



# **YAMAHA RightWaters Trash Interceptor**

Jonathan Draigh | Emily Haggard | Mohamad Kassem | Martin Senf | Andrew Walker

# T518 Team Introductions

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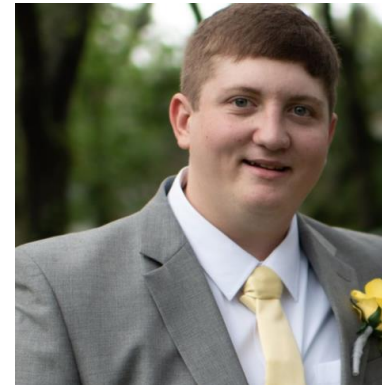
Jonathan Draigh  
**Materials Engineer**



Martin Senf  
**Manufacturing Engineer**



Emily Haggard  
**Fluids Engineer**



Andrew Walker  
**Manufacturing Engineer**

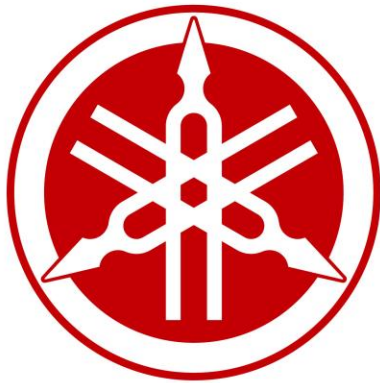
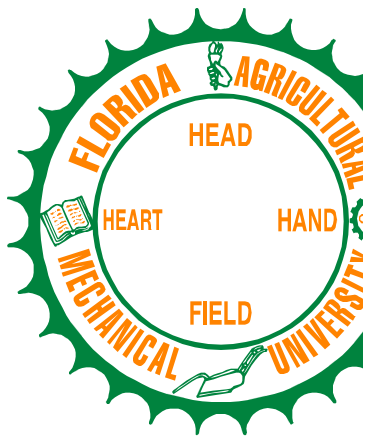


Mohamad Kassem  
**Controls Engineer**

Martin Senf

# Sponsor and Advisor

John O'Keefe



**YAMAHA**

Engineering Mentor

John O'Keefe

*Yamaha Motors*

Shayne McConomy



Academic Advisor

Shayne McConomy, Ph.D.

*Senior Design Professor* Martin Senf



# Objective

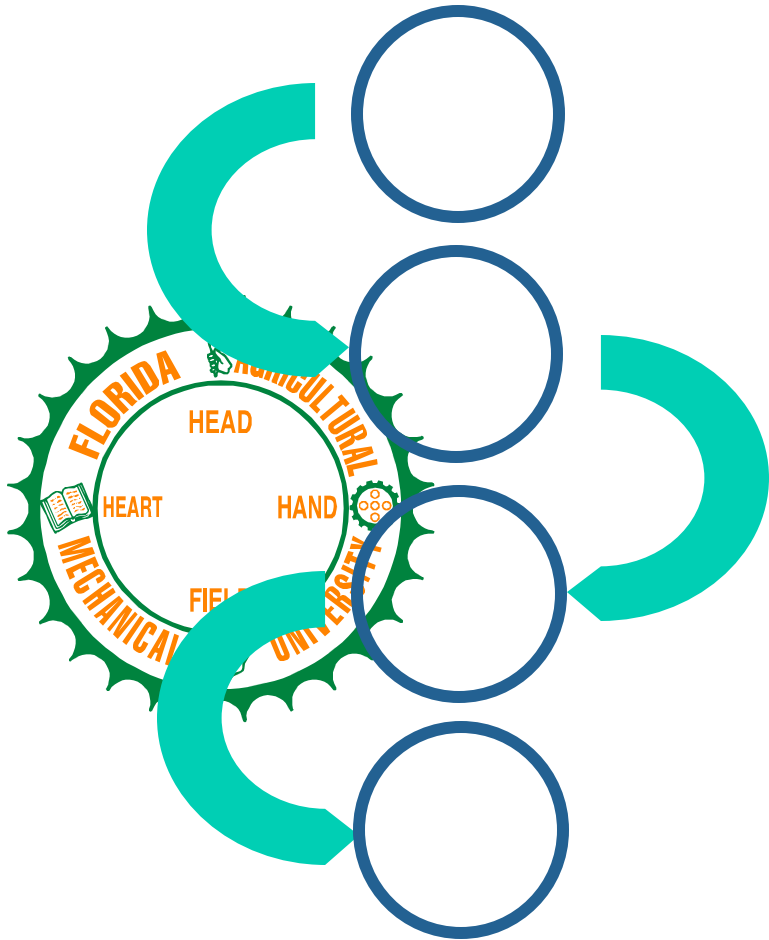
To implement an effective land-based trash interceptor, collecting debris – primarily plastic wastes – in storm drains before being released into bodies of water



Martin Senf



# Key Goals

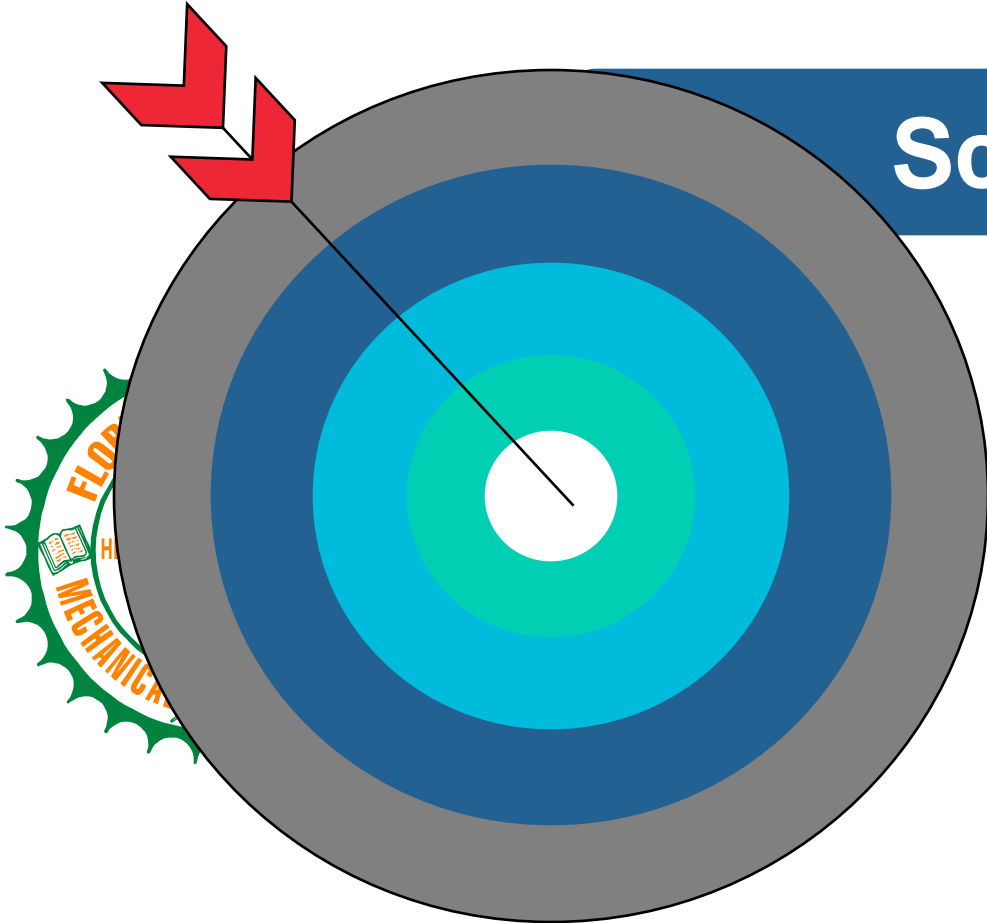


- **Scalable** - Allows the device to fit in various sized storm drains
- **Expendable** - Allows the device to be inexpensive and can be replaced if damaged
- **Economical** - Inexpensive to ensure that it can be bought by a larger market
- **Deployable** - Will be easily deployed by skilled contractors

