Personal Hydroelectric Generator
Team 7

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Team 7

Background

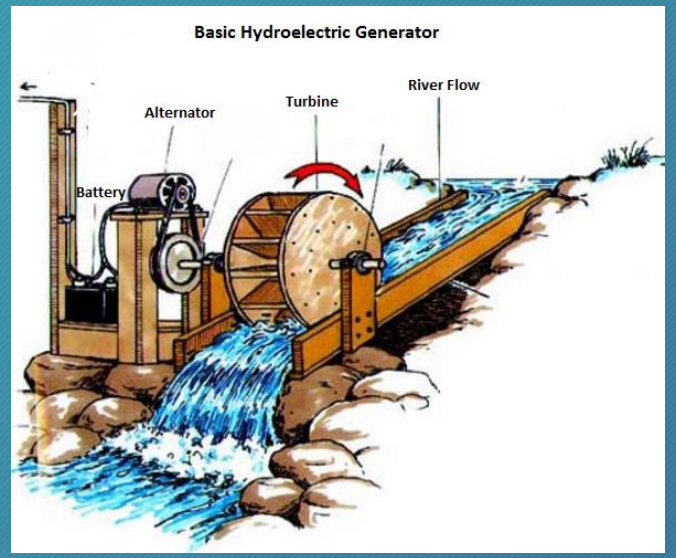

Fig. 1 – Basic Hydroelectric Generator

- Takes kinetic energy of flowing water and converts it to electrical energy
- Flowing water spins turbine which spins alternator which charges battery
- Process is more environmentally friendly than traditional methods
- Also better than building a hydroelectric dam which destroys the river below it
- Drawback is that not nearly as much electric potential is stored as in other methods

Presentation Overview

Fall 2015 Recap

- Project Definition
- Mechanical Overview
- Electrical Overview
- Entrepreneurial Overview

Current State

- Component Status Update
- Financial Update

Spring 2016 Forecast

- Gantt Chart
- Experimental Forecast
- Entrepreneurial Forecast
- Design / Assembly Forecast

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Project Definition

- Problem Scope
- Need Statement
- Goal Statement
- Target Market
- Objectives
- Project Constraints
- HOQ Development

Problem Scope

This project will consist of creating a marketable power generation system that not only harnesses power from flowing water but is also portable. These generators will create a realistic means of providing sustainable power to anywhere there is a reasonable amount of flowing water.

Needs Statement & Goal Statement

- Need Statement:

  "People in remote locations do not have access to electricity for powering their electrical devices."

- Goal Statement:

  "Develop a portable device that transforms organic kinetic energy into usable electricity."

Target Market

American Red Cross

Objectives

- Produce enough power to satisfy the need of our target consumers.
  - Supplemental emergency power generation.
  - Environmentally conscious recreational camper.
  - Companies in rurally indigenous locations.
- Minimize weight to ensure portability
  - Modular design
- Environmentally friendly
- Fast and simple assembly and disassembly

Project Constraints

- Weight
  - <100lb
- Noise Level
  - <50 dB
- Waterproof
  - Protect electrical components
- Safe and Reliable
  - Little environmental and human impact
- Generate Electricity
  - In order to charge a battery

Customer Discovery Survey

- If the generator could sustain all your lighting needs, run a small refrigerator, or power any TV, how much would you spend?
- Where would you mainly use this item?
- What is the most important from the following: Power Output, Price, Durability or Size?
- How likely are you to buy a hydroelectric generator if it meets your needs?

Survey Results

If a generator could sustain all your lighting needs, run a small refrigerator, or power any TV, how much would you spend?	5	5	15	6
	Camping	Hunting	Cabin	Fishing Trip
Where would you mainly use this item?	13	16	4	10
	Power Output	Price	Durability	Size
What is the most important from the following: Power Output, Price, Durability or Size?	8	5	10	8
	Would buy	Might buy it	Wouldn't buy	I don't know
How likely are you to buy a hydroelectric generator if it meets your needs?	14	5	4	8

Table 2 – Survey Results

- $550 to $750
- Hunting
- Durability
- Would Buy

House of Quality

Engineering Characteristics →		Rate of Power Generation	Cost	Weight of Device	Stream Lined Profile	Power Output Efficiency	Mechanical Complexity	User Friendly	Selling Points
Customer requirements	Importance to Customer								
Functionality	5	10	5	2	9	10	5	4	225
Easy to Operate	3						6	10	64
Light Weight	4	7	7	10	4		3	8	117
Compact	4	6	2	8	6	2	6	8	114
Price	2	4	10	5		6	8	3	144
Durability	3		7	3	1	5	6	2	120
Aesthetically pleasing	1		4		8				48
Maintenance	3		3	5	2		5	8	92
Importance Weighting		110	115	116	102	85	128	150	

