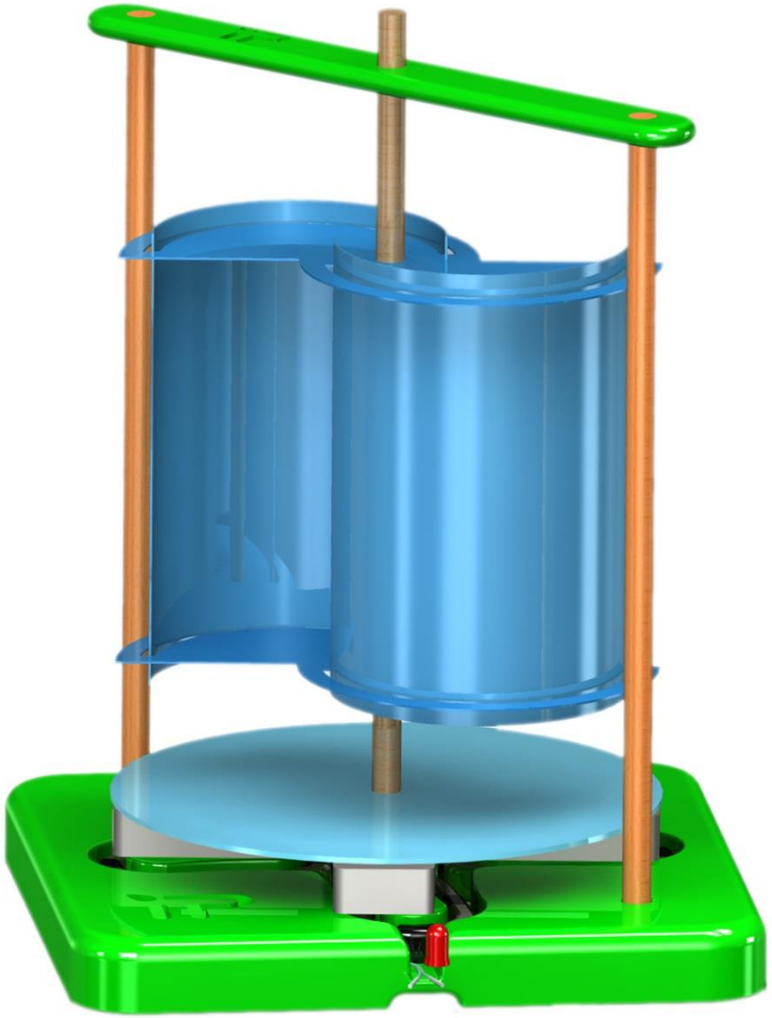
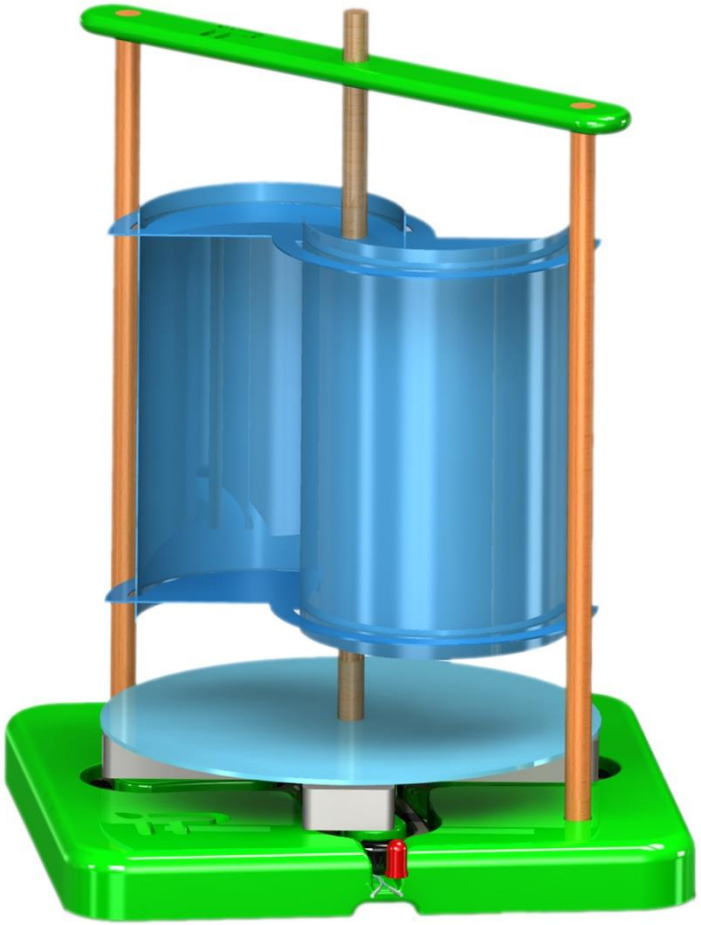
2016 Blackfeet Camp Les: 3.0 Wind Turbo to produce Electricity