Martin Senf

# Targets and Metrics

Scalability



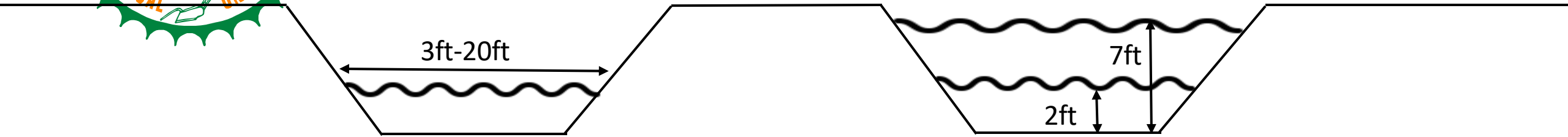
Martin Senf

# Scalability Metrics



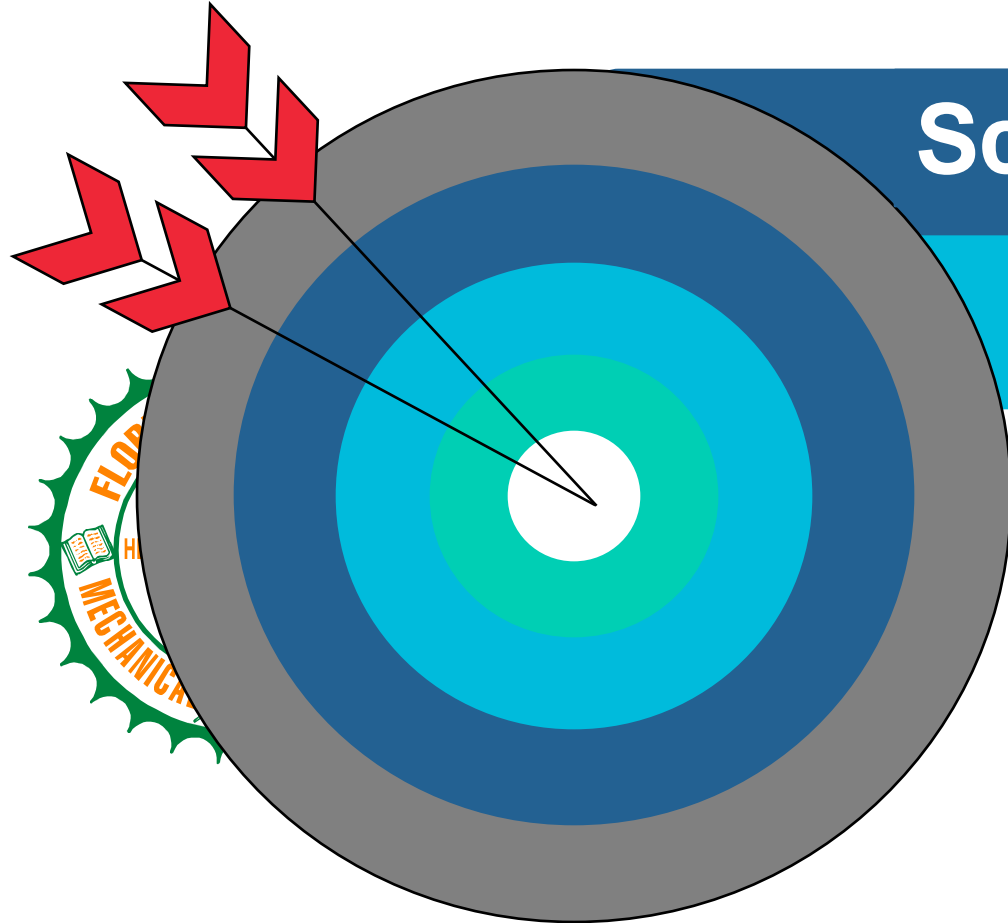
**Horizontal Expansion**  
3ft – 20ft

**Vertical Expansion**  
2ft – 7ft



Martin Senf

# Targets and Metrics



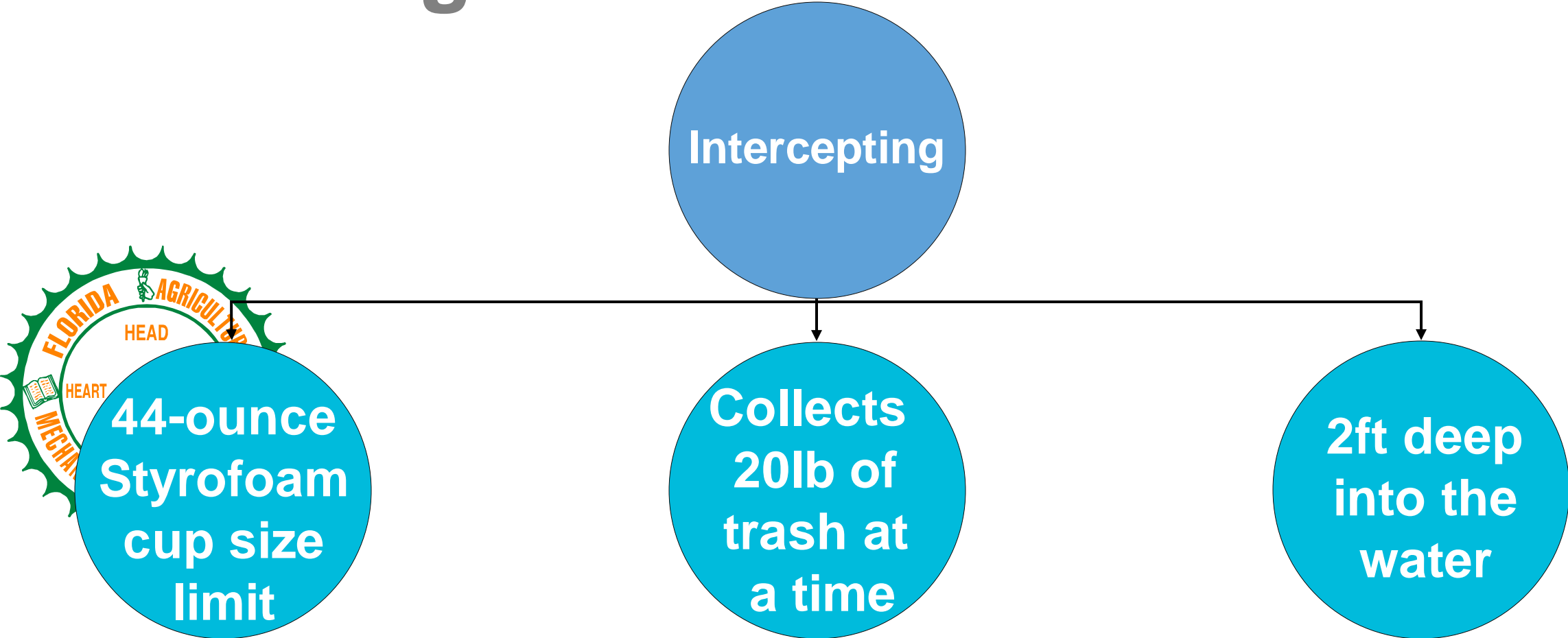
Scalability

Collecting

Martin Senf

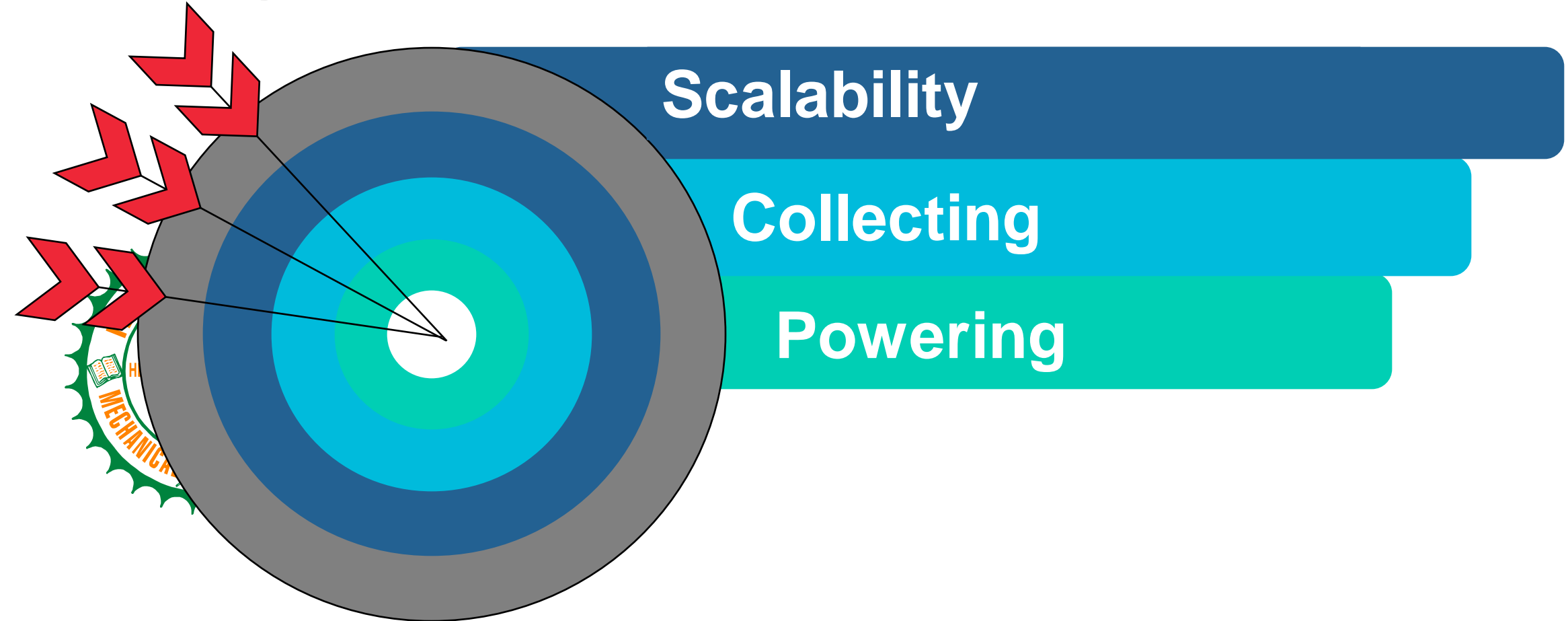


# Collecting Metrics



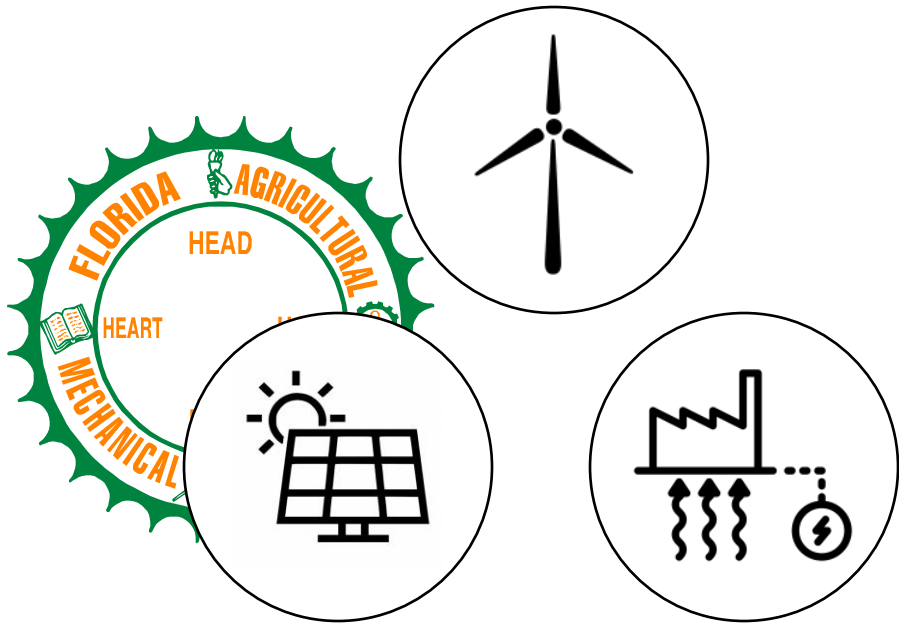
Martin Senf

# Targets and Metrics



Martin Senf

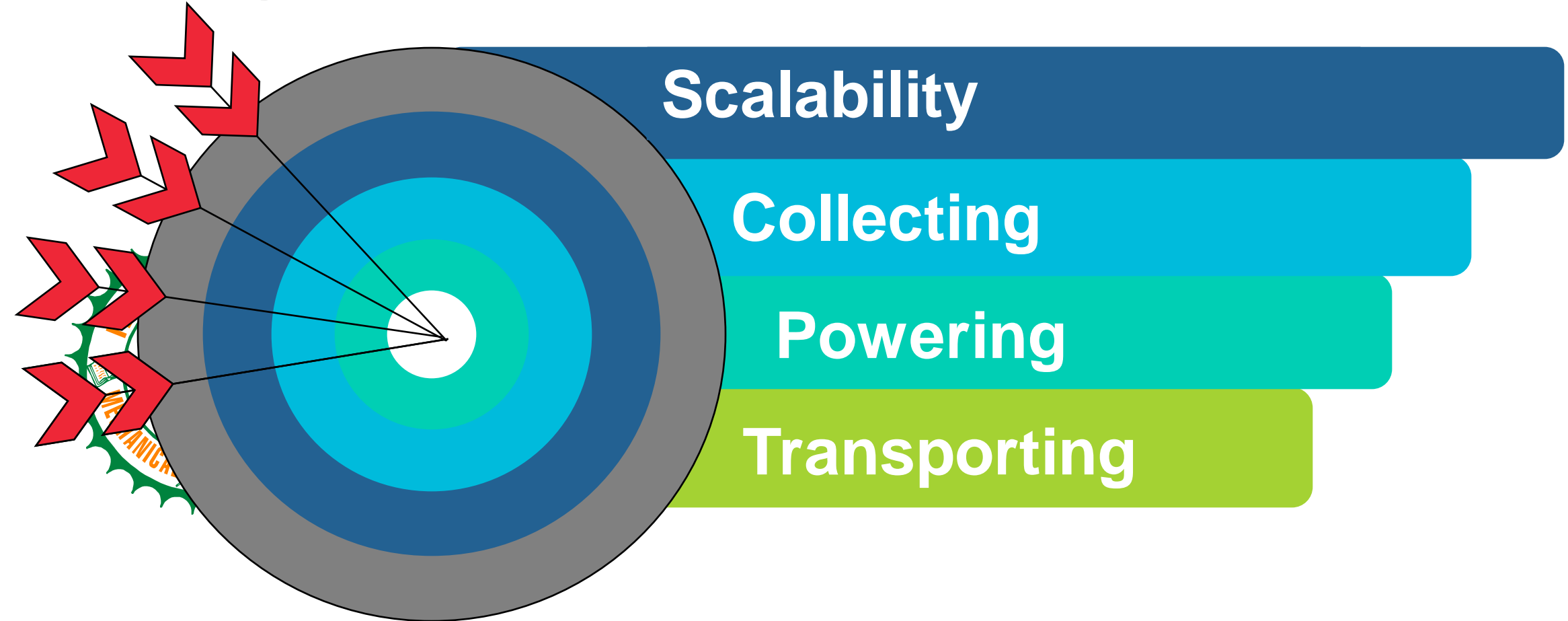
# Powering Metrics



- 700lb-ft to move 50lbs of trash for 60 seconds
- 11.67lb-ft per second