Fig. 3 – House of Quality

Initial Design

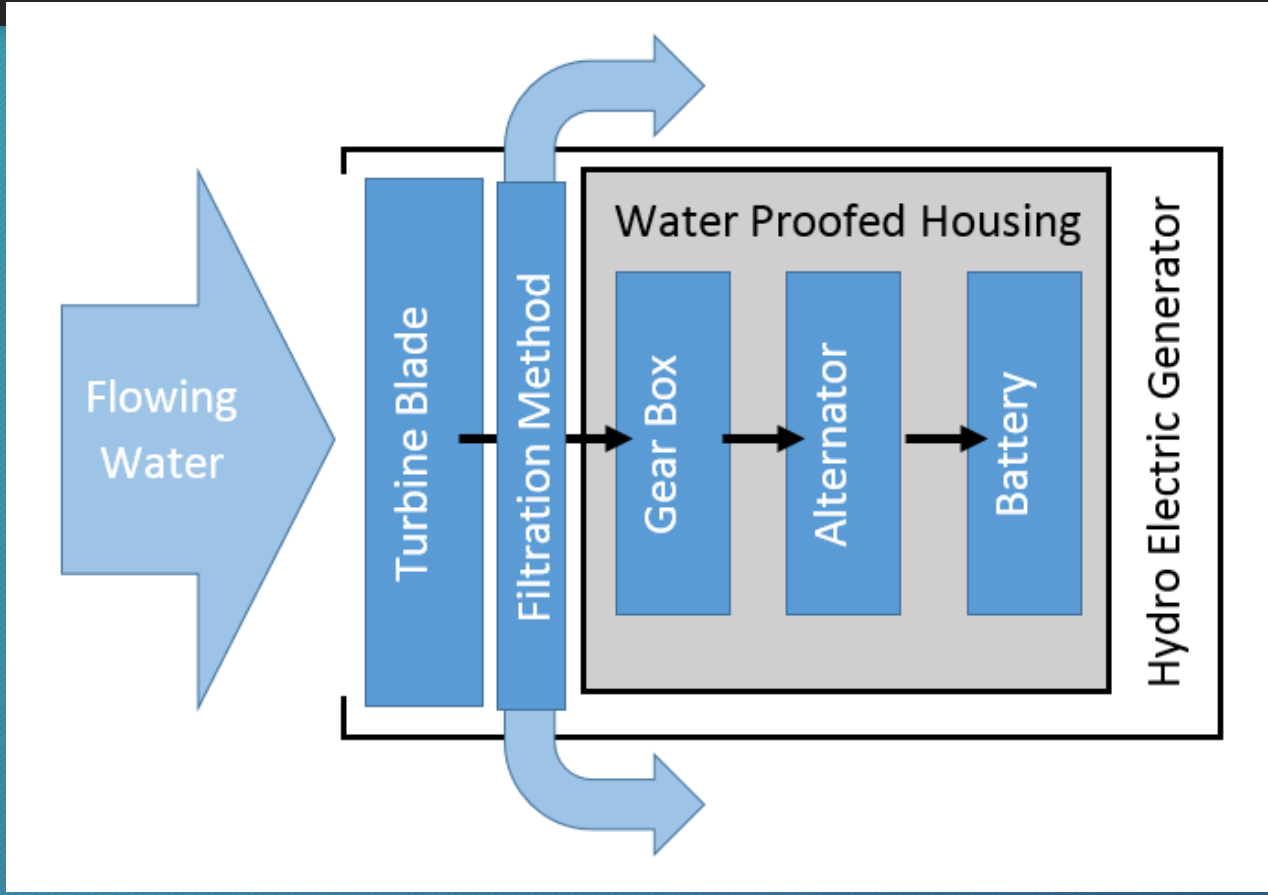


Fig. 7 – Design Flowchart

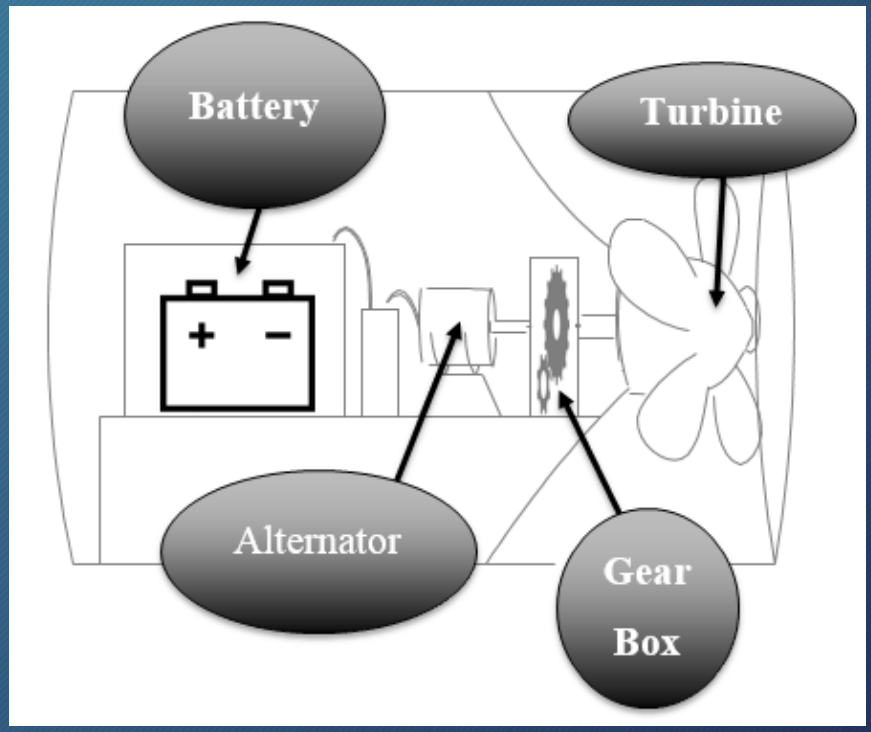


Fig. 8 – Design Overview

