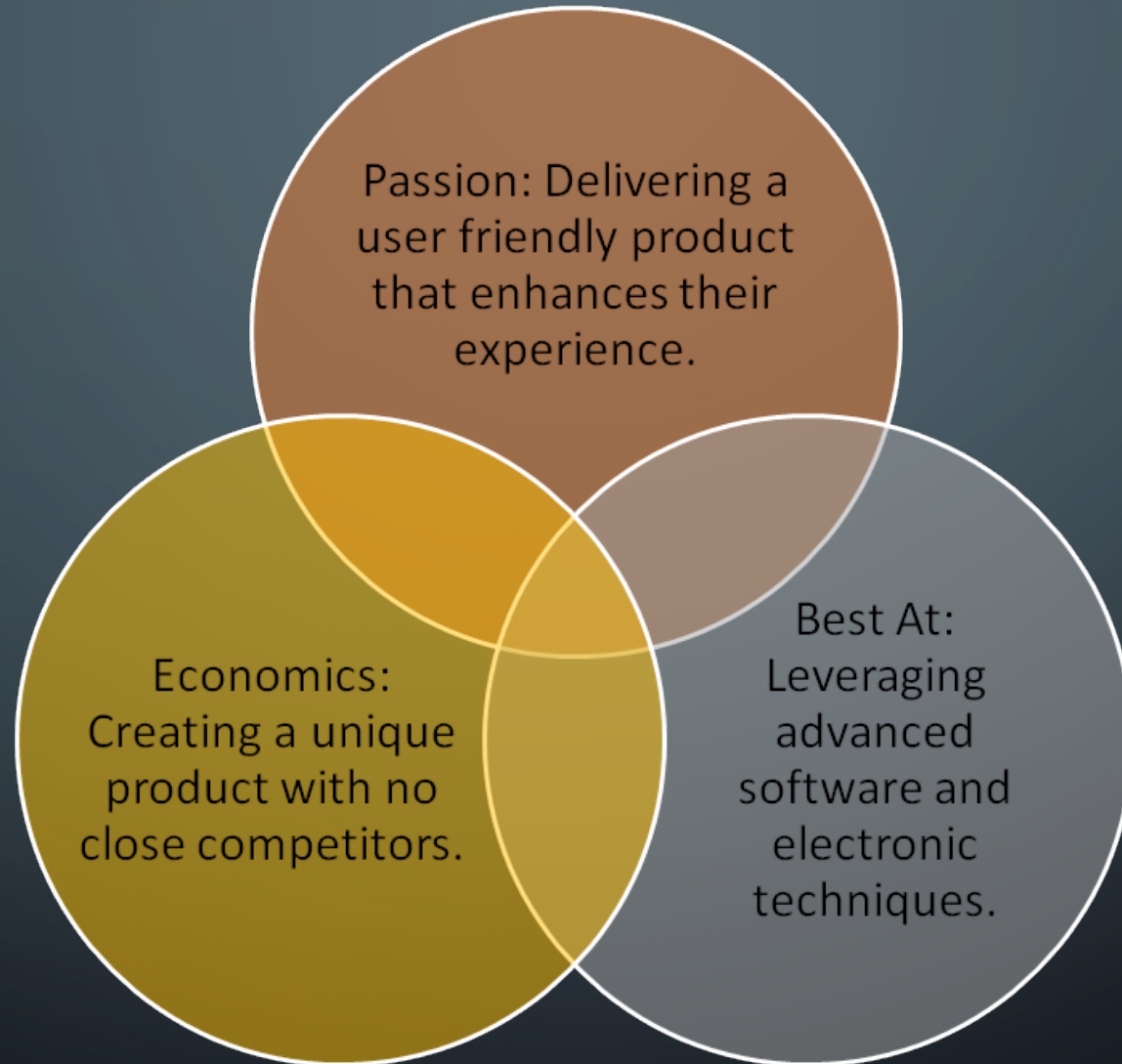
Product
Overview

Evolution

Testing

Cost

HEDGEHOG CONCEPT

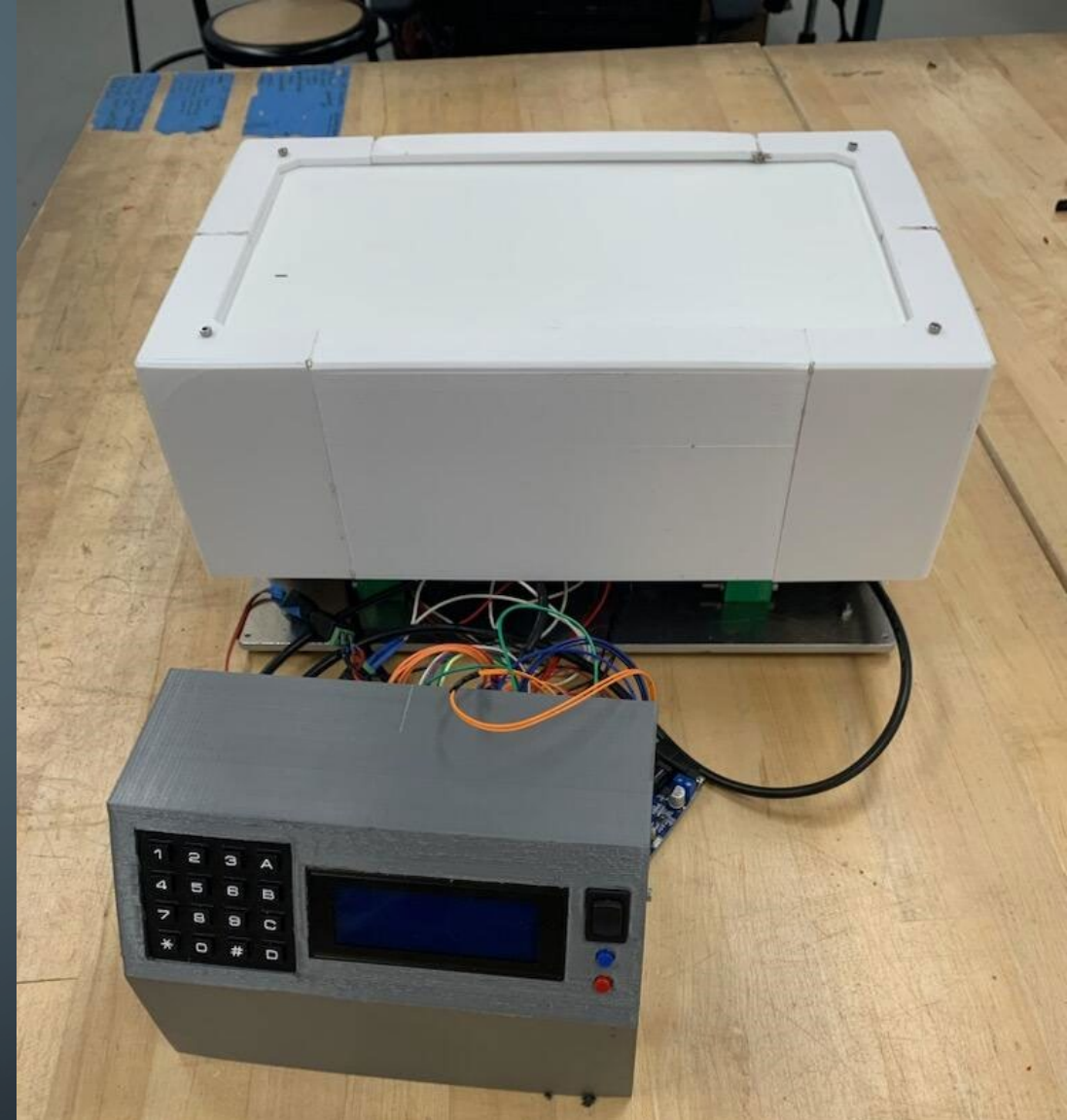


KEY PRODUCT SPECIFICATIONS

- Max Volume: 14" x 9.75" x 7.5"
- Run on a standard wall outlet
- OD/FI capability
- Linear, Orbital, and Double Orbital
- Various Test Tube and Well Plate combinations
- Waterproof
- Temperature Survival Range [4 °C, 70°C]
- Intuitive User Interface
- Rotation speeds of up to 350 RPM and diameter of 25 mm

