Spectrum Brands

WE MAKE LIVING **BETTER** AT HOME

Final Presentation

Internship On Demand FA21 Cohort

11/23/2021

Presentation Outline

Module 1: Market Research

1. Project & Meeting Goal
2. Timeline Overview
3. Desirability Research: market/user research review

Module 2: Engineering Research

4. Spectrum ID sketches
5. Functionality identified
6. Feasibility Review
7. Highlight of initial winner

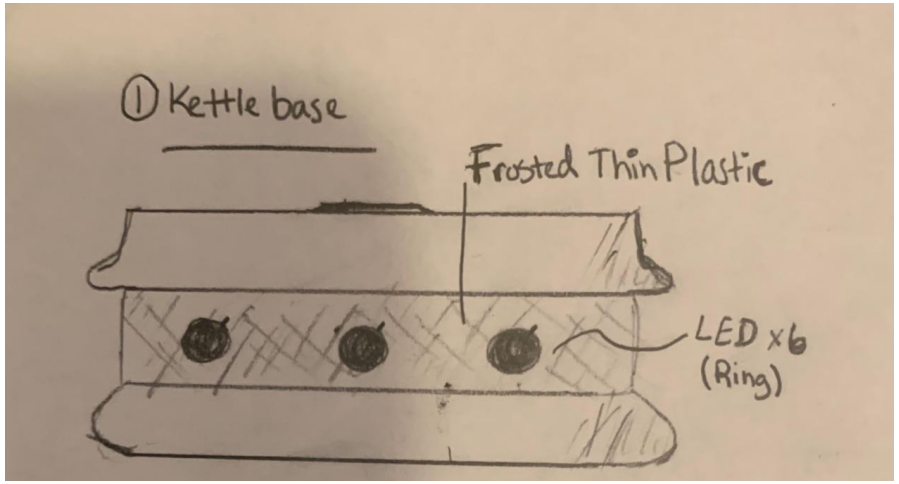
Module 3: Concept Refinement and Solution

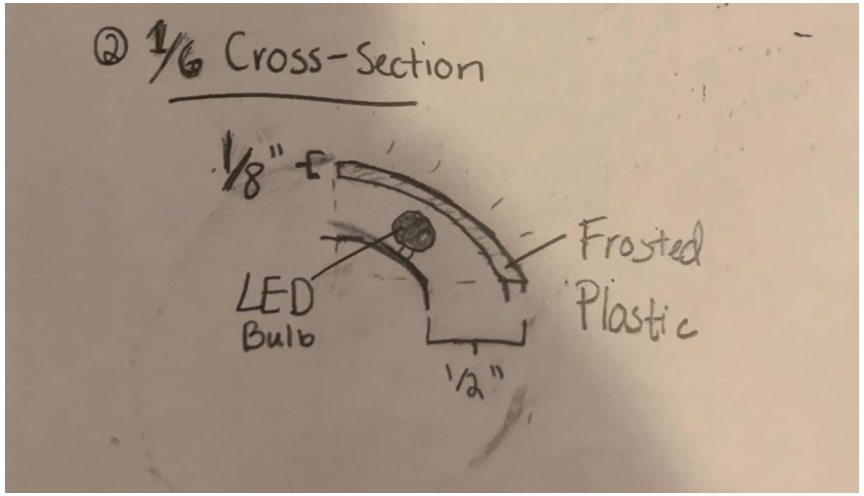
8. Updates based on Progress Update #2
9. Why this concept?
10. Prototype Recommendations
11. Cost Considerations
12. Next Steps

Project & Meeting Goal

- We have completed market research, engineering development and prototyping of a new kettle concept featuring new lighting, which increases the perceived value

- Our team analyzed an original concept, 2 Spectrum ID concepts and an additional hybrid concept to arrive at our final design