Revised Design

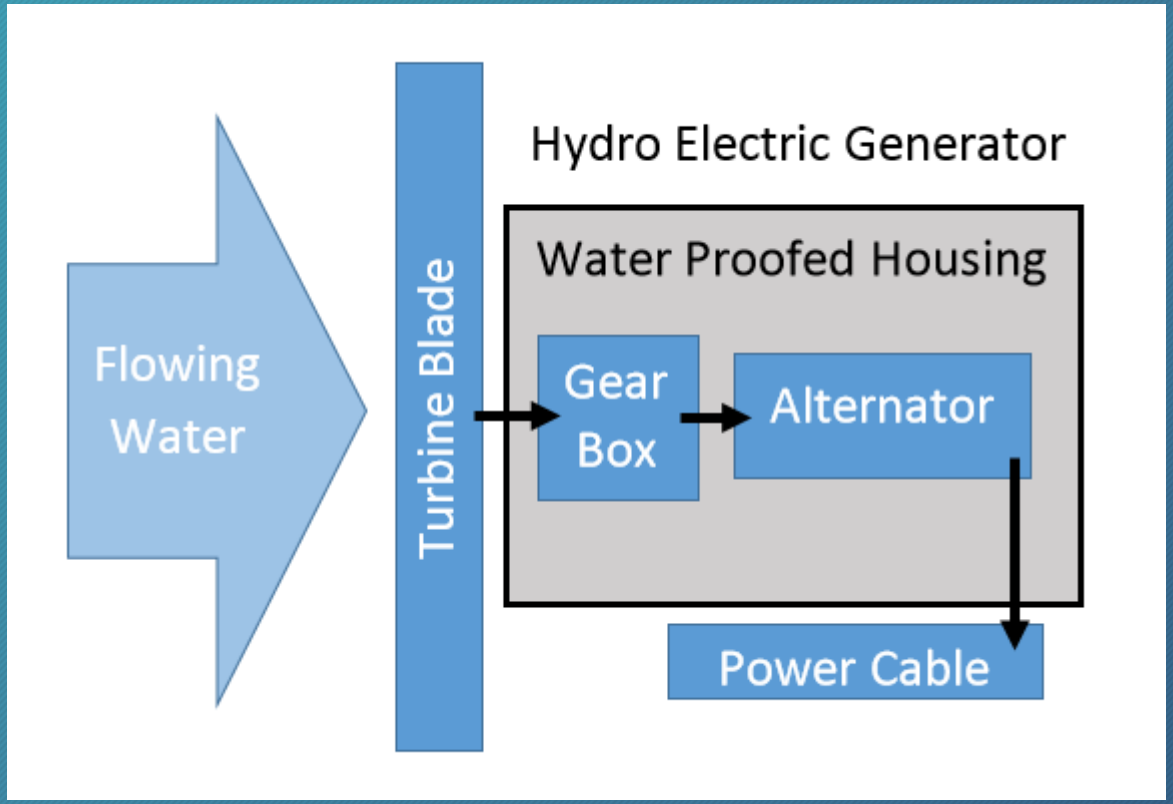


Fig. 9 – Revised Design Flowchart

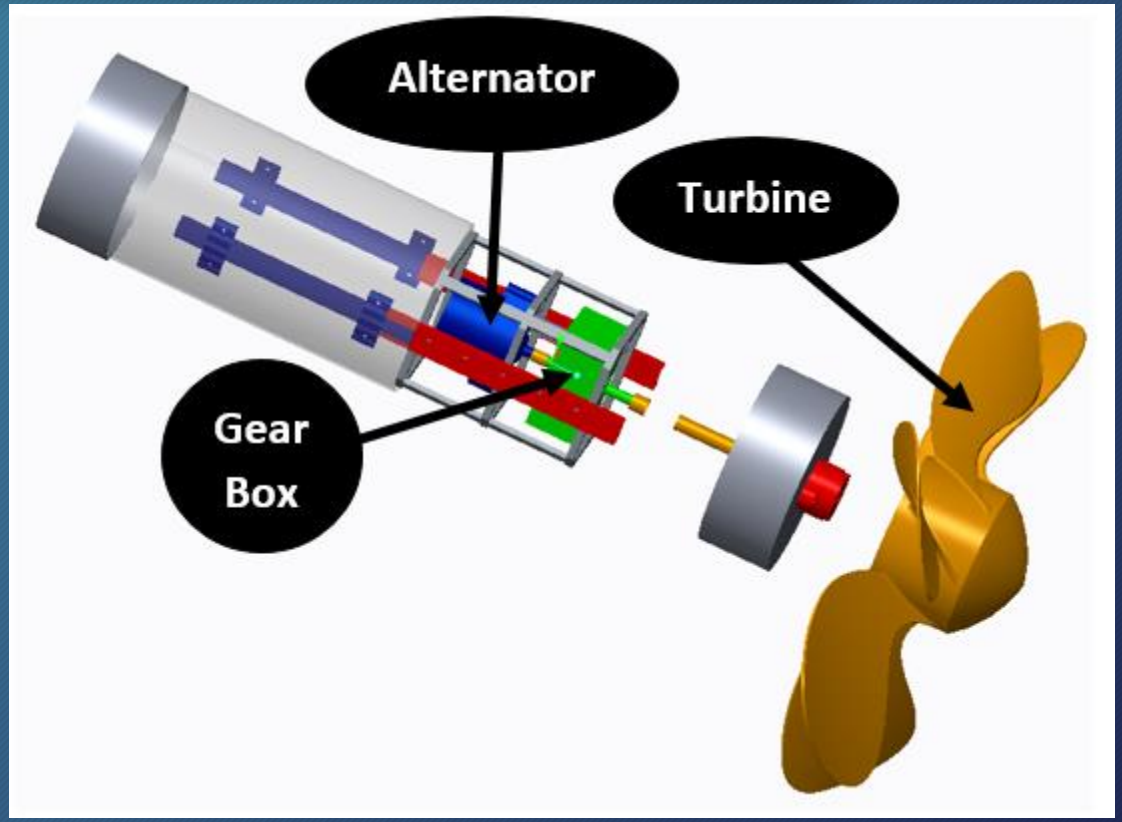


Fig. 10 – Revised Design Overview

Detailed CAD Schematic