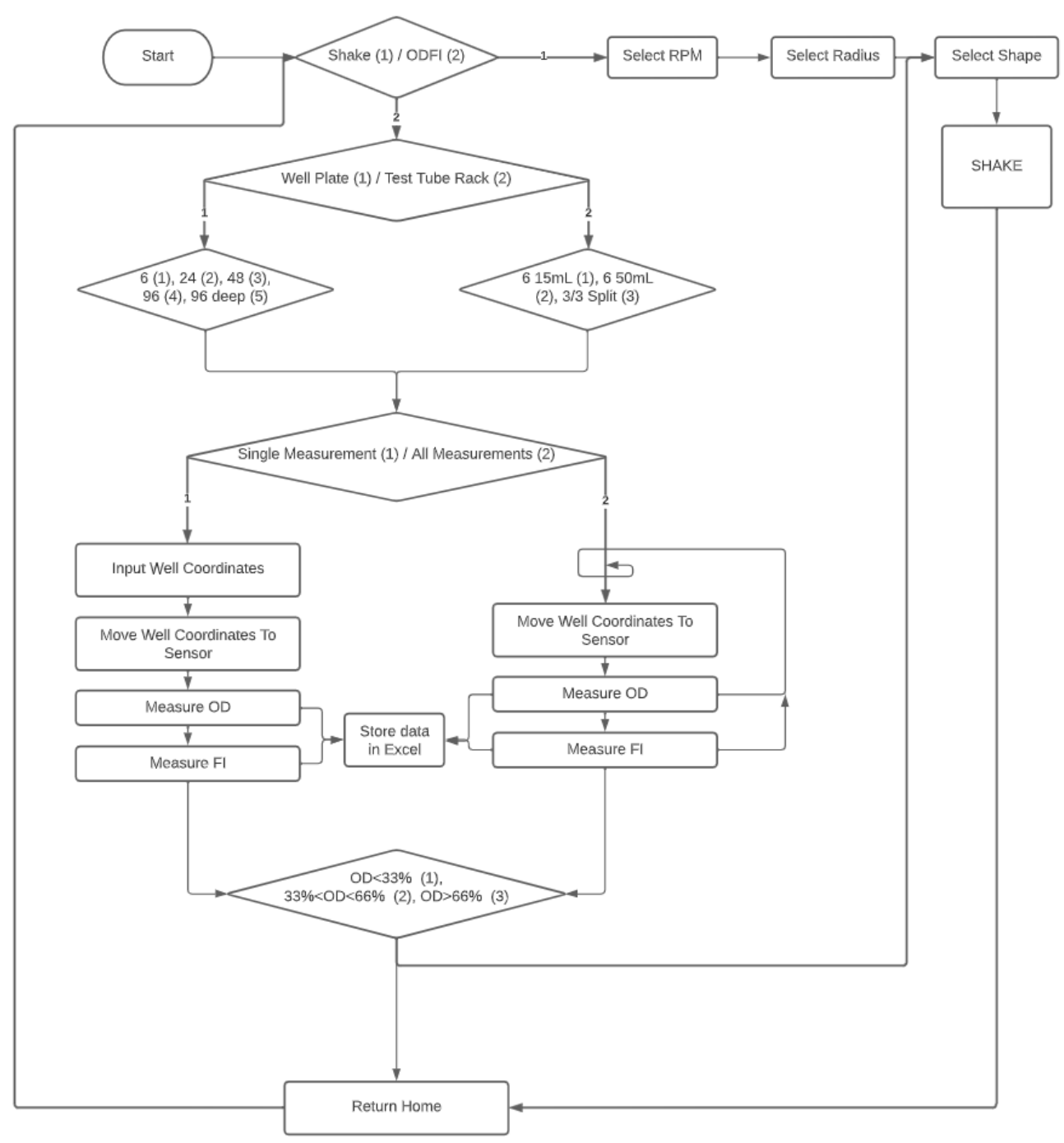
PRODUCT OVERVIEW

- 14" x 9.5" x 7.5"
- Weight: 9.6 lbs
- Linear, Orbital, and Double Orbital Motion
- 100, 200, 300, 350 RPM
- 10, 15, 20, 25 mm
- Various test tube and well plate combinations
- OD/FI
- Capability to individually test all well plates or test tubes