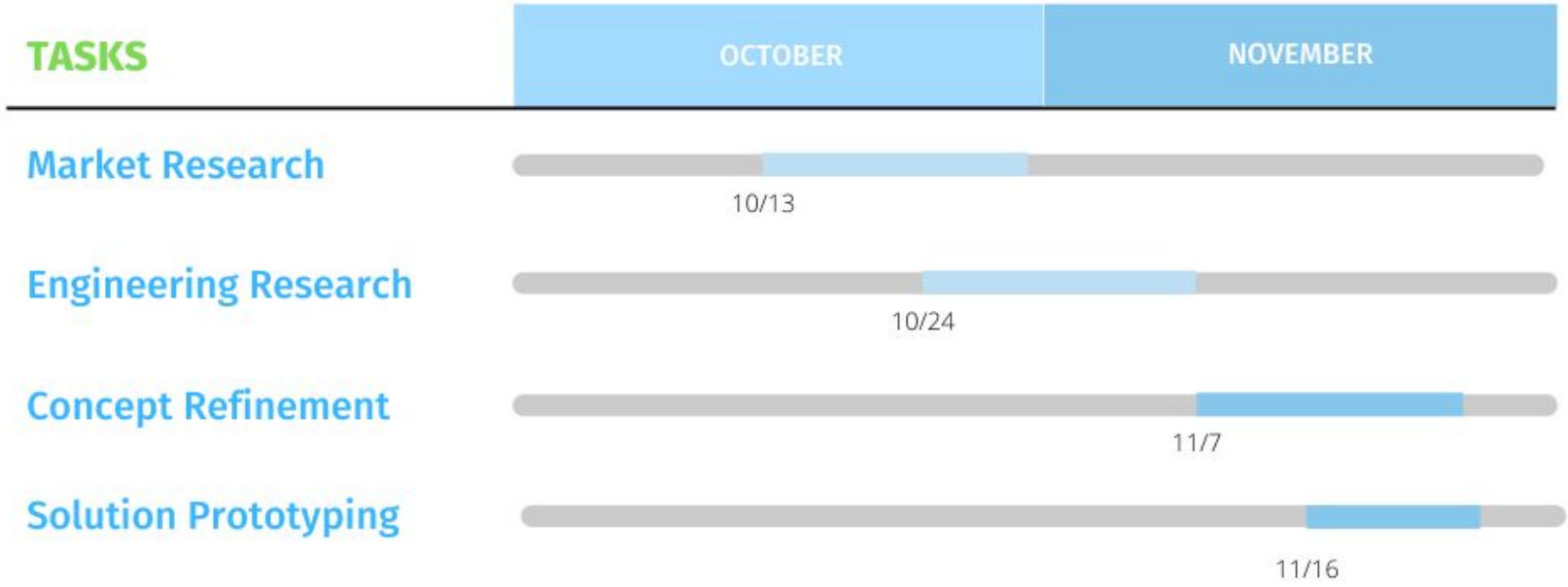




Timeline Overview

Spectrum Brands IOD 2021

PROJECT TIMELINE



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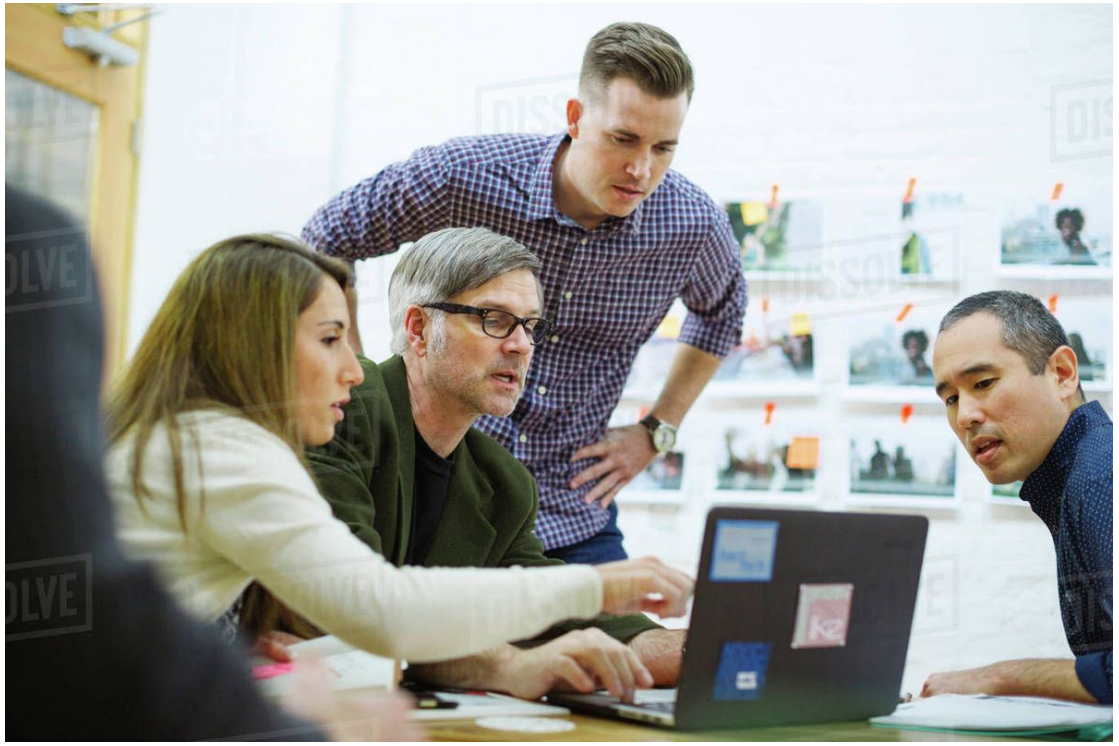
Module 1: Market Research