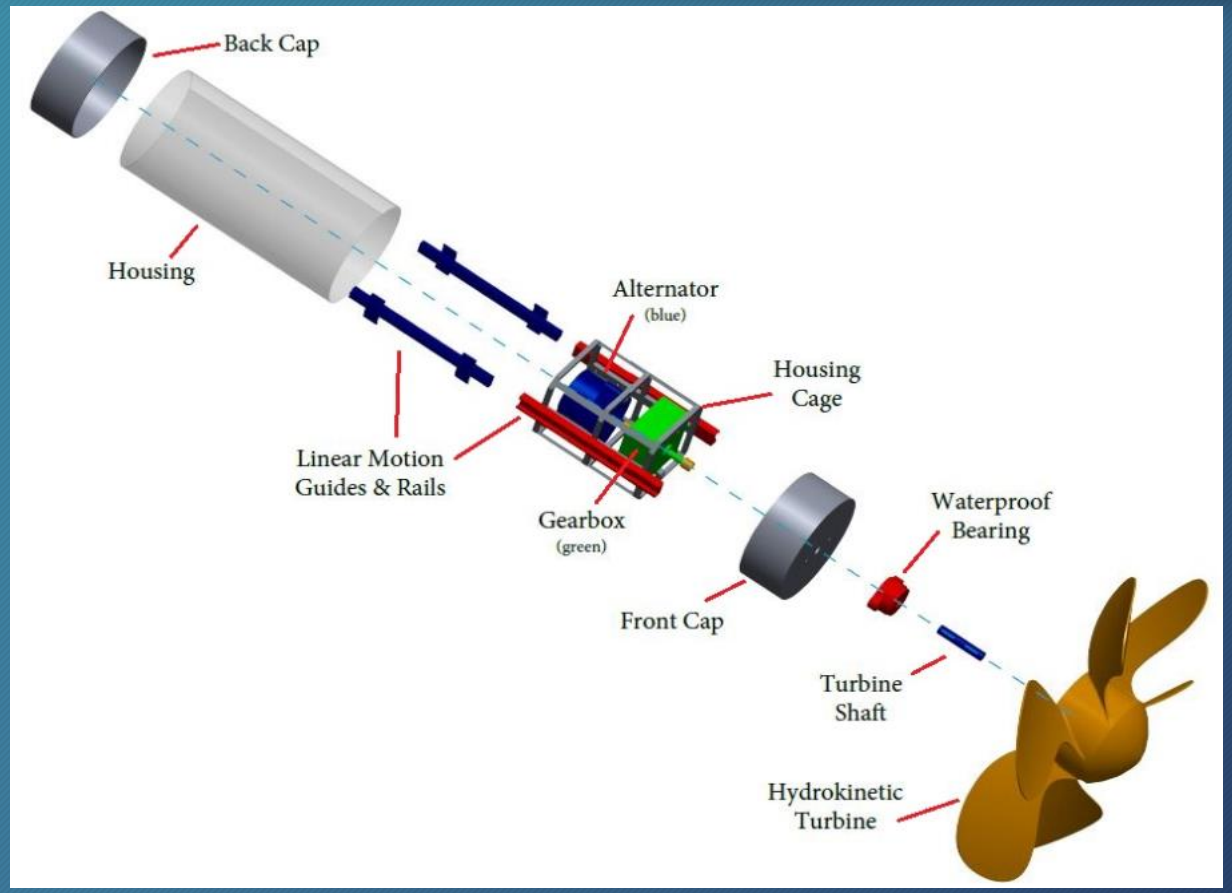


Fig. 11 – Hydroelectric Generator CAD

Detailed CAD Schematic

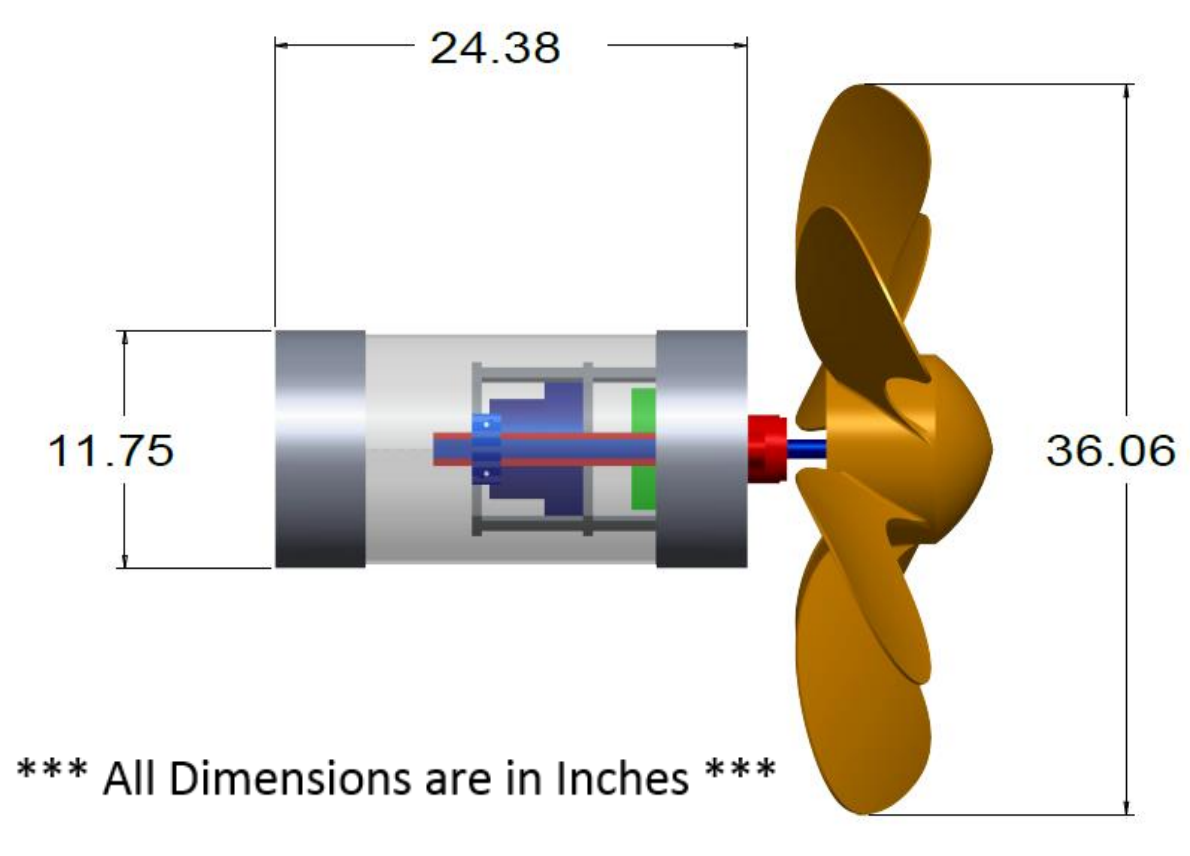


Fig. 12 – Hydroelectric Generator CAD with Dimensions Side - View