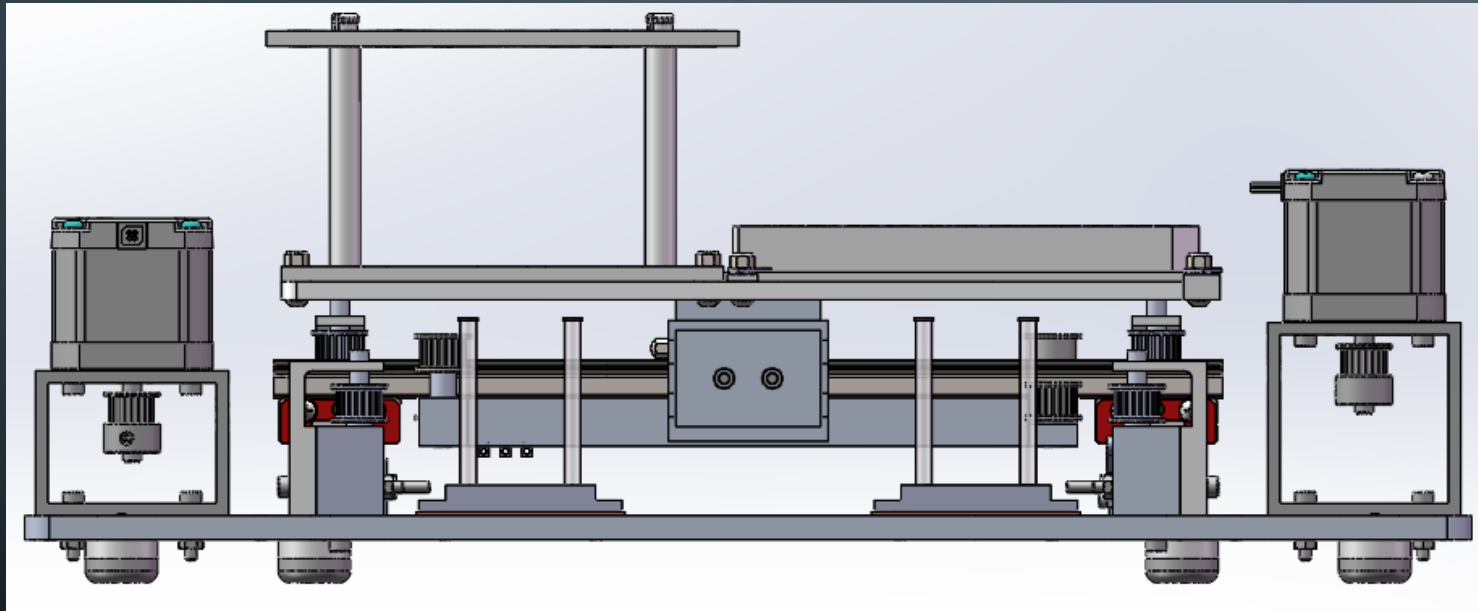


KEY FEATURES

- Intuitive user interface
- Integrated ODFI without robot arm
- Easy removal/addition for ODFI testing
- Table does not “walk”
- Combats drifting