- Potential energy sources are wind, solar, and/or geothermal

Martin Senf

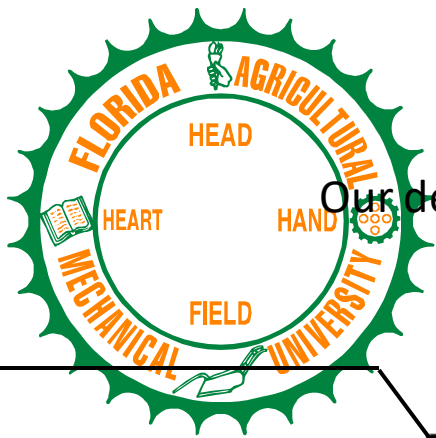
# Targets and Metrics



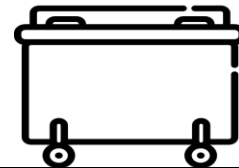
Martin Senf

# Transporting Metrics

- 8-yard slant dumpster
- 71.5in wide by 80in long
- Volume of 216 ft<sup>3</sup> and weight limit of 1,600lbs
- 4,700 44-ounce Styrofoam cups

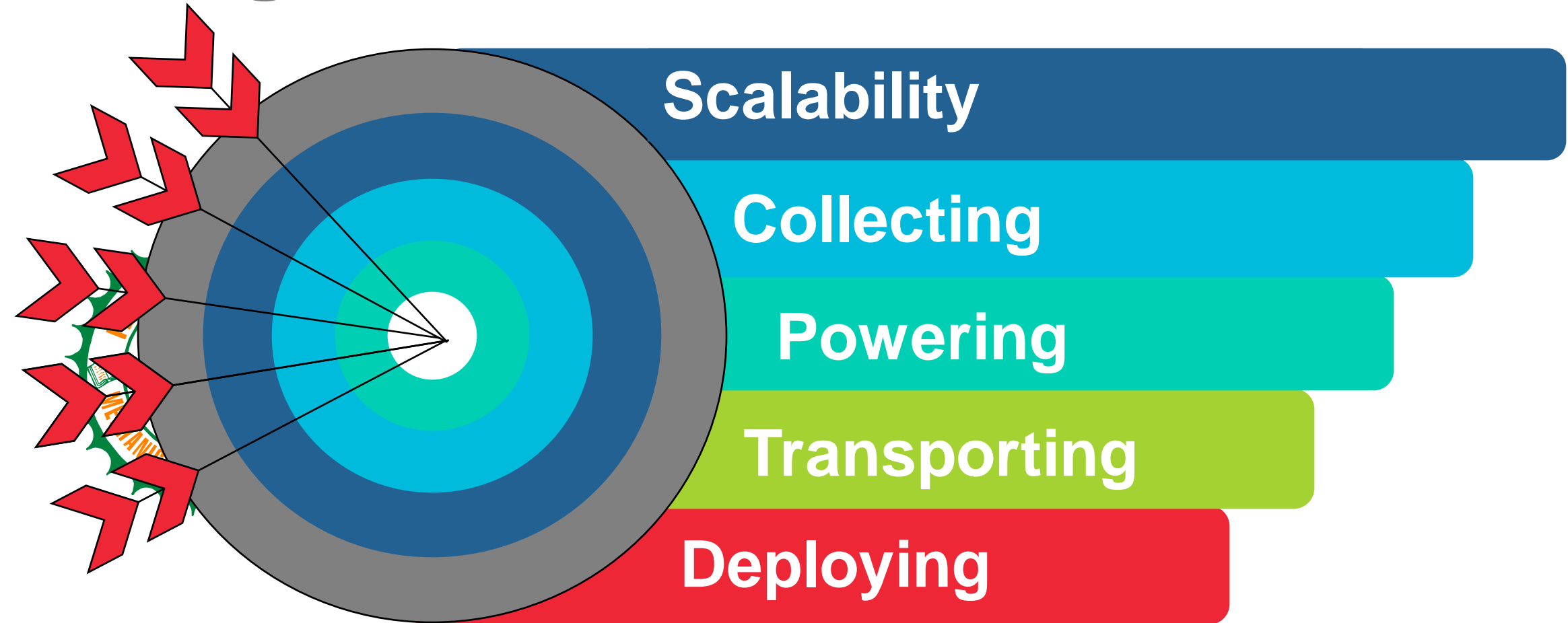


Our device

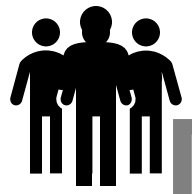


Martin Senf

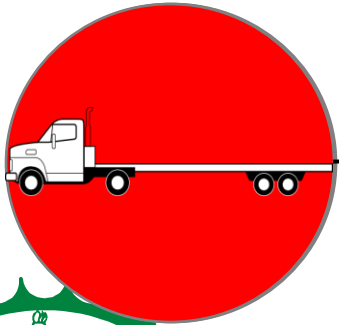
# Targets and Metrics



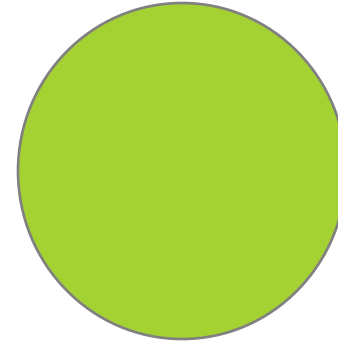
Martin Senf



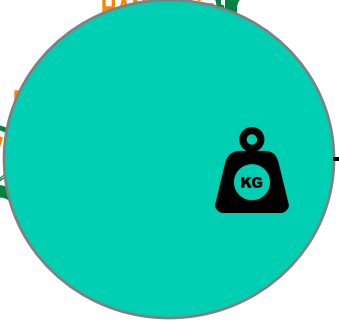
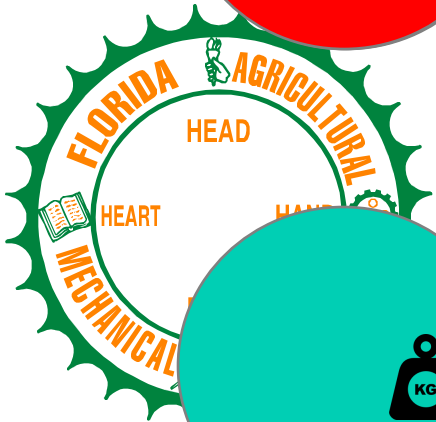
# Deploying Metrics



