HARNESSING WIND ENERGY FROM RECYCLED MATERIALS

Design Progress Report

Team 3

Katherine Carroll

Margo Dufek

Andrew McCarthy

Leanne Willey

Department of Mechanical Engineering

Northern Arizona University

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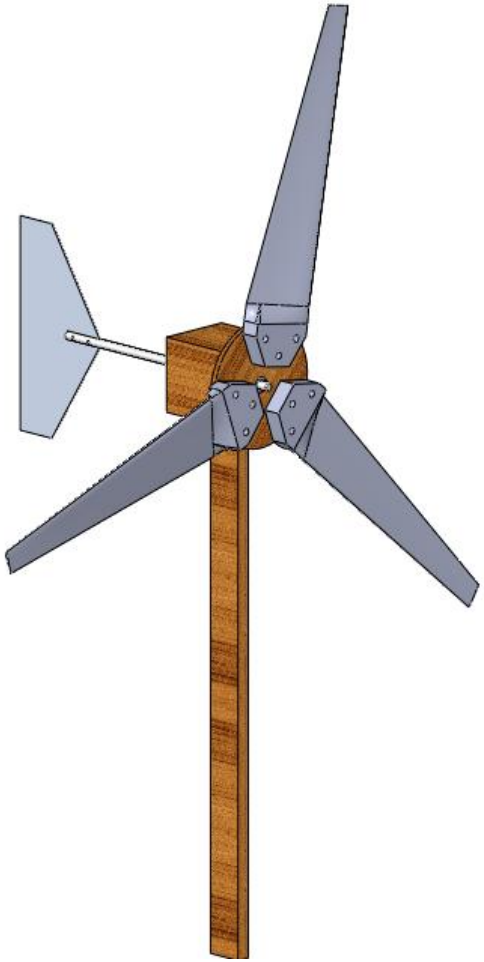
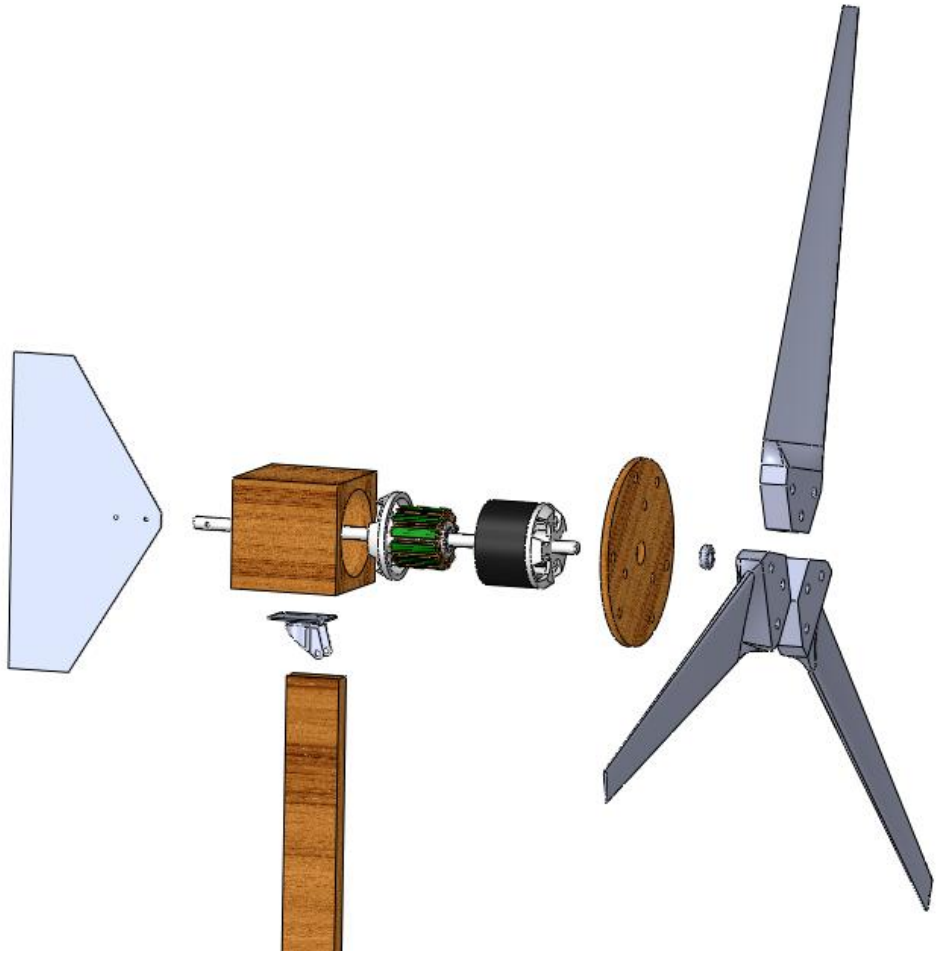
Overview

- **Customer Need**: Inhabitants of third world countries have limited access to electricity.
- **Goal:** Design an inexpensive, portable wind turbine system to harness and store wind energy.
- **Requirements/Constraints:**
  - Provide at least 0.5 kWh / day
  - Total cost does not exceed $50
  - Weight does not exceed 45 kg