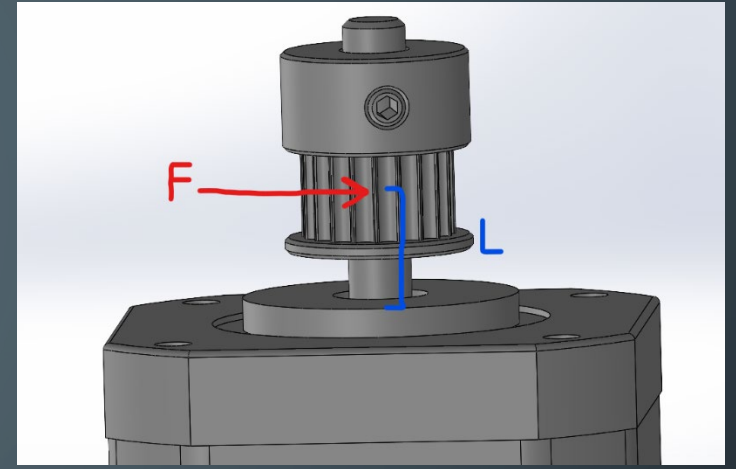
MAJOR DESIGN CHANGES



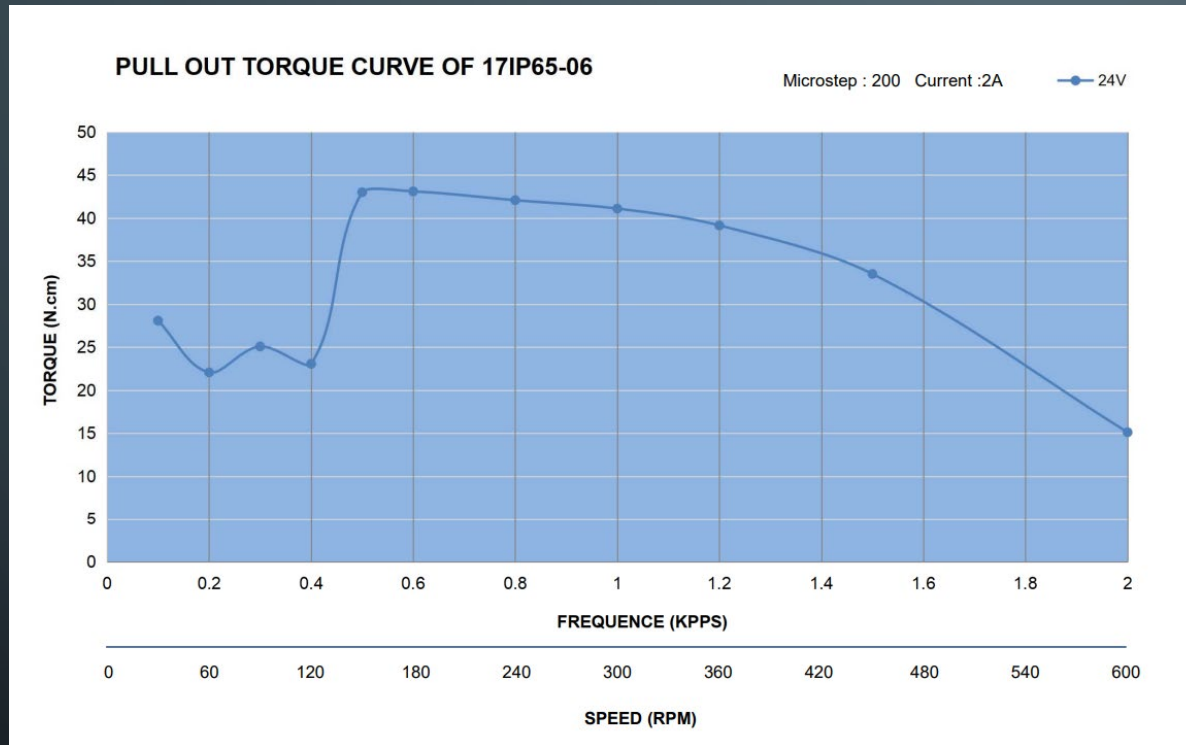
- Decreased vertical profile, decreasing COG
- Altered motor/belt mounting solution, flipping the motors upside down and adding belt idlers to maintain tension
- Added ODFI capabilities
- Added structural support for idlers (no free cantilever beams)
- Significantly reduced noise emitted
- Added integratable outer shell casing

MOTOR ANALYSIS

- Max tension sustainable by Belts 146 N
- $Torque = Force * Distance$
- $Approved\ Torque = 28\ N * 16.2mm = 0.4536\ Nm$
- $Estimated\ Torque = 146\ N * 8.2mm = 1.197\ Nm$