50ft long by 8.5ft wide size limit



Maximum of three people to deploy it

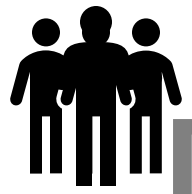


50lb weight limit per person

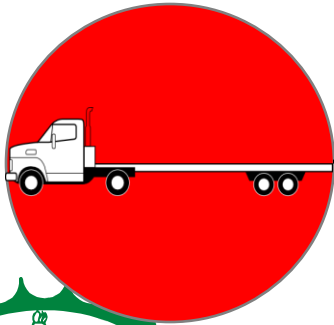


100lb weight limit per part

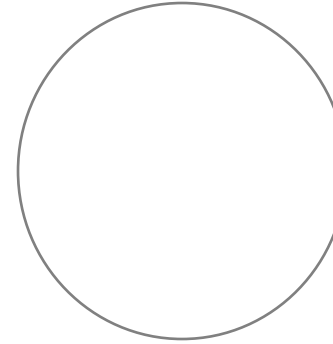
Martin Senf



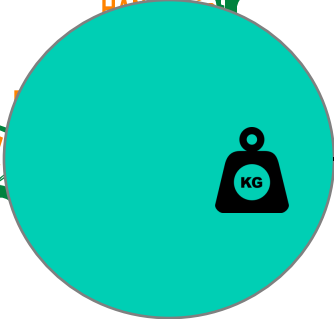
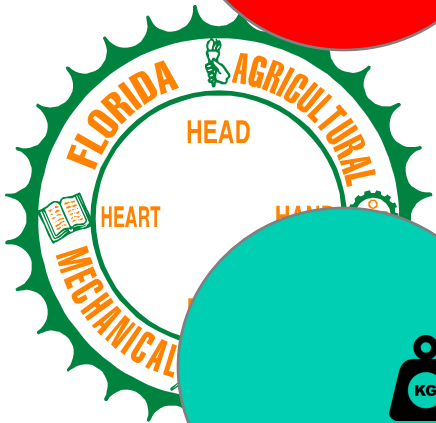
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50ft long by 8.5ft wide size limit



Maximum of three people to deploy it



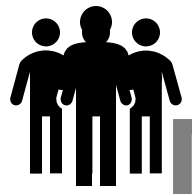
50lb weight limit per person



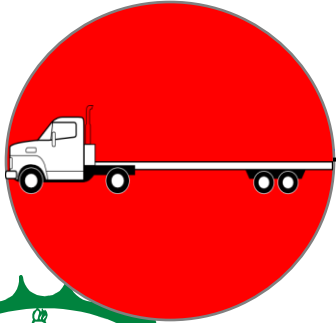
100lb weight limit per part

Martin Senf

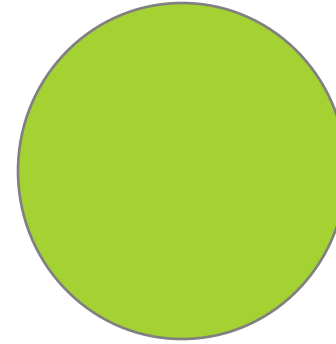




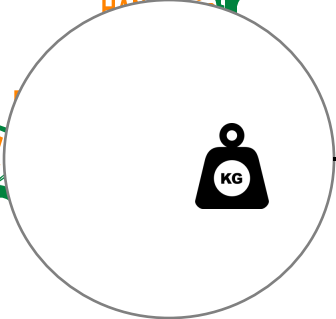
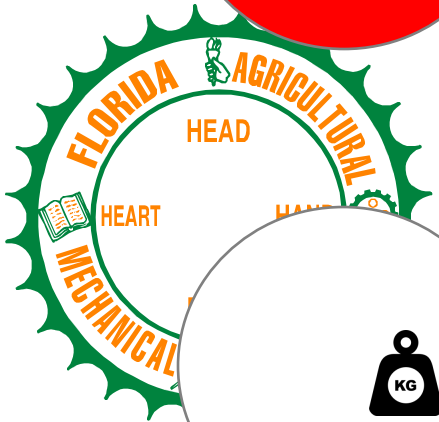
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50ft long by 8.5ft wide size limit



Maximum of three people to deploy it

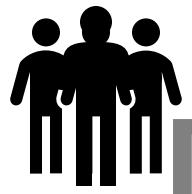


50lb weight limit per person

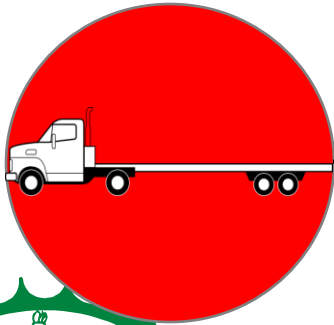


100lb weight limit per part

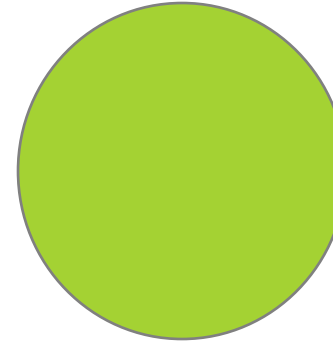
Martin Senf



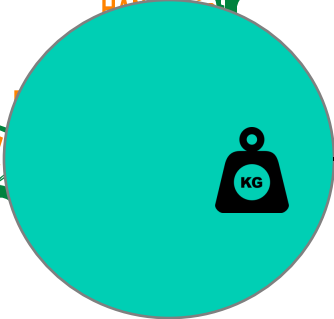
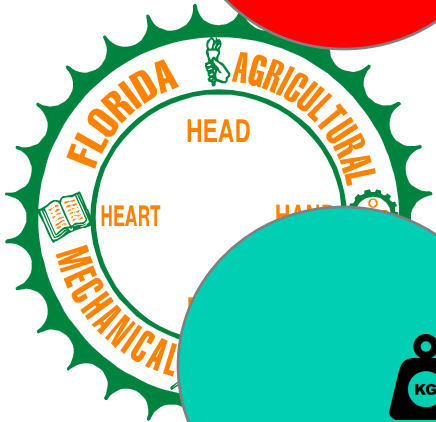
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50ft long by 8.5ft wide size limit



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50lb weight limit per person

