# Vex Robotics - Reverse Engineering

## Burgess Brothers Appliance: Mini Waffle Maker


## Participants: Emily & Madison

## Team: 98709T

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# Introduction:

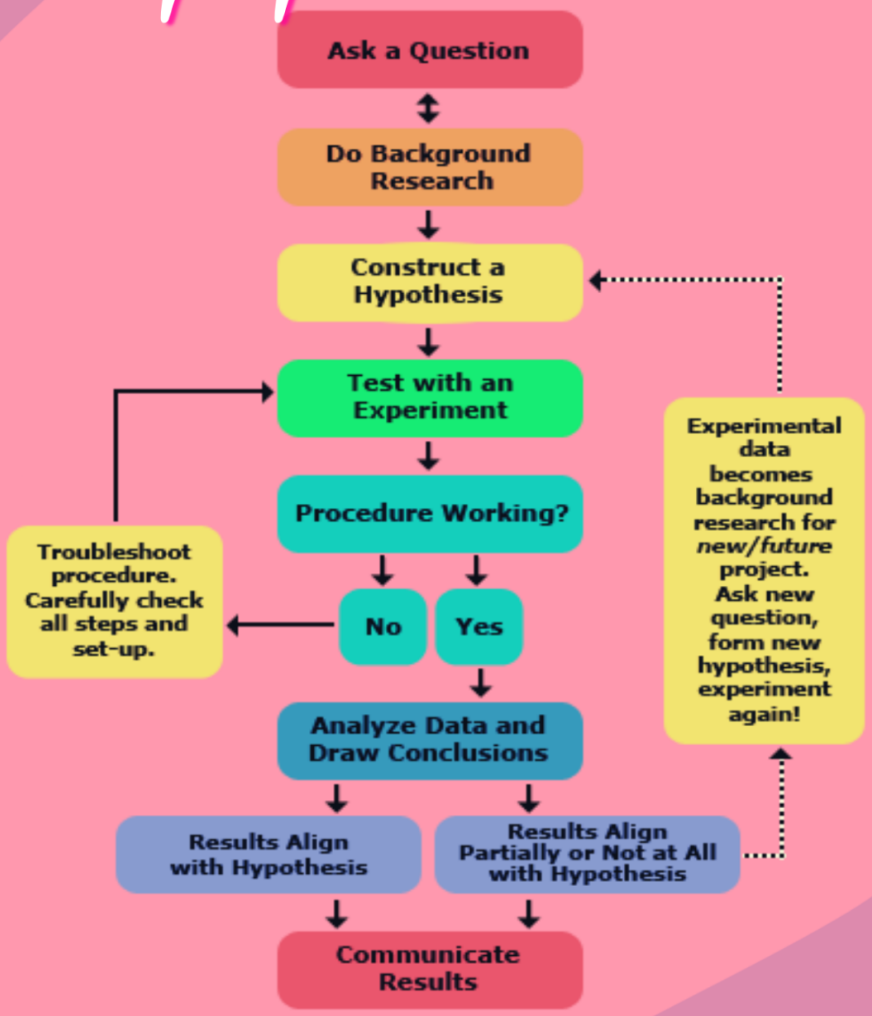
## Meet our team:

There are two female engineers working on our project. On the left is Emily and on the right is Madison. We are in a robotics class at school. Our robotics team has tasked us with the project to compete in the VEX online challenges in hopes to win some money to better our robotics team at school!

## Our idea:

I would like to preface this project by saying, our robotics team LOVES WAFFLES! Whenever our team was brainstorming ideas on what we could reverse engineer, items like radios, phones, and smoke detectors came to mind at first. But suddenly a wave of hunger came over us and we came up with a genius idea: a waffle maker. The day after we received our waffle maker, Emily decided to make waffle batter. So with the help of Madison we tested our waffle maker by making waffles for our team. Therefore, solving two problems at once: our hunger and a VEX project.