MOTOR ANALYSIS CONT



$$W = (4.7 \text{ kg}) 9.81 \frac{m}{s} = 46.107 \text{ N}$$

$$F_f = \mu F_N = 0.64 (46.107 \text{ N}) = 29.5 \text{ N}$$

$$T = r F_f \sin(\theta)$$

$$T = 0.0125 \text{ m} (29.5 \text{ N}) \sin(90)$$

$$T = 36.875 \text{ N cm}$$

- Max Speed Achievable: 420 RPM

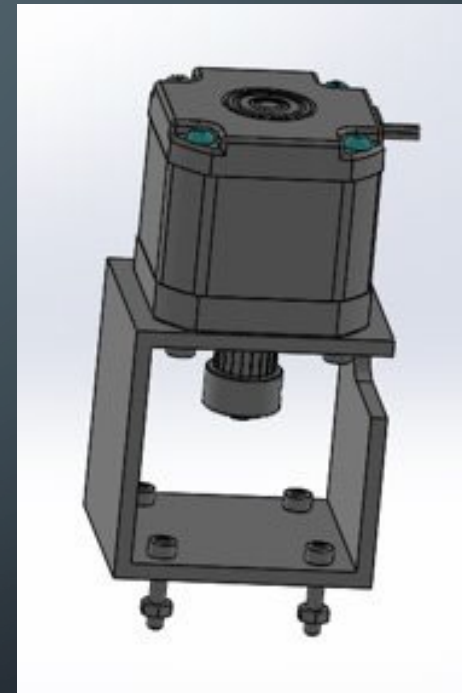
HEAT FLUX

- $Q''_{total} = Q''_{outer} + Q''_{casing} + Q''_{inner}$

	Equation	ABS	Aluminum
Q''_{outer}	$h(T_1 - T_2)$	$1920 \frac{W}{m^2}$	$1920 \frac{W}{m^2}$
Q''_{casing}	$-\frac{k}{L}(T_1 - T_2)$	$114.8 \frac{kW}{m^2}$	$9120 \frac{kW}{m^2}$
Q''_{inner}	$h(T_1 - T_2)$	$1920 \frac{W}{m^2}$	$1920 \frac{W}{m^2}$
Q''_{total}		$118.7 \frac{kW}{m^2}$	$9123.4 \frac{kW}{m^2}$

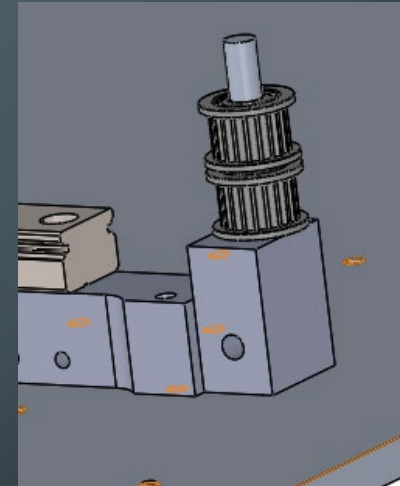
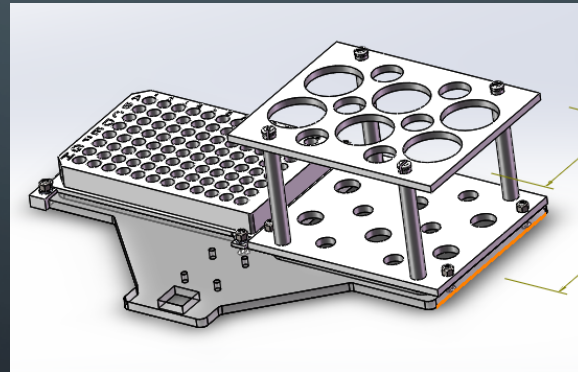
EVOLUTION OF PRODUCT

- Base plate simplified and enlarged
- Height of table lowered (COG lowered)
- Inverted motors and tube stock motor mounts