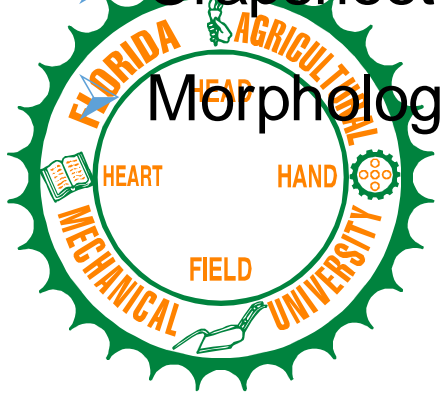


100lb weight limit per part

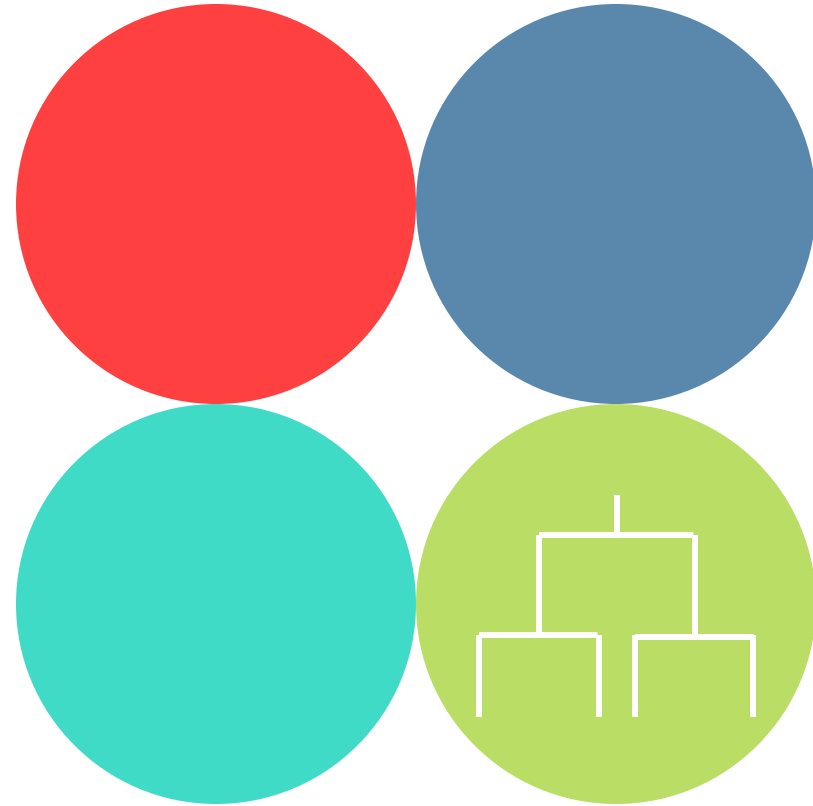
Martin Senf

# Methods Used

- Biomimicry
- Brainstorming
- Crapshoot

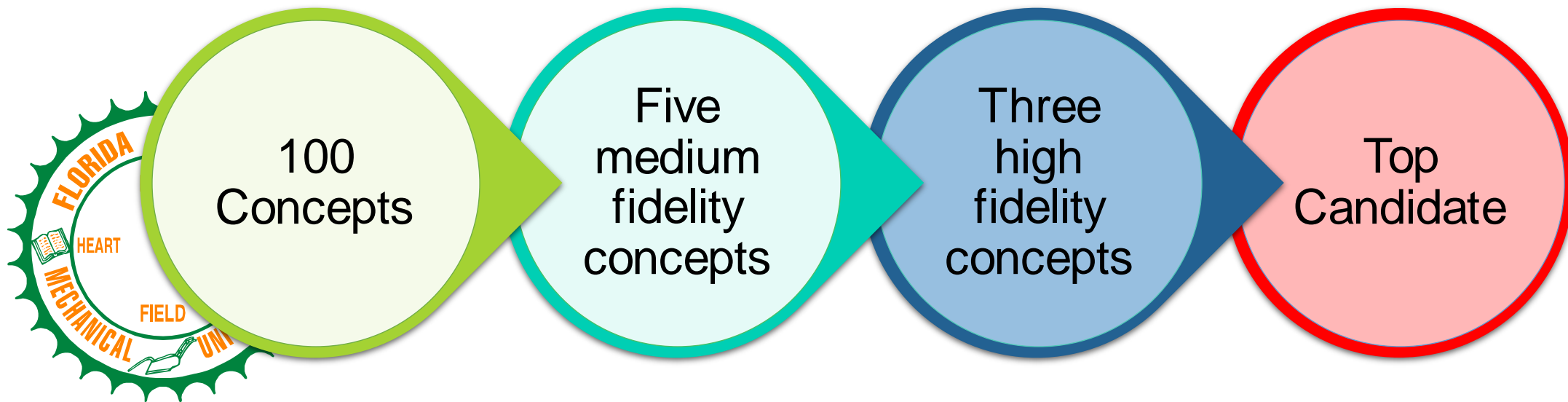


Morphological Chart



Mohamad Kassem

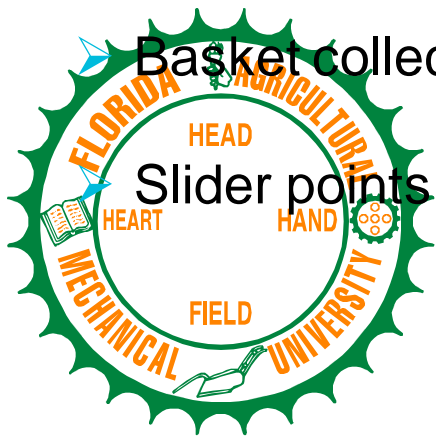
# Concept Generation



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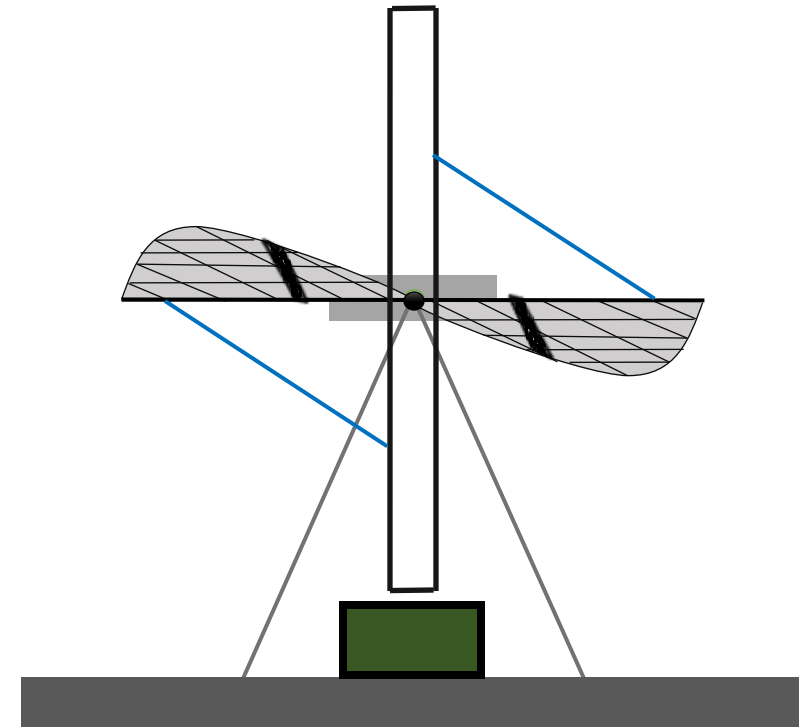
# Medium Fidelity

- Trash accumulates before wheel is actuated
- Rotating baskets (similar to a fish wheel)



Basket collects accumulated trash

Slider points trash into reservoir



Mohamad Kassem

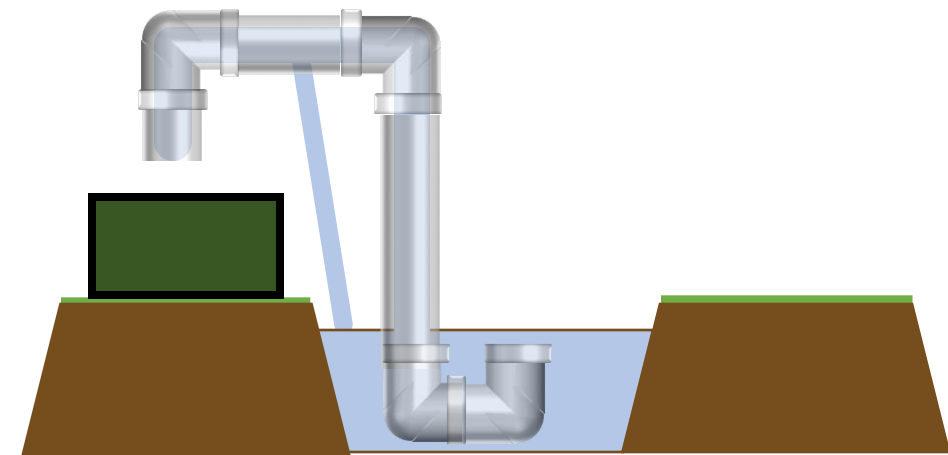


# Medium Fidelity

- Floating barrier that accumulates trash
- The accumulated trash is sucked by the piping system



Pipe takes trash to the dumpster  
Water is drained from pipe before entering reservoir

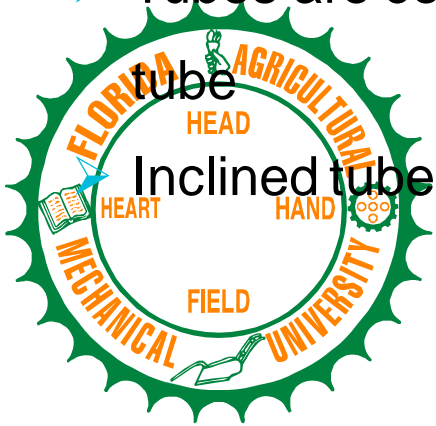


Mohamad Kassem



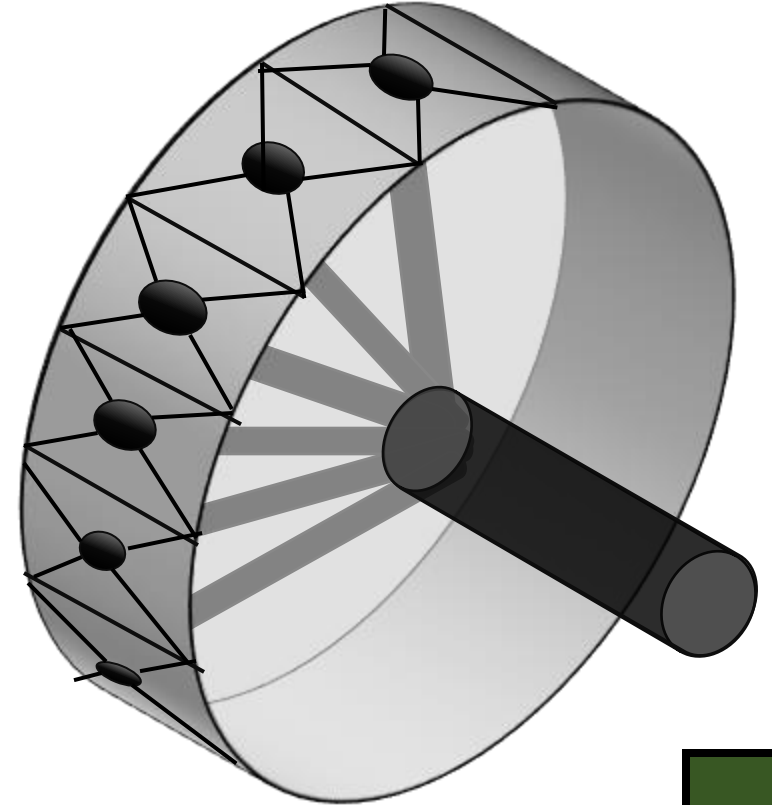
# Medium Fidelity

- Helical wheel with sloped slots
- Slots guides trash into tubes
- Tubes are connected at the center to an inclined