What are people looking for in a kettle?

Some common themes we found…

- Pleasing aesthetic design
  - Matte solid color or chrome/silver
- Indication of water temperature
- Ability to use in the dark
  - Space illumination
- Easily see the water level



The use of lighting meets all of these customer CTQ needs

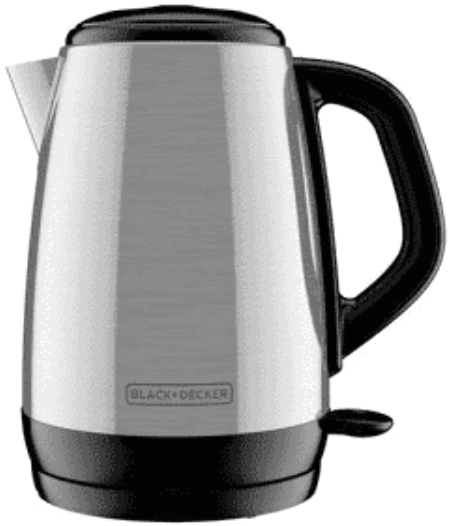
Spectrum Brands Current Kettle Lines

Black and Decker

- 1.7 L Rapid Boil Kettle, $29.99
- 1.7 L Cordless Kettle, $19.99
- Honeycomb 1.7 Cordless Rapid Boil Kettle, $29.99

Russel Hobbes

- 1.0 L Electric Cafe Kettle, $124.99
- 1.7 L Rapid Boil Kettle, $29.99
- 1.7 L Inspire Electric Kettle, $32.99



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Module 2: Engineering Research

Spectrum ID Concepts (Functionality)

Option 1
Lights in bottom of kettle shining down onto the Powerbase.
Lights switch off when kettle is lifted off

Option 2
Lights in the powerbase and the powerbase can
keep lights switched on when the kettle is lifted off

Spectrum ID Concepts (Aesthetics / Mock Line)

Functional Decomposition

- Analyzed the required functions using our knowledge from the product teardown
- Decided on 8 key functions
  - Brainstormed 3 solutions

Using these key functions and solutions, we created our 3 concepts to evaluate with a pugh matrix

Give user info through light	Transfer light	Power transfer	Doesn't impede functionality
Turn on light brighter as the water temperature rises	Light pipe	Power cord to base of kettle	Circuit for light does not interfere with heating element(isolated/ parallel connection)
When the kettle is connected, turn one color. Once boiling, turn another color	Mirror	Solar panel	Only take advantage of non-occupied space/not removing any preexisting internals
Change color as the water temperature rises	Clear window in front of LED strip	Internal batteries could be rechargeable from wall or replaceable	Single source light
Waterproofing of lights	**Activation of lights**	**Diffusion Method**	**Proper lighting in the dark**
Sealed light pipes to surface of base	When kettle is connected to base lights turn on	Use a diffuser	Integrate a dim light feature when the kettle is left idle
Clear shell/window where you want the light to escape	Switch on base that turns lights on/off	No diffuser	Ambient lighting that is always on when base is plugged in
Vacuum sealed enclosure	External power button	End of light tube is a cone	Extra bright lighting when outside is dark

Early Concepts

1. **Lights outside bottom of kettle (Spectrum ID #1)**
2. **Lights outside of powerbase (Spectrum ID #2)**
3. **Lights inside kettle and outside bottom of kettle**

By evaluating the solutions to our identified functions, we were able to create these three unique concepts using the solution sets.