Final Design



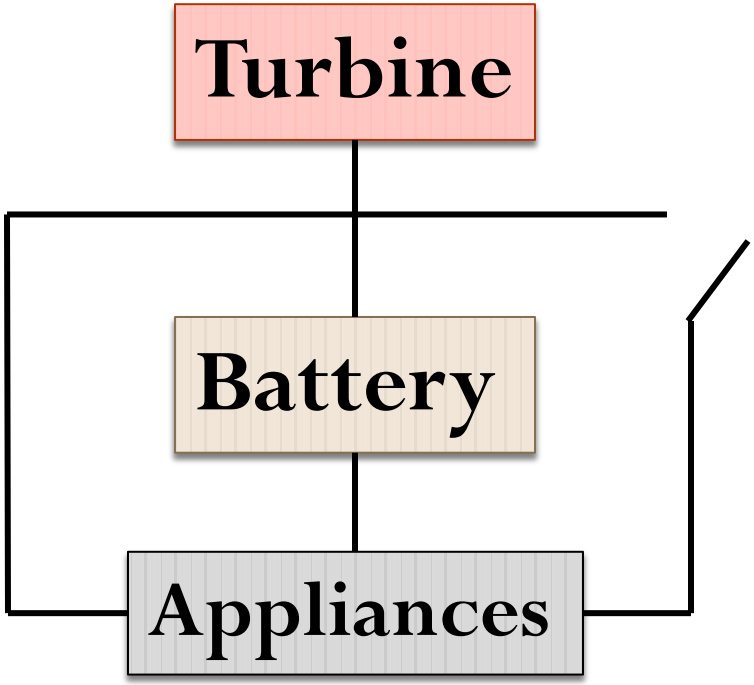
Final Design - Components



Battery Specifications

- Capacity
  - 24 - 30 Ah
  - 288 - 360 Wh
- Voltage: 12 V
- Charging current: 2.4 – 3.0 A

Circuit Diagram



Appliance Specifications

- Light Bulb: 14W DC, 12V DC CFL Bulb
- Marine Fan: 20W- 30W, 12V DC, blade diameter 12"

http://store.sundancesolar.com/12vdcledreli.html

http://www.westmarine.com

Stator Specifications

- Needed:
  - 34 W to power electronics
  - 12 V to charge car battery
  - DC power supplied

Stator Specifications

http://www.trailtech.net/SR-8200.html

Honda SR-8200 Stator and Flywheel

DC system: 40 W, 12 V, 3.3 A

Blade Specifications

- Blade Length: 0.75 m or 2.5 ft
- Angle of Twist to Blade Tip: 5°
- Pitch: 10°
- Taper: Minimal
- Airfoil Shape: NACA 004

Blade Materials

- PVC Pipe: Strength, Low Cost
- Target Pipe Size: Schedule 80, Nominal Pipe Size: 8", Wall thickness > 0.5"

Blade Construction

- Flatten PVC Pipe (Melting Point of PVC: ~ 212° F - Boiling temperature of water)
- Cut PVC into desired shape
- Mold PVC using template + heat gun
- Sand edges to create airfoil cross section

- Setbacks: Strength may be compromised, Consistency of construction process --> COM of blades.

Turbine Shaft

- Runs the length of the horizontal wind turbine
- Length: 30 inches
- Thickness: 3/4 inch (5/8 to 7/8)
- Material: Steel or Aluminum (rebar)
- Balance and Rigidity

Weather Vane Design

- Surface area: 1/3 swept area of turbine blades
- Thin metal (sheet, soda can)
- Counterweights
- Oscillates between 120 degrees

Hub Bearing

- Inter diameter size determined by thickness of shaft (5/8 to 7/8 inch)
- Pressed into wooden hub
- Provides rotation for flywheel and turbine blades
- Washer to keep out debris and dust
- Readily available

Timeline

Phase 1: Material Collection	Week 1			Week 2			Week 3								
	1/14	1/16	1/18	1/21	1/23	1/25	1/28	1/30	2/1						
Reasses Design															
Gather Hardware Materials															
Gather Electrical Components															
Phase 2: Part Construction	**Week 4**			**Week 5**			**Week 6**								
	2/4	2/6	2/8	2/11	2/13	2/15	2/18	2/20	2/22						
Build Hardware Components															
Build Electrical Circuit															
Phase 3: Assembly Construction	**Week 7**			**Week 8**			**Week 9**								
	2/25	2/27	3/1	3/4	3/6	3/8	3/11	3/13	3/15						
Assemble Turbine System															
Connect Electrical System to Turbine System															
Phase 3: Testing / Finalize Design	**Week 10**			**Week 11**			**Week 12**			**Week 13**			**Week 14**		
	3/18	3/21	3/23	3/25	3/27	3/29	4/1	4/3	4/5	4/8	4/10	4/12	4/15	4/17	4/19
Test Prototype															
Redesign & Retest Prototype															
Prepare Deliverables															

Conclusion

- Questions?