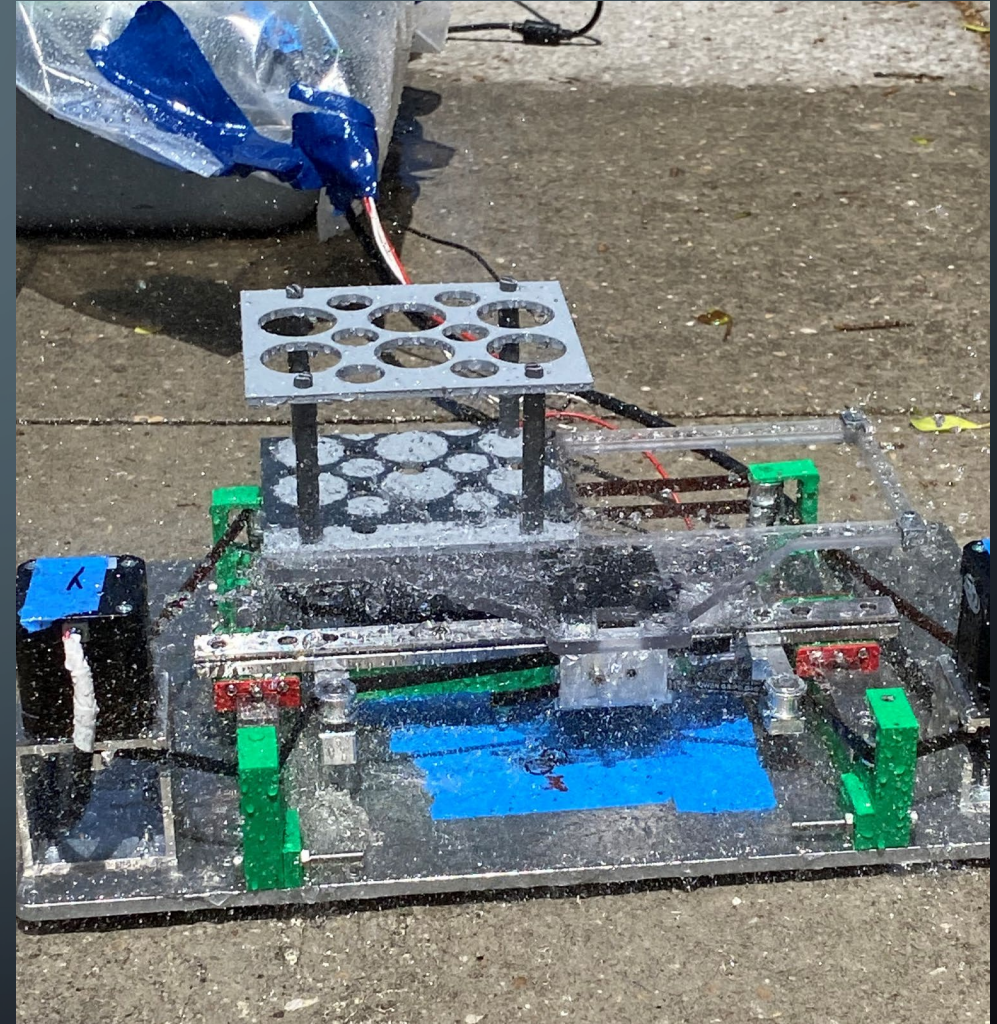
EVOLUTION OF PRODUCT

- Addition of idlers
- Idler support brackets
- Shaker fixture design updated



IP-X5 INFILTRATION TEST

- Water hose with nozzle of 12.5 L/min sprayed at table
- Infiltration lasts for 4 minutes
- Sprayed from 3 meters
- Let table dry for 20 min
- Show shaker works after 20 min rest period
- Test was successful



OD/FI INTEGRATION TEST

Optical Density

- Measure turbidity of milk/water mixture from 0%-0.1% milk to $\pm 15\%$ of full range

Fluorescent Intensity

- Measure concentration any quinine solution in 0.05 M H_2SO_4 background from 0 ppm to 10 ppm to $\pm 15\%$ of full range

COLD SOAK TEMPERATURE TEST

- Test table's functionality under an extreme cold environment
- Mini fridge set to $\sim 4^{\circ}\text{C}$
- Testing runs for 105 minutes
- Run at double orbital pattern at 0.1 Hz
- K-type thermocouple used to read temperature

HIGH TEMPERATURE TEST

- Test table's functionality under an extreme hot environment
- Test oven set to $\sim 70^{\circ}\text{C}$
- Testing runs for 110 minutes
- K-type thermocouple used to read temperature
- Run at overcook speed for 10 min
- Run 100 min in the oven

DROP TEST

- A drop from a ~ 75 cm height
- Only shaker is dropped
- Repair any necessary parts
- Test the 3 types of motion after impact

COST TABLE SUMMARY

	Labor Costs	Manufacturing Costs	Material Costs	OTS Costs	Total Cost
Prototype	N/A	N/A	\$198.69	\$763.77	\$962.46
Production Cost per 1000 Units	\$20/hr	\$120	\$198.69	\$542.38	\$861.07

WHY US



Extremely intuitive user interface



Unique self-reliant product



Provides the user with a superior experience

THANK YOU!