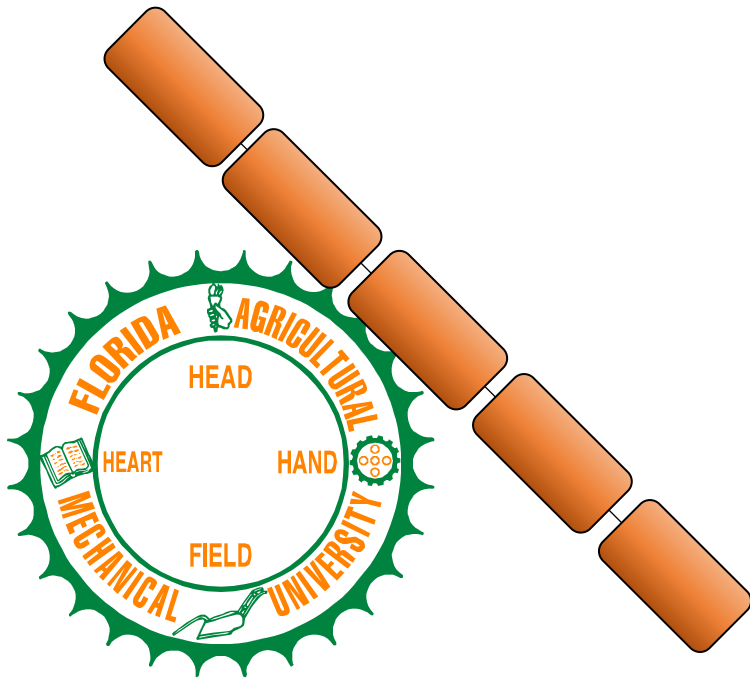
tube

Inclined tube guides trash into reservoir

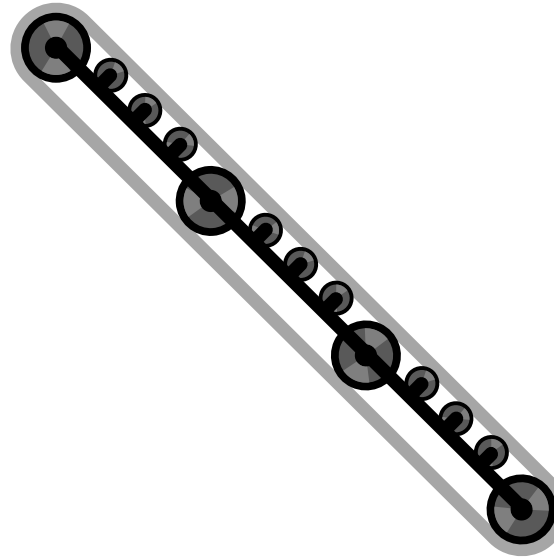


Mohamad Kassem

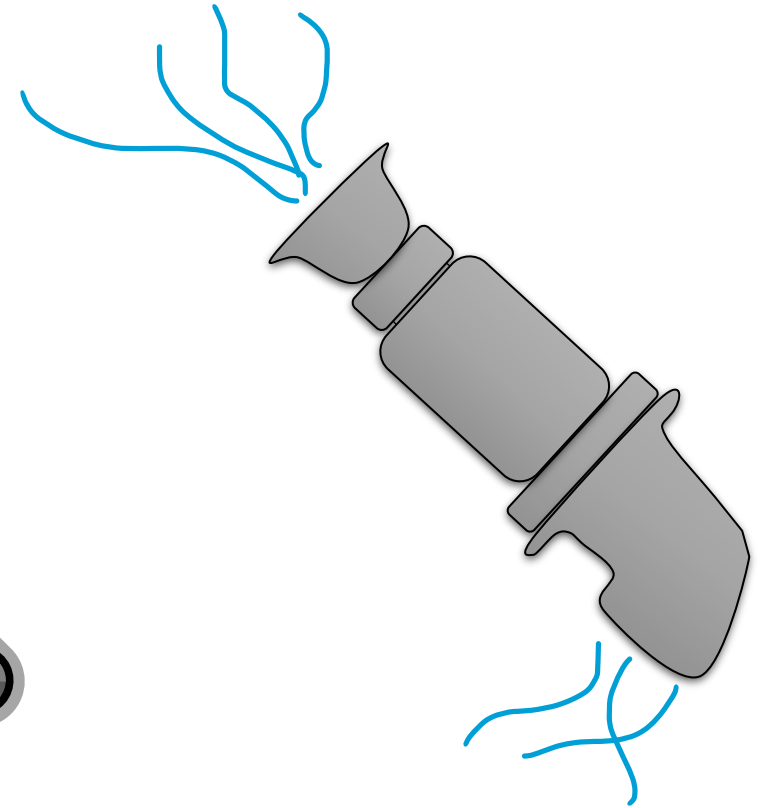
# Key Components



Floating Boom



Conveyer Belt



Water Propeller jet

Mohamad Kassem





# High Fidelity #1

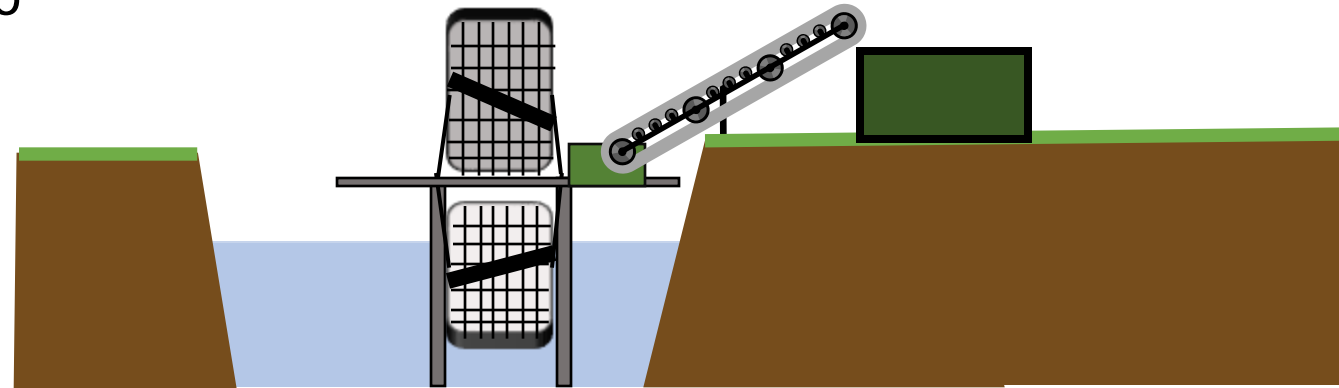
- Floating boom will angle trash
- Water is accelerated by a jet
- Rotating basket-like wheel collects trash



➤ Trash slides into a reservoir

➤ Conveyor belt takes trash from reservoir to

dumpster

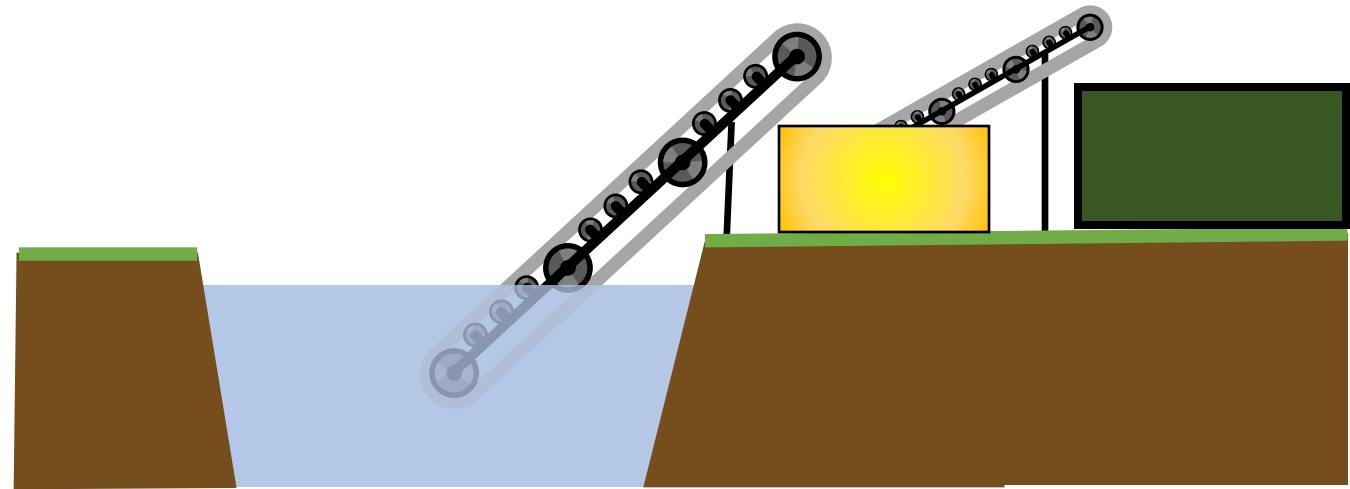


Mohamad Kassem



# High Fidelity #2

- Floating boom will angle trash
- Water and trash is accelerated by a jet
- A conveyor belt takes trash out of storm



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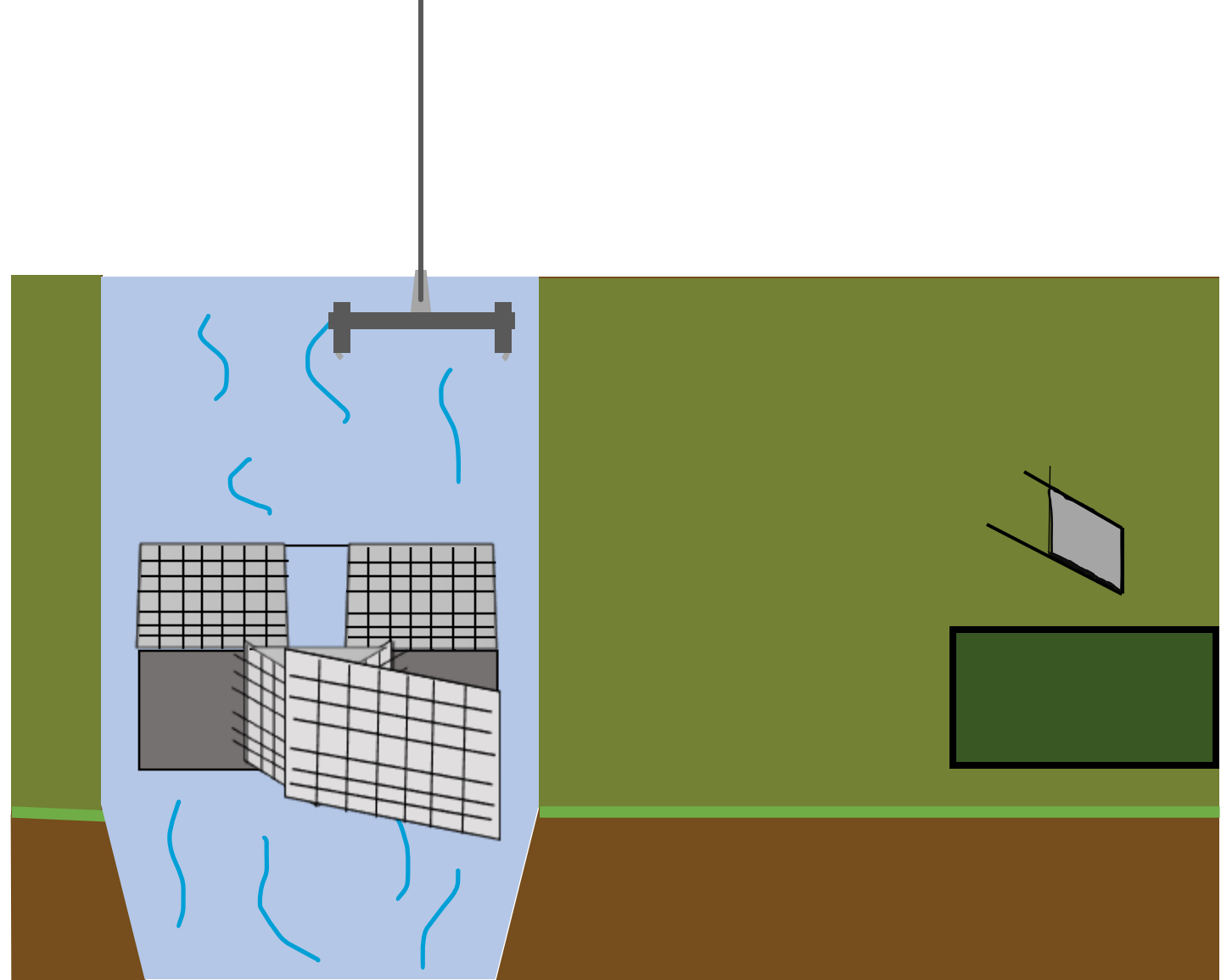


# High Fidelity #3

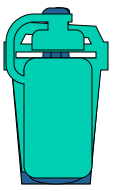
- Funnel lines directing trash and water
- Trash will go into two chambers
- A crane will pick up the full chamber



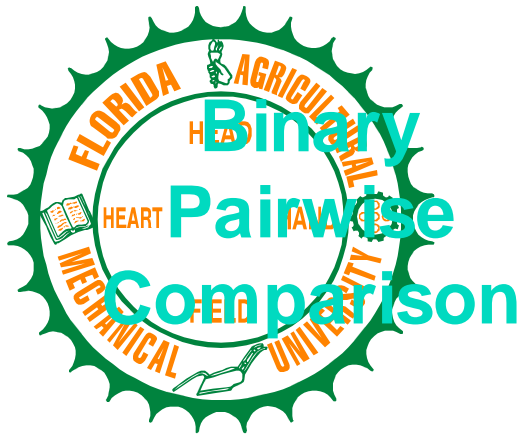
Chamber's door opens to release trash into dumpster.