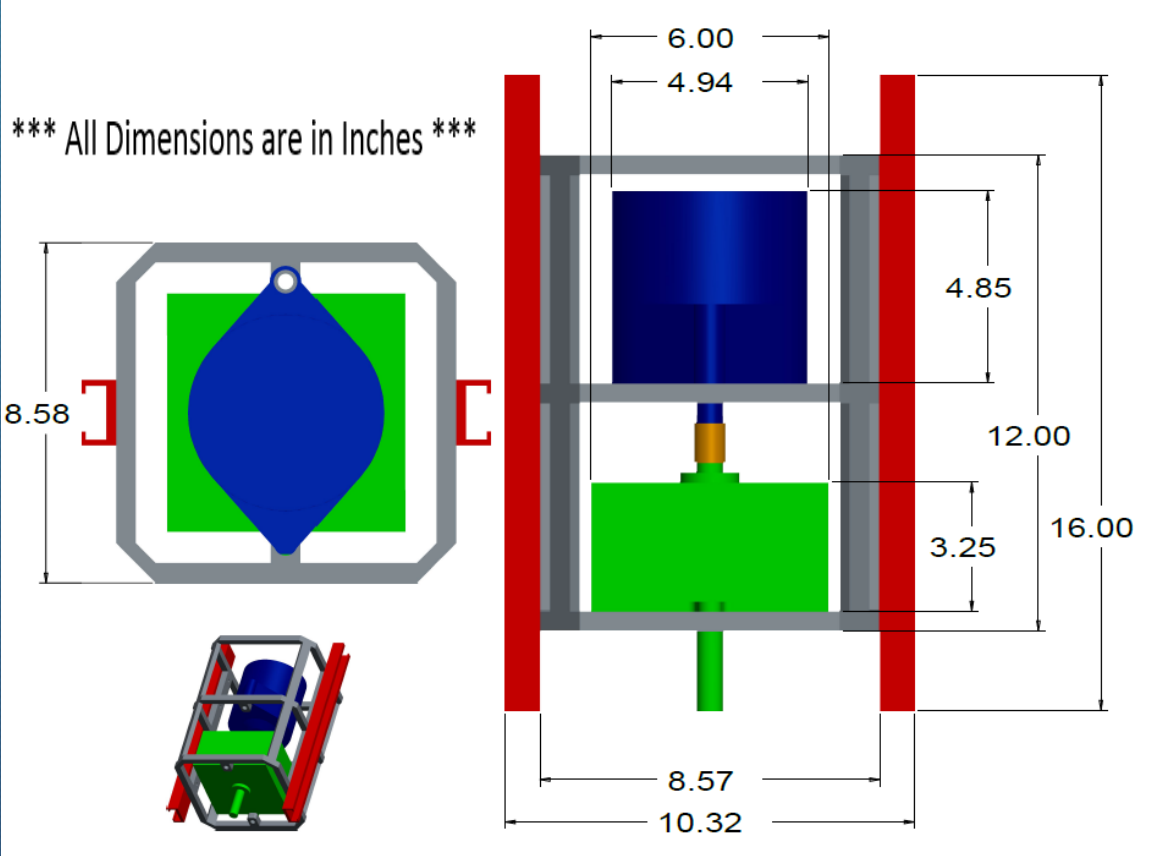
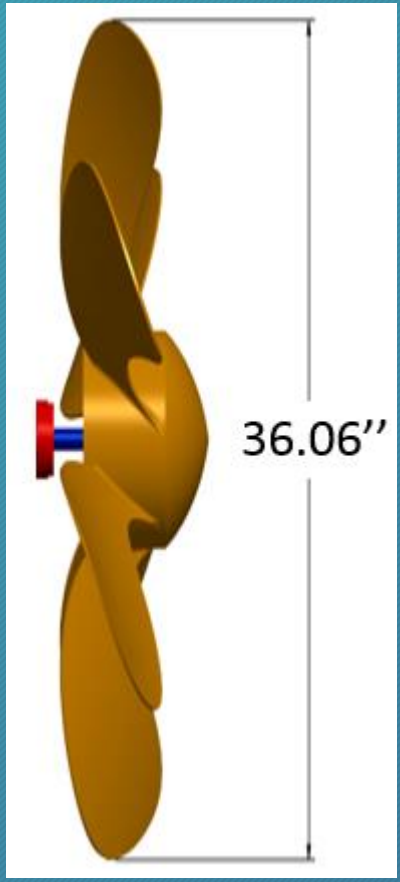
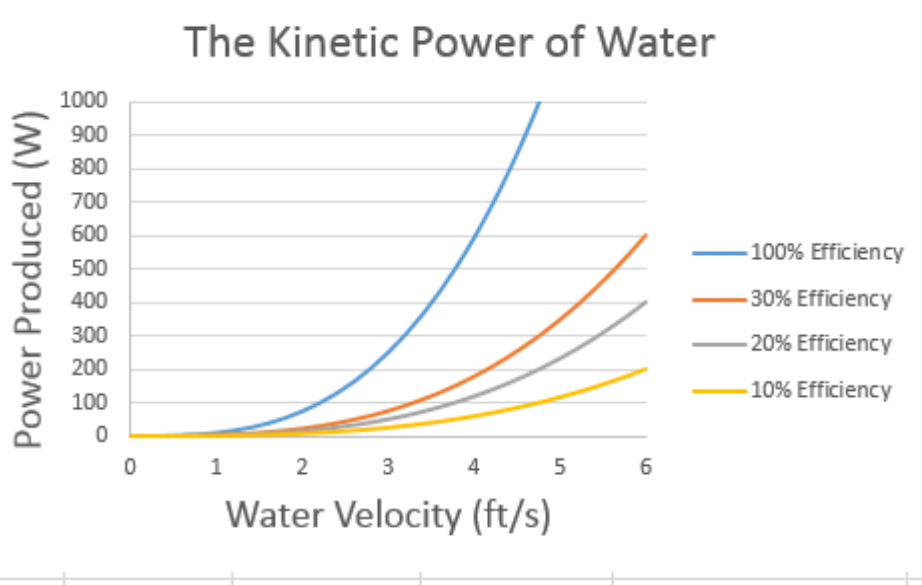
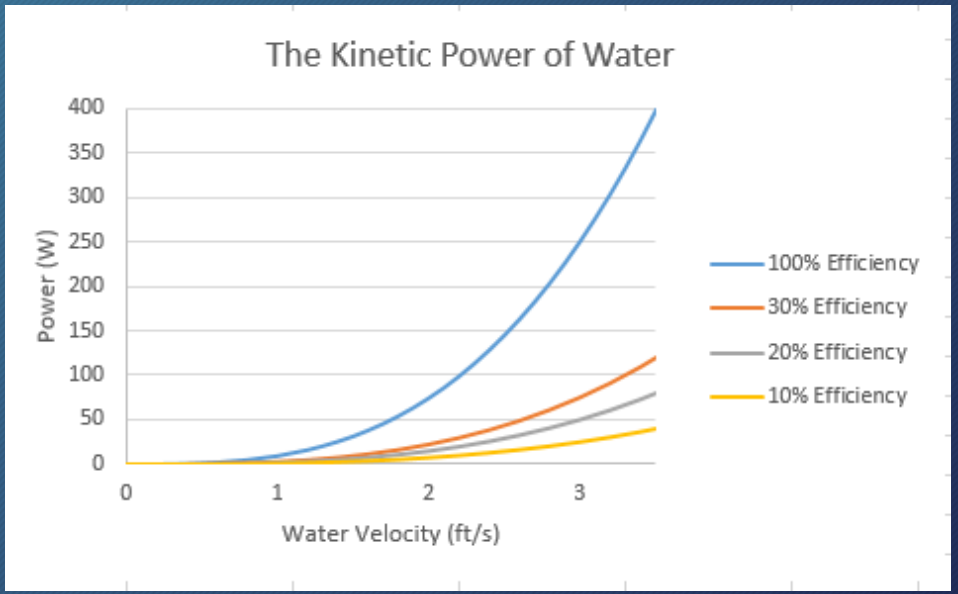