# Our Approach

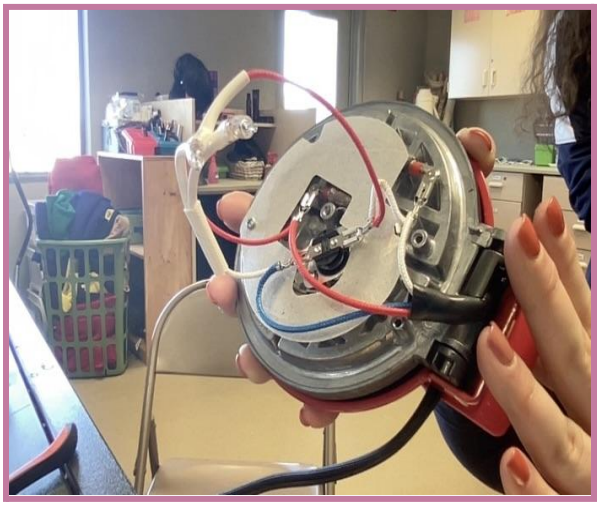


| Parts: | Description: | Size: |
|---|---|---|
| Casing | Red shell that encloses the waffle plate. | Diameter short: 5 in.<br><br>Diameter long: 6 in.<br><br>Height: 3 in. |
| Waffle Plate | Heats up waffle batter and conducts the energy from the heating element. | Diameter: 4 in.<br><br>Height: .5 in. |
| Heating Element | This is the heat source, and it heats the waffle plate up to the perfect temperature. | Length: 10.5 in.<br><br>Height: .2 in |
| Red Electrical Lead | A lead wire is a metal wire connected from the electric pole of an electronics part or an electronic component. The red wire is positively charged and the secondary heat source. | Length: 10 in. |
| Blue Electrical Lead | The blue wire, sometimes a hot wire but changes based on the application, has the | Length: 7 in. |

| | | |
|---|---|---|
| | function of transferring electricity away from the appliance. | |
| White Electrical Lead | The white wire is the "neutral" wire, it takes any electricity that has not been used and sends it back to the breaker panel. | Length: 8 in. |
| Screws | They were used to hold plates together. | Height: .5 cm. / 1 cm. |
| Light Casing | Red and green lights on top of casing that light up when the waffle maker is turned on. | Length: .625 in.<br><br>Height: .1875in. |
| Neon Indicator Lamps (Light bulbs) | Lights up the light casing which lets the chef know the waffle maker is on | Height: .437 in<br><br>Length: .1875 in. |
| Thermal cut out | A fixed temperature disc type safety device that opens the control circuit when it's at set point. | Diameter: 1 in<br><br>Height: .375 in. |
| Thermal Fuse | Fusing temperature is 240 C. It protects electronic elements in the waffle maker from | Length: .5 in.<br><br>Diameter: .0625 in. |

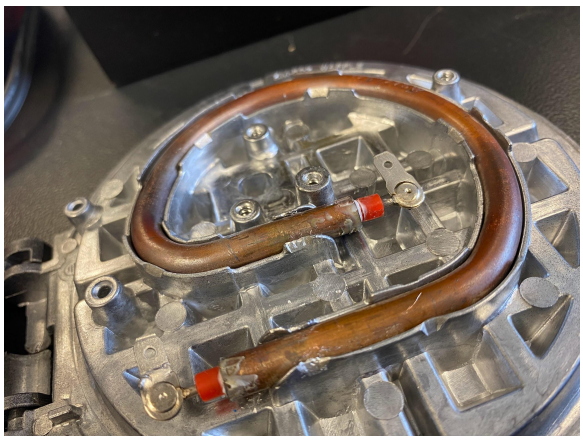
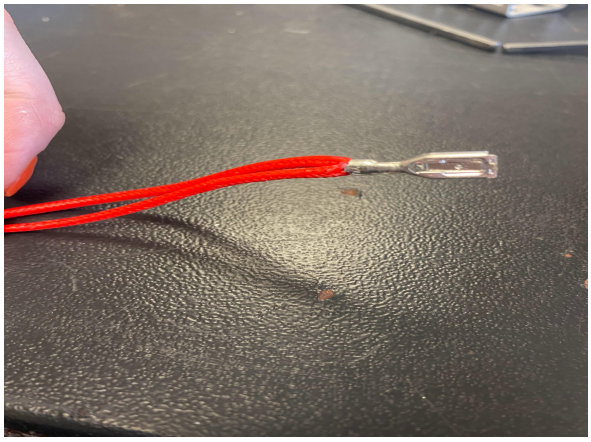
| | | |
|---|---|---|
| | overheating. | |
| Fiber Sleeve | Protection sleeves are commonly used when two fibers are fused/spliced together. The protection sleeve is meant to protect the splice joint and exposed fiber after the splice has been completed. | Diameter: .25 in<br><br>Length: 1 in. |