Mohamad Kassem



# Concept Selection



House  
of  
Quality

Pugh  
Charts

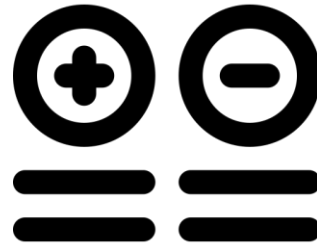
Analytical  
Hierarchy  
Process

Andrew Walker

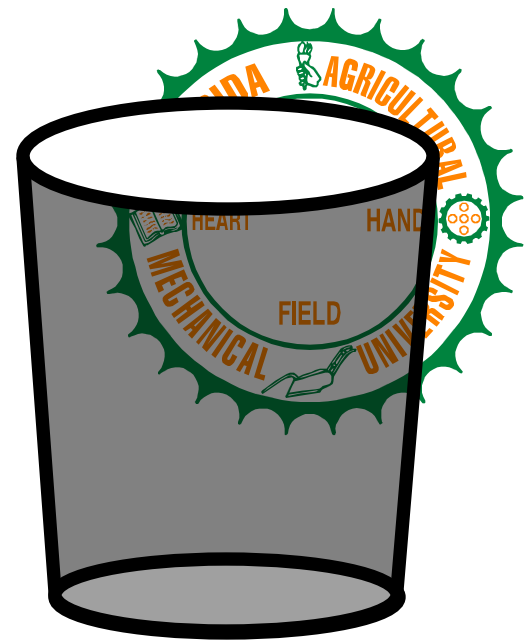


# Binary Pairwise Comparison

13 Important  
Customer Needs



13 Customer  
Needs Ranked By  
Importance

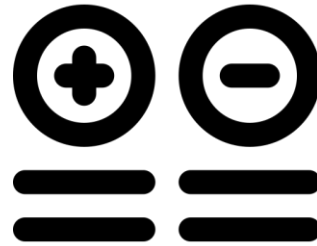


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# Binary Pairwise Comparison

13 Important  
Customer Needs



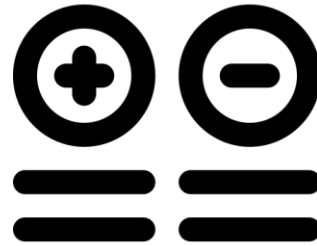
13 Customer  
Needs Ranked By  
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Andrew Walker



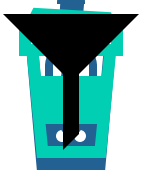
# House of Quality

13 Important  
Targets and Metrics



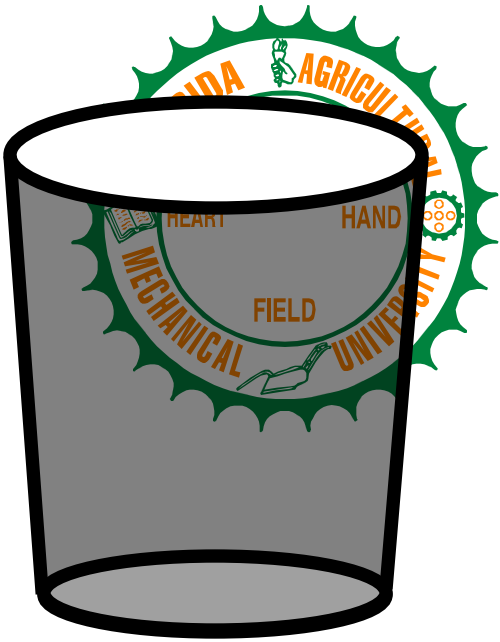
13 Targets and  
Metrics Ranked By  
Importance

Andrew Walker



# Pugh Charts

8 Viable Concepts

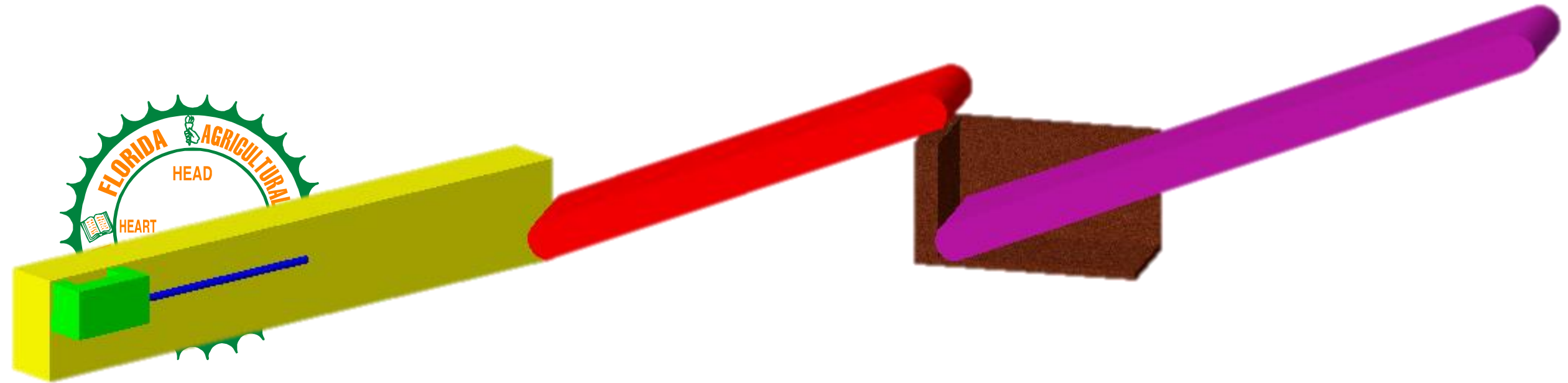


3 Best Concepts

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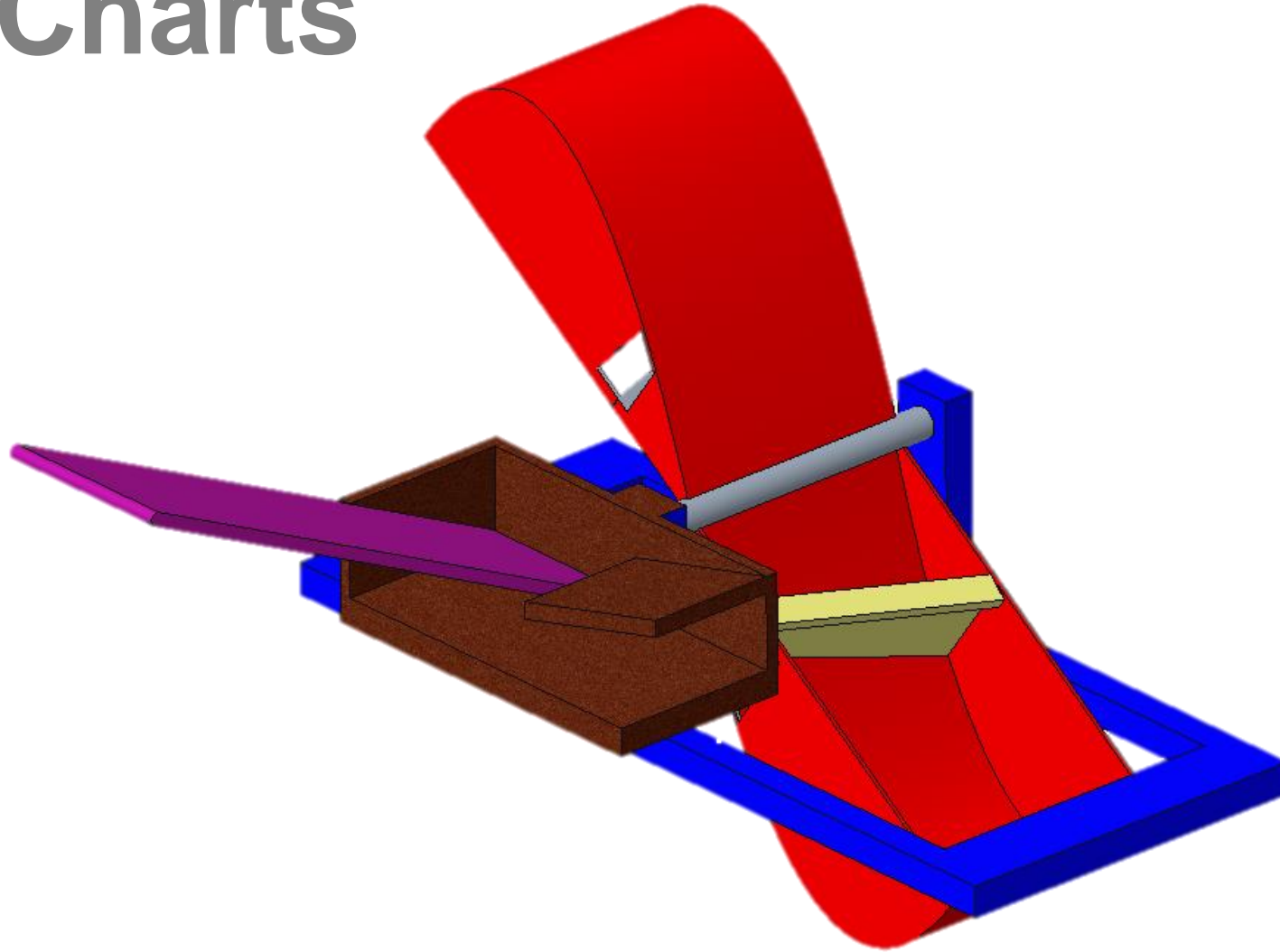