Fig. 13 – Hydroelectric Generator Cross-Sectional View with Dimensions

Hydrokinetic Turbine







Electronic Components – Circuit Schematic

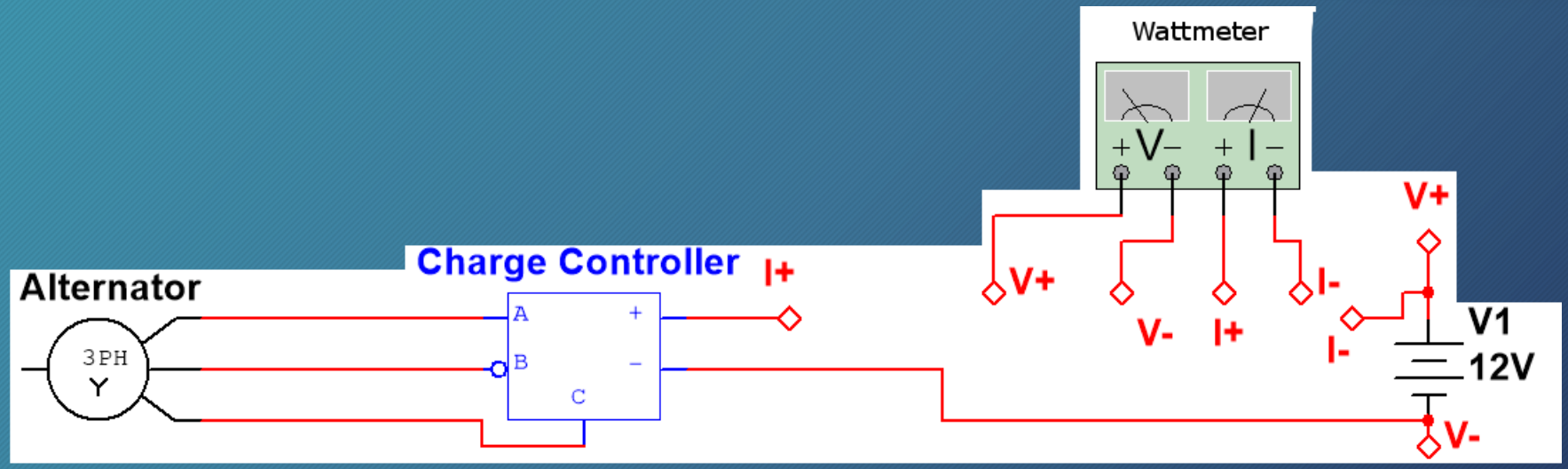


Figure 27 – Circuit Schematic

Entrepreneurial Senior Design

InNolevation Challenge - $10,000 for 1st place & Domi Venture entry

- Business Model Canvas
- Stage 1 – Value Proposition (Success)
- Stage 2 – Rest of canvas except for financials (Success)
- Stage 3 – Completed Business Model Canvas with testing & pivots (Eliminated)