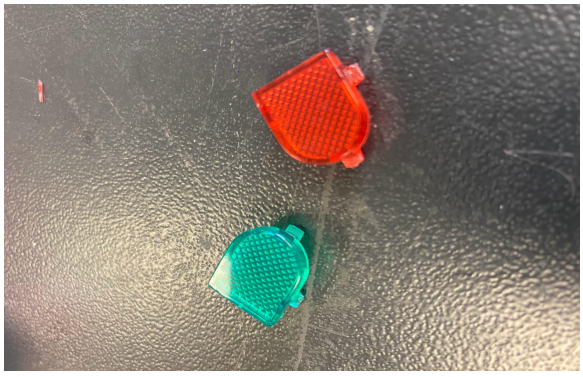
## Insides before deconstruction:

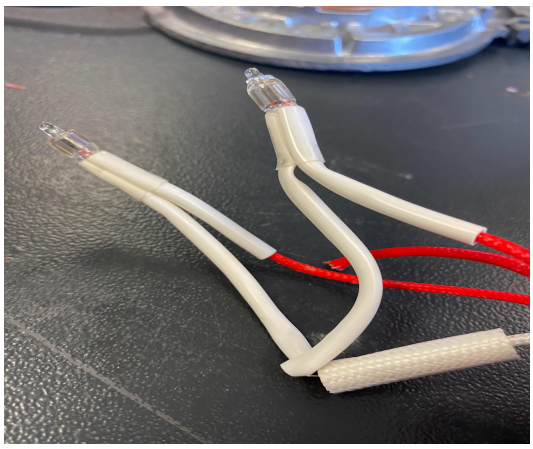


## Outside before deconstruction:

| Parts: | Images: |
| --- | --- |
| Casing |  |
| Waffle Plate |  |

| | |
|---|---|
| Heating Element |  |
| Red Electrical Lead |  |
| Blue Electrical Lead |  |

| | |
|---|---|
| White Electrical Lead |  |
| Screws |  |
| Light Casing |  |

| | |
|---|---|
| Neon Indicator Lamps<br>(Light bulbs) |  |
| Thermal cut out |  |
| Thermal Fuse |  |

| | |
|---|---|
| Fiber Sleeve |  |

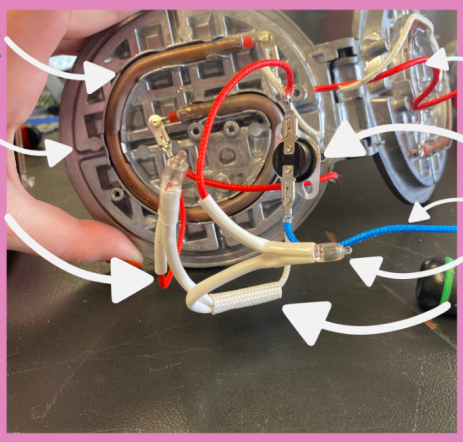
## OUTSIDE


## INSIDE

heating element

waffle plates

white electric lead



red electric lead

thermal cutout

blue electric lead

neon indicator lamps

fiber sleeve

thermal fuse

inside sleeve

## Conclusion:

In conclusion, we learned alot about waffles, and not just how they taste. We learned about circuitry, how to deconstruct electrical components and gained valuable research skills. Going into this project was intimidating but by the support of our team, coach, and helpful engineers we were able to tackle the inner workings of a waffle maker! I appreciate you reading our findings, I hope we made you hungry.

## References:


- All About Circuits
- https://www.webstaurantstore.com/documents/pdf/avantco_panini_manual.pdf
- https://www.swe-check.com.au/editorials/thermal_fuses.php
- https://www.easytechjunkie.com/what-is-a-thermal-cutoff.htm