CONCEPT 1: Lights outside bottom of kettle (Spectrum ID #1)

Give user info through light	Transfer light	Power transfer	Doesn't impede functionality
Turn on light brighter as the water temperature rises	Light pipe	Power cord to base of kettle	Circuit for light does not interfere with heating element(isolated/ parallel connection)
When the kettle is connected, turn one color. Once boiling, turn another color	Mirror	Solar panel	Only take advantage of non-occupied space/not removing any preexisting internals
Change color as the water temperature rises	Clear window in front of LED strip	Internal batteries could be rechargeable from wall or replaceable	Single source light
Waterproofing of lights	**Activation of lights**	**Diffusion Method**	**Proper lighting in the dark**
Sealed light pipes to surface of base	When kettle is connected to base lights turn on	Use a diffuser	Integrate a dim light feature when the kettle is left idle
Clear shell/window where you want the light to escape	Switch on base that turns lights on/off	No diffuser	Ambient lighting that is always on when base is plugged in
Vacuum sealed enclosure	External power button	End of light tube is a cone	Extra bright lighting when outside is dark

CONCEPT 2: Lights outside of powerbase (Spectrum ID #2)

Give user info through light	Transfer light	Power transfer	Doesn't impede functionality
Turn on light brighter as the water temperature rises	Light pipe	Power cord to base of kettle	Circuit for light does not interfere with heating element(isolated/ parallel connection)
When the kettle is connected, turn one color. Once boiling, turn another color	Mirror	Solar panel	Only take advantage of non-occupied space/not removing any preexisting internals
Change color as the water temperature rises	Clear window in front of LED strip	Internal batteries could be rechargeable from wall or replaceable	Single source light
Waterproofing of lights	**Activation of lights**	**Diffusion Method**	**Proper lighting in the dark**
Sealed light pipes to surface of base	When kettle is connected to base lights turn on	Use a diffuser	Integrate a dim light feature when the kettle is left idle
Clear shell/window where you want the light to escape	Switch on base that turns lights on/off	No diffuser	Ambient lighting that is always on when base is plugged in
Vacuum sealed enclosure	External power button	End of light tube is a cone	Extra bright lighting when outside is dark