INTRODUCTION

DEMONSTRATE PicoTurbine with super magnets with wind machine



Turbo Turbine



Converting Wind
to Electricity

Please follow the instructions page in order inside your kit.

Parts

- Peg legs
- Wood Base
- Handle
- Screws # 8-1-1/4”
- Black Terminals

- Turbine Kits

Turbine kits

- Magnets (4)

- Coils (4)

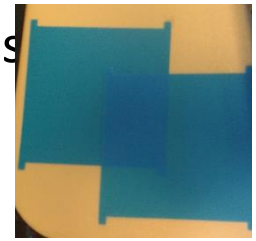
- Dowels (3)

- Base

- Frame

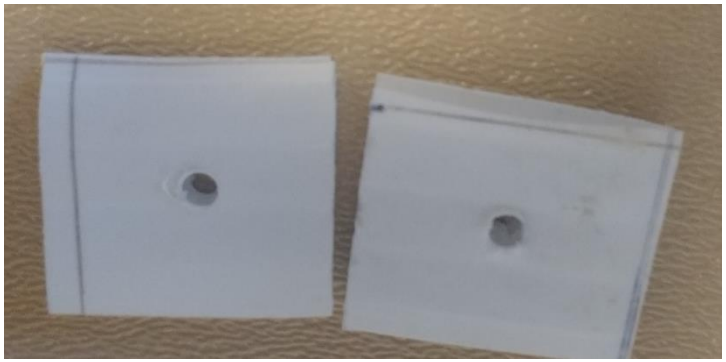
Turbine Kits

- Blade Sheets



- S Frame

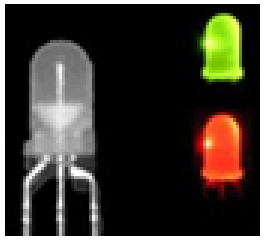
- Stabilizer



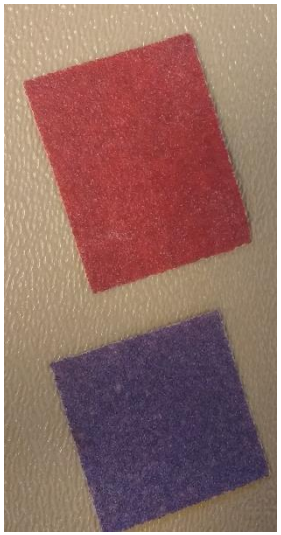