The Business Model Canvas

Team or Company Name: Personal Hydroelectric Generator

Date: 11/18/2015

[X] Primary Canvas

[ ] Alternative Canvas

Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
• Payment service such as *paypal* • Distribution partners –USPS, FedEx, etc. • Suppliers – generators, alternators, and turbine components • FSU – (senior design) supplies initial funding for the project • Kickstarter – entry level fundraising • Grants from competitions such as InNolevation Challenge	• R&D –improve on hydroelectric generator design • effective sales team • establish premium models with added features **Key Resources** • Brand name • Product design • Sales and support teams • Sales of parts and expanded features	• Provide a constant, clean energy source with enough power to supply a small home or cabin with electricity • Utilize the power of flowing water in order to generate electricity • Significantly quieter than its gasoline counterpart • Portability	• Dedicated sales for large purchase accounts • Support staff • Automation (where possible) • Periodic newsletter **Channels** • Global sales and support team • Online website with product information • Social media accounts	• Developing countries – specifically villages and homes near bodies of water • Humanitarian organizations • Outdoorsmen – riverside camp sites • Military

Figure 28 – Business Model Canvas

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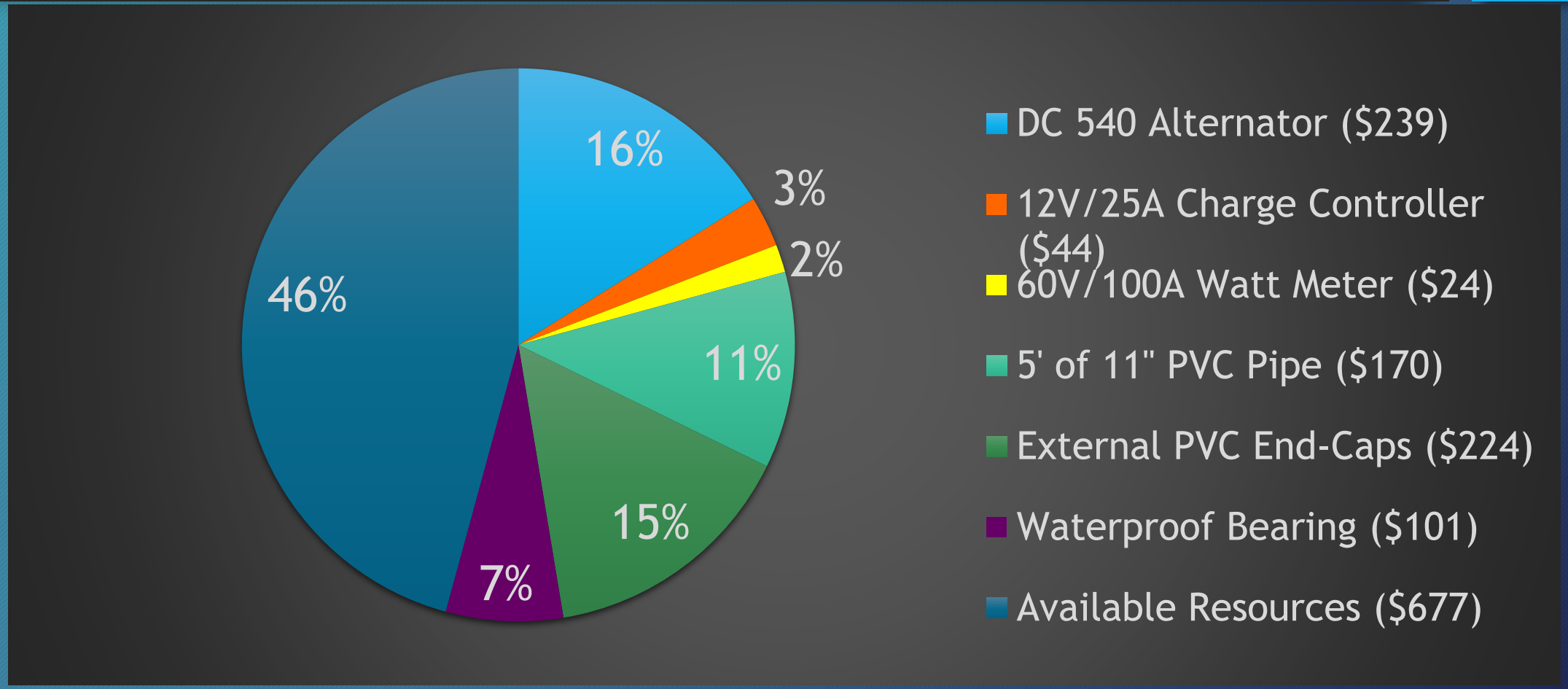
Component Status Update

Component	Delivered	Ordered	Designed	Needs to be Addressed
DC 540 Alternator	X			
Charge Controller	X			
Watt Meter	X			
5’ of 11’’ PVC Pipe	X			
PVC End-Caps	X			
Water-Proof Bearings		X		
Shaft / Shaft Couplings		X		
Gearbox Set				X
Anchoring System				X
Turbine Blade				X
Internal Housing			X	

Components Delivered

Financial Update (Total Budget - $1500)