CONCEPT 3: Lights inside kettle and outside bottom of kettle

Give user info through light	Transfer light	Power transfer	Doesn't impede functionality
Turn on light brighter as the water temperature rises	Light pipe	Power cord to base of kettle	Circuit for light does not interfere with heating element(isolated/ parallel connection)
When the kettle is connected, turn one color. Once boiling, turn another color	Mirror	Solar panel	Only take advantage of non-occupied space/not removing any preexisting internals
Change color as the water temperature rises	Clear window in front of LED strip	Internal batteries could be rechargeable from wall or replaceable	Single source light
Waterproofing of lights	**Activation of lights**	**Diffusion Method**	**Proper lighting in the dark**
Sealed light pipes to surface of base	When kettle is connected to base lights turn on	Use a diffuser	Integrate a dim light feature when the kettle is left idle
Clear shell/window where you want the light to escape	Switch on base that turns lights on/off	No diffuser	Ambient lighting that is always on when base is plugged in
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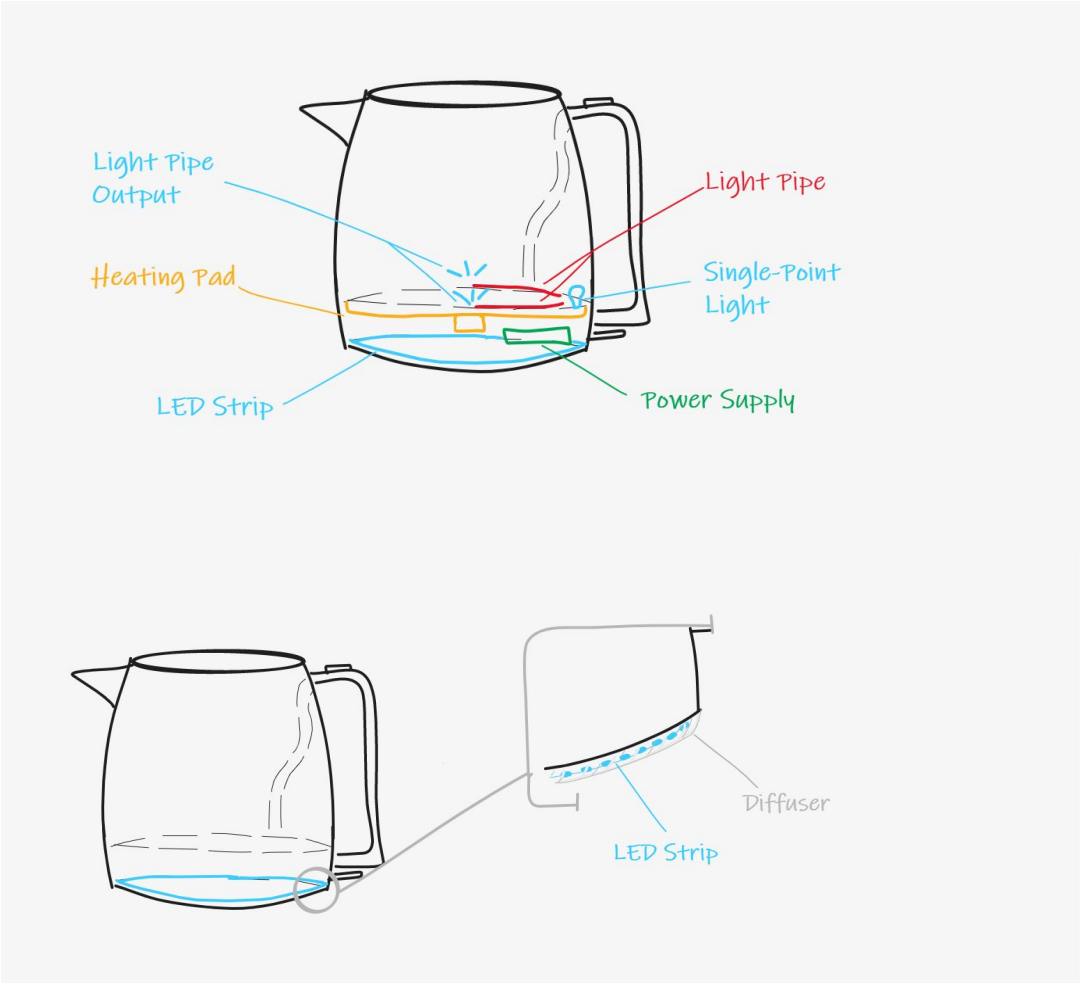
Initial Pugh Matrix Build

Criteria	Weight	Lights outside	Lights in powerbase	Lights inside/ outside	Lights outside	Lights in powerbase	Lights inside/ outside
Safety	5	1	1	0	5	5	0
Ergonomics	4	0	0	1	0	0	4
Cost	1	0	1	-1	0	1	-1
Design Complexity	2	0	1	-1	0	2	-2
Aesthetics / Visuals	5	0	0	1	0	0	5
Novelty	3	0	-1	1	0	-3	3
Information Display	4	0	-1	1	0	-4	4
Feasibility	3	0	0	-1	0	0	-3
Total					5	1	10

Pugh Matrix Iteration 1 Winning Concept

Concept 3

- Lights inside and outside kettle
- Hybrid design to enhance functionality



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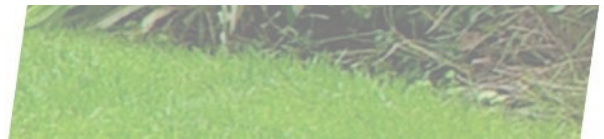
Module 3: Concept Refinement & Solution



After Progress Update #2

- Revisited cost on Pugh Matrix to weigh it correctly
- Reconsidered our constraints and goals to arrive at the optimal solution
- Streamlining and refining the design
  - Old design iterations suffered from functionality bloat
  - Tried to fulfill all of customer wants with individual components
    - Some components can be combined to fulfill consumer need (ex. water temperature and notification of boiling completion can be done with a single light rather than multiple components)
  - Changed components such as light piping to LED strip with frosted glass

Revised Pugh Matrix

Criteria	Weight	Lights outside	Lights in powerbase	Lights inside/ outside	Lights outside	Lights in powerbase	Lights inside/ outside
Safety	5	1	1	0	5	5	0
Ergonomics	4	0	0	1	0	0	4
Cost	5	0	1	-1	0	1	-5
Design Complexity	2	0	1	-1	0	2	-2
Aesthetics / Visuals	5	0	0	0	0	0	0
Novelty	3	0	-1	1	0	-3	3
Information Display	4	0	-1	1	0	-4	4
Feasibility	3	-1	0	-1	-3	0	-3
Total					2	5	1