# Pugh Charts



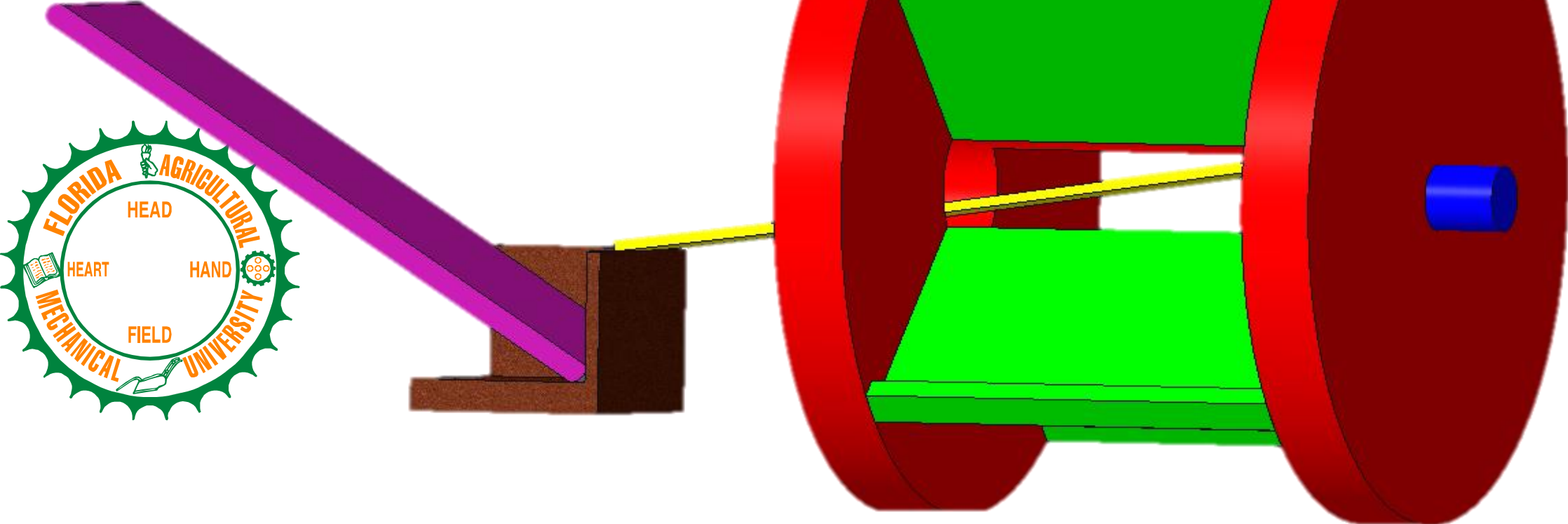
Andrew Walker

# Pugh Charts



Andrew Walker

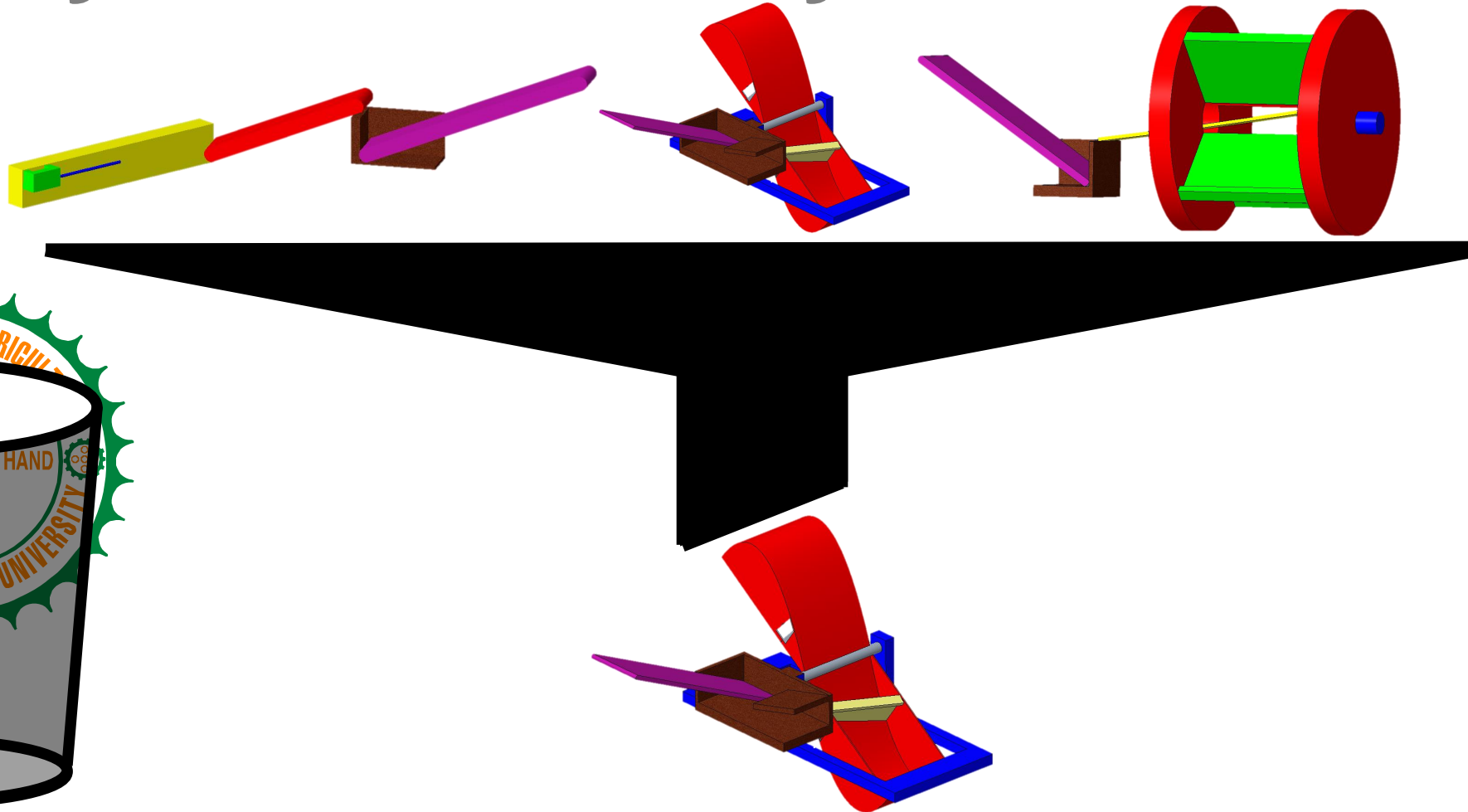
# Pugh Charts



Andrew Walker



# Analytical Hierarchy Process



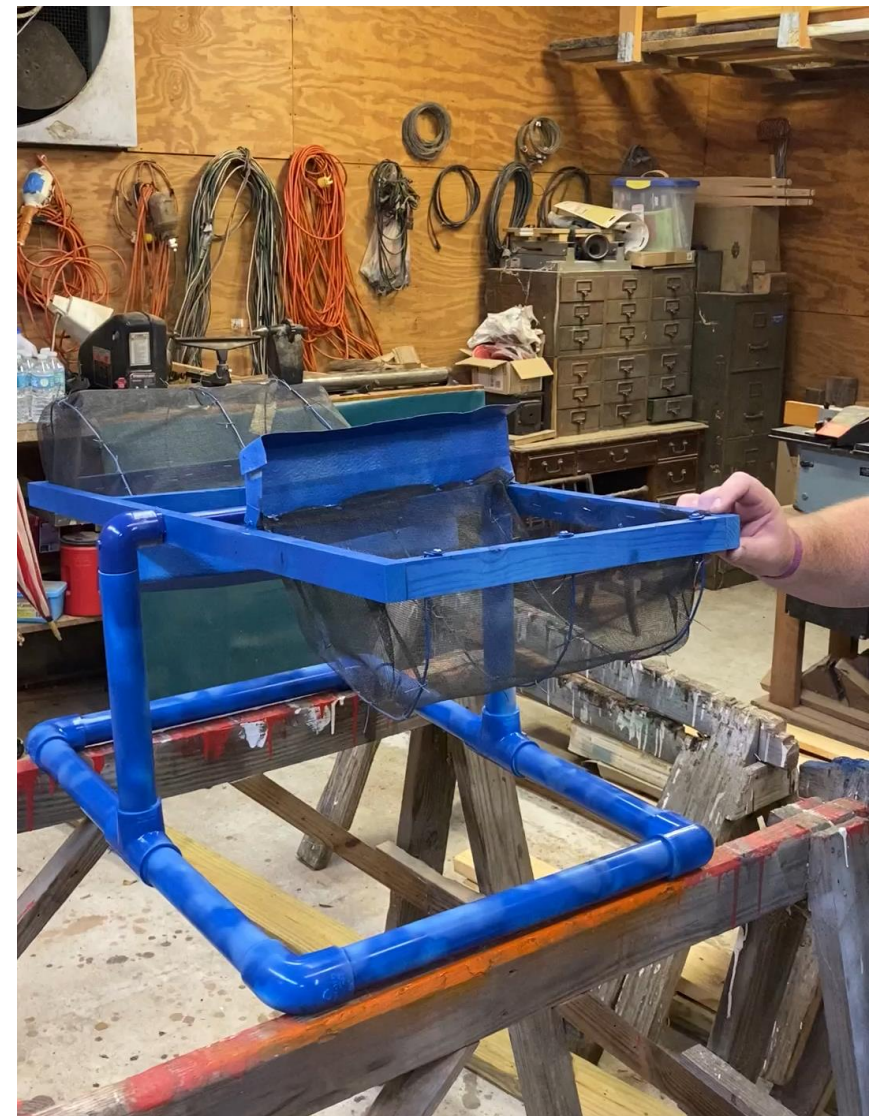
Andrew Walker

# Prototyping

➤ Should the base float at water level or sink to the bottom?

➤ What is a better way to attach the mesh?

Is there a better way to allow the slide to move past the structural post?

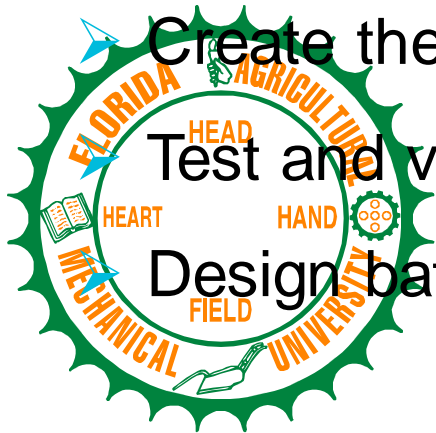


Andrew Walker



# Future Work

- Finalize supporting structure of design
- Decide what sustainable energy is desired for our design



➤ Create the bill of materials

➤ Test and validate the power required for operation

➤ Design battery storage system



# YAMAHA RightWaters Trash Interceptor

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**Andrew Walker**  
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