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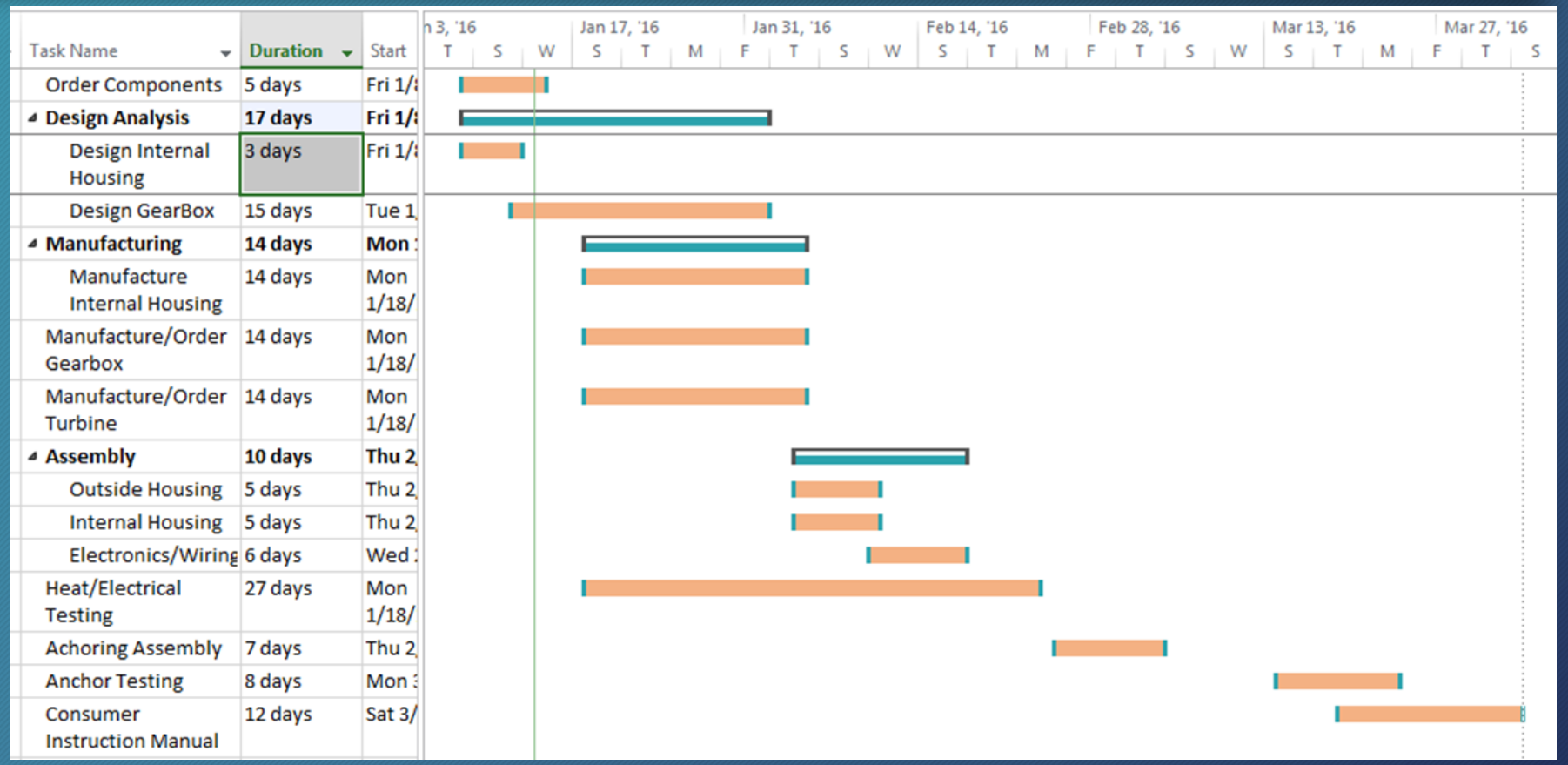
Potential Challenges

- Heat dispersion inside the housing
- Water contacting electrical components
- Achieving proper gear ratio for desired output
- Submerging the apparatus to desired depth
- Anchoring the system to withstand the necessary forces
- Keeping the design compact and easy to assemble

Gantt Chart



Task Name	Duration	Start
Order Components	5 days	Fri 1/
Design Analysis	**17 days**	**Fri 1/**
Design Internal Housing	3 days	Fri 1/
Design GearBox	15 days	Tue 1
Manufacturing	**14 days**	**Mon**
Manufacture Internal Housing	14 days	Mon 1/18/
Manufacture/Order Gearbox	14 days	Mon 1/18/
Manufacture/Order Turbine	14 days	Mon 1/18/
Assembly	**10 days**	**Thu 2**
Outside Housing	5 days	Thu 2
Internal Housing	5 days	Thu 2
Electronics/Wiring	6 days	Wed
Heat/Electrical Testing	27 days	Mon 1/18/
Achoring Assembly	7 days	Thu 2
Anchor Testing	8 days	Mon
Consumer Instruction Manual	12 days	Sat 3/

Figure 29 – Gantt Chart

Current Agenda

- Design/assemble internal housing for alternator and gearbox
- Test alternator for heat dissipation issues
- Test waterproof bearing
- Finalize Following Component Designs and Selections:
  - Turbine Blade
  - Anchoring System
  - Gear Box
- Investigate measures to protect turbine and turbine user during operation
- Implement a failsafe

Experimental Forecast

Heat Dispersion Test: Run the alternator at a constant rpm in a confined space while taking temperature measurements to ensure the alternator does not exceed a safe working temperature

Waterproof Test: Submerge the housing with the waterproof bearing to observe any potential leaks

Electrical Output Test: Correlate alternator rpm with wattage output

Anchoring Test: Discover how our system responds under flowing water

Entrepreneurial Forecast

Introduce the ACC Competition we are doing, give the upcoming deadlines and go over the requirements.

Design/Assembly Forecast

- Ordering of the turbine blades instead of manufacturing
  - Strong blades since water flow can be destructive
  - Wind-turbine since it's a common concept
- Gearbox system!!!!?!?!?!?!?!?
- Anchoring system will be designed once housing with turbine is set up and tested
  - Three possible methods (Cantilever, Floating system, tree ratchet webbing support)

- This section will be used to go over aspects we plan to design and rough timeline (Anchoring System internal housing, etc..) This section BLAH!

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QUESTIONS?