Implementation Considerations

Light Piping

- Not Practical Independently

Premade LED Strip

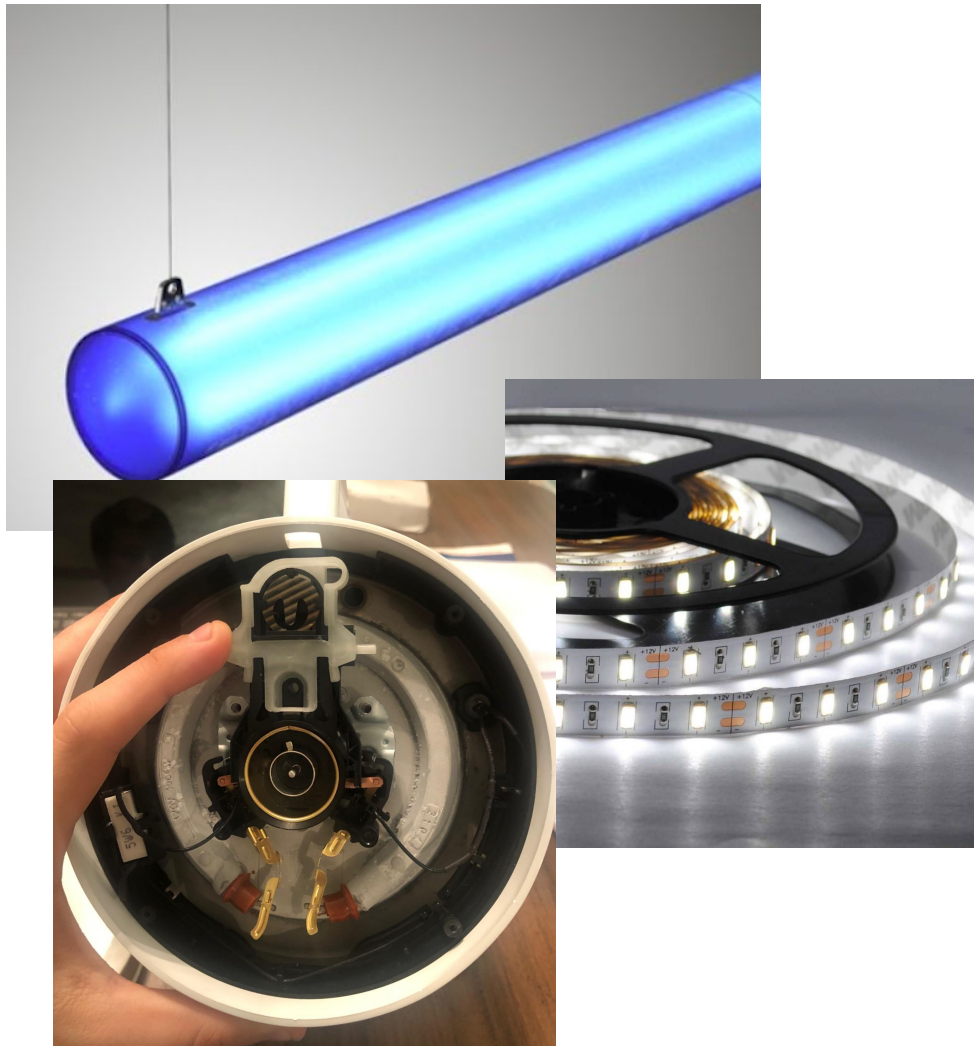
- Practical But Costly

Custom LED Circuit

- Practical And Cheap

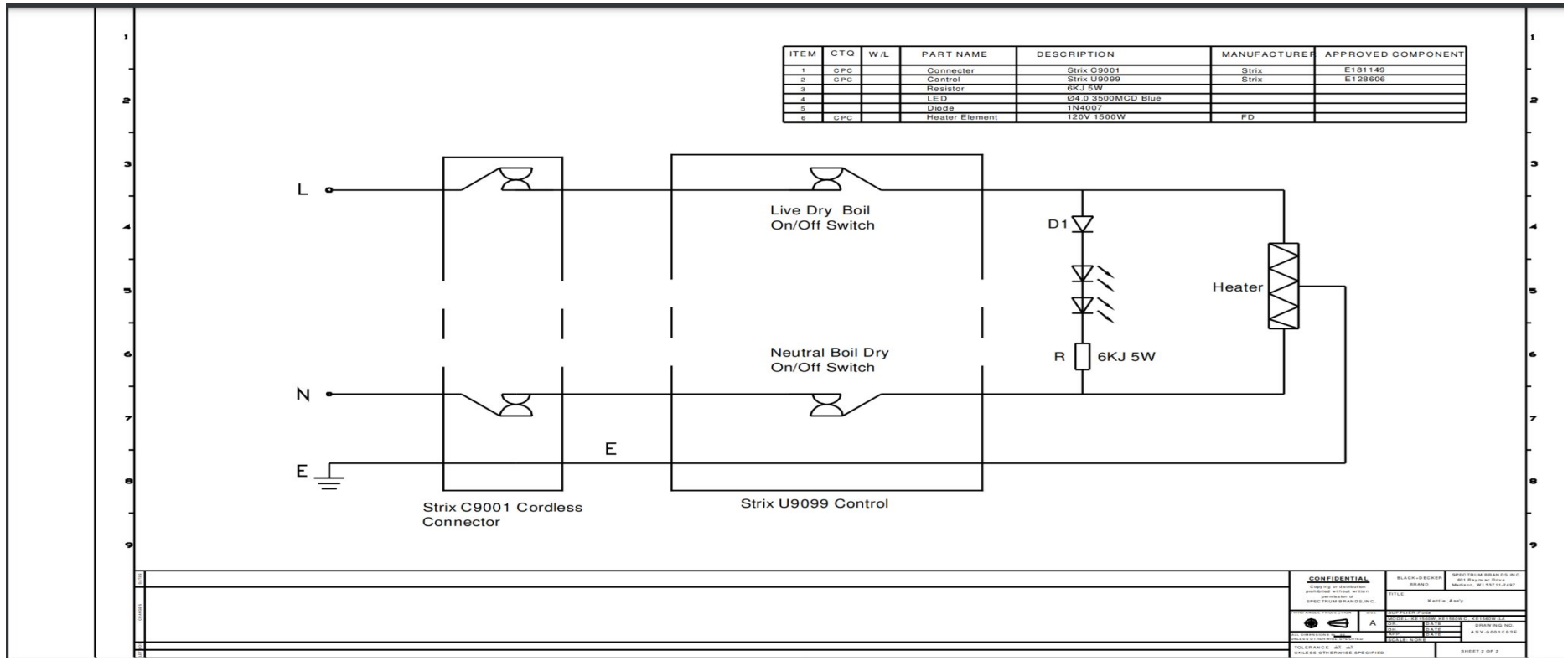
Late Consideration

- Combine Light Piping and LED Circuit
  - Cut number of LEDs in half



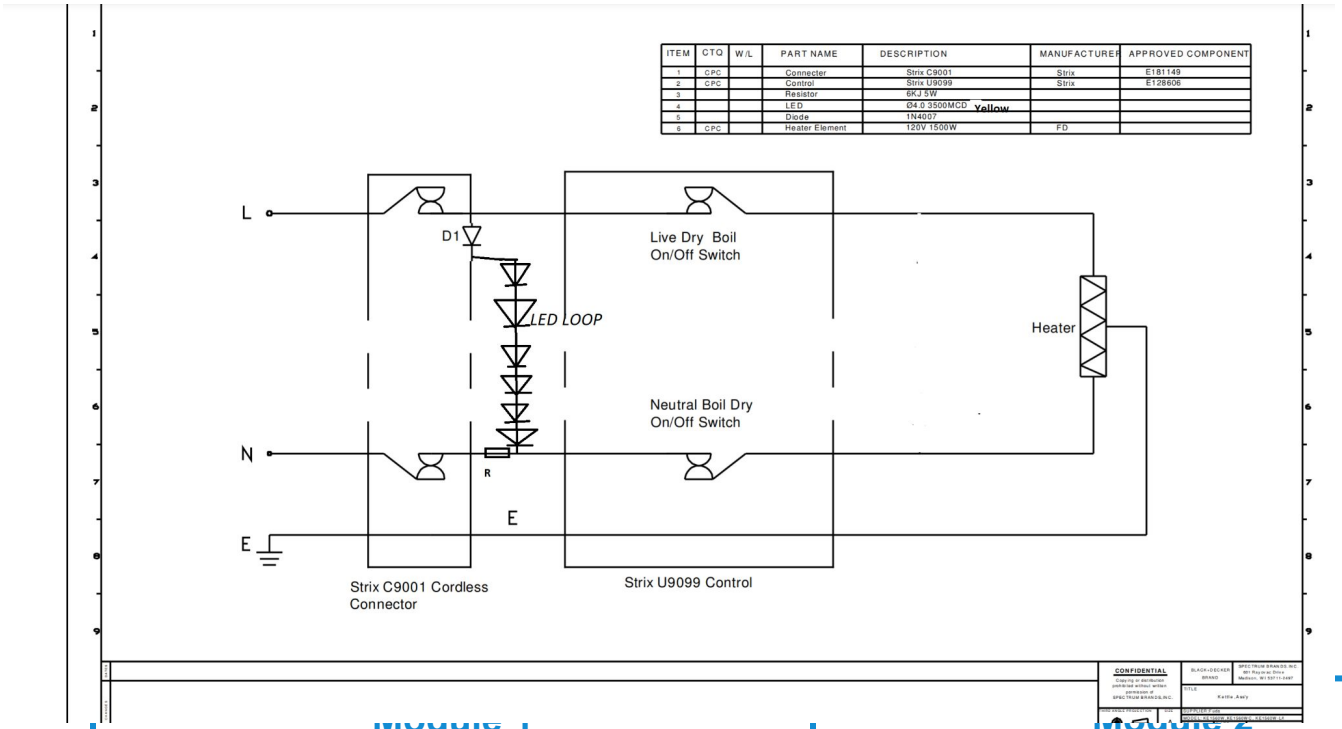
Old Circuit

- Assume same circuit in new kettle



NEW Circuit

- 6 LEDs in series around the power base with 12V drop total across them (2V each) for yellow LEDs (color from model)
- Heater still consumes 1500W at 120V so 12.5 amps current draw(Russell hobbs website)
- Resistor in series with LED strip to maintain current level and prevent to much current
- Diode before the loop to act as a half wave rectifier so only positive half of AC current and voltage pass.



Bill of Materials

Quantity Per Assembly	Part Name	Prototype Cost	Production Cost
1	6 Bulb LED Strip	$5	$1.25
1	Frosted Plastic	$3	$0.75
1	Wire	$3	$0.75
2	Resistors	$2	$0.50
Total Cost		**$13**	**$3.25**

Prototype Recommendation

- What does your team see as the most pressing technical or aesthetic hurdle?
  - Refine the circuit either for 220V or 120V input
  - Need to add lighting functionality that looks good and provides information to consumer while also not increasing the cost of the kettle by too much
  - Color of LEDs
- How could you most effectively test your hypothesis?
  - Hands-on prototyping: creating and testing various designs for lighting
- Draw out, plan out, and cost your prototype.
  - How can we test our proposed light ring?
    - Build only the circuit for the power base to test functionality or run a simulation.

WHY our kettle?

- Most cost effective
- Price perception maximizing aesthetics
- Similar circuit as before so we know it is functional and similar in complexitivity

Next Steps

- With more time and money, our focus would be on creating a physical prototype
  - Help understand any other engineering issues (wiring, component spacing, etc.)
  - Get an exact measure of cost and functionality
  - Allows us to tweak any questions that we have lingering ie.
    - How many lights are optimal?
    - What color of light is the best?
    - How thick does the plastic need to be?
    - What color of plastic is most effective?
    - Does our product hold up in testing to the industry standard?
    - Circuit design questions ie resistor/LED characteristics
- If we had additional time we could explore and answer these questions to create a high quality prototype and eventually a final product

Summary

What was hard and what was easy about the project?

- Difficulties in project direction and frequent communication given the online-based nature of this project
- Because each person was willing to communicate and put in effort doing the project as a group made things easier

Anything you would've changed about your project

- Having a clearer project timeline from the start would have been very helpful
  - A preliminary in-depth meeting with IOD or Spectrum to go over project goals would have allowed the team to draw out a comprehensive timeline. Our team struggled to understand the smaller goals that we set throughout the project.
  - Creating timelines for each meeting would have netted more efficient and productive meetings

What did you have to leave out?

- Some of the more ambitious design plans got out of hand and there was not enough time to refine them

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Questions

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Thanks to Mark, Dave and the Spectrum team

As well as Keegan, Ryan and the IOD team