- Rotor Disc

Turbine Kits

- LED



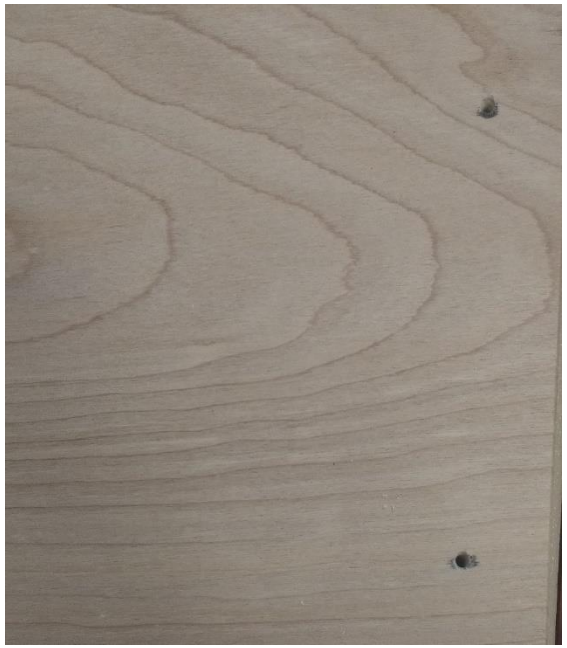
- Sand Paper



- Double Sided Tape
- Tape

Step I

- Preparing Base



1.Drill Holes Through Wood

2. Place the Handle and Screw It on the Base

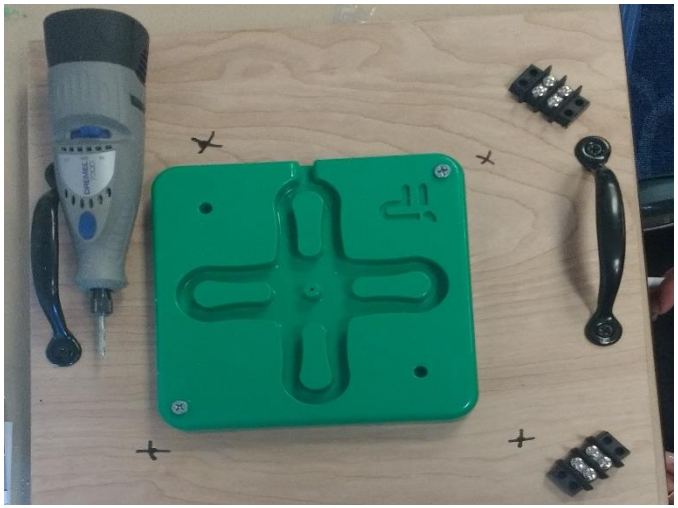
Step II

- Place the turbine base at the center of wooden base

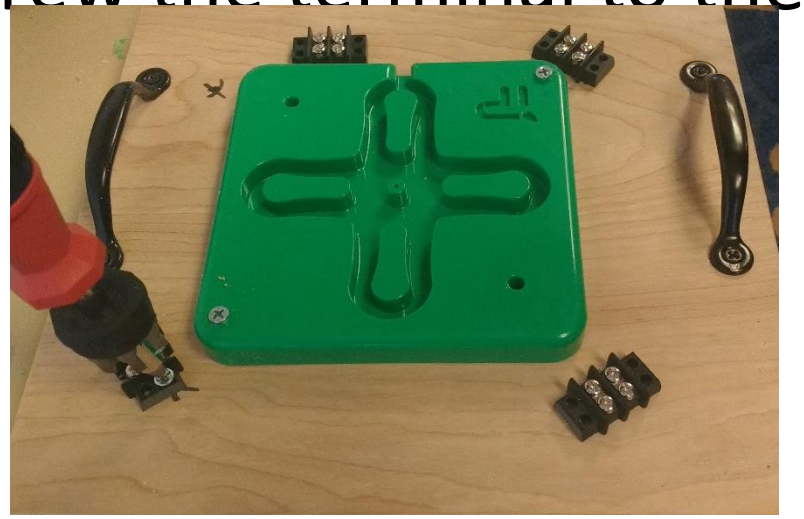
- Drill holes on corner which doesn't have holes and put screw and tighten.

Step III

- Mark Position for terminals and drill holes.

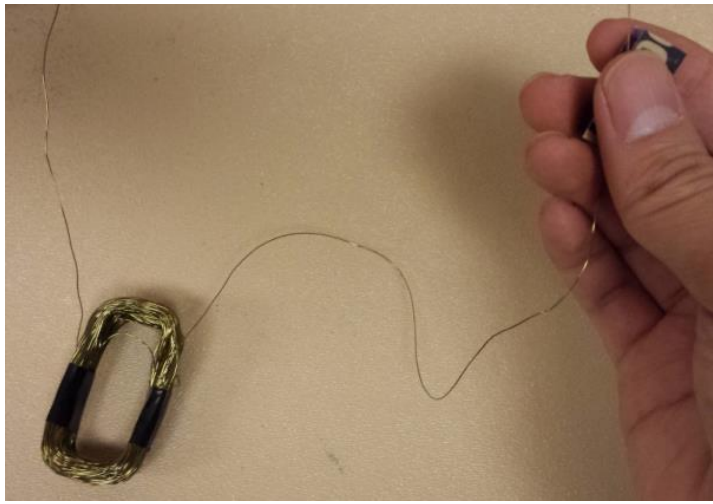


- Screw the terminal to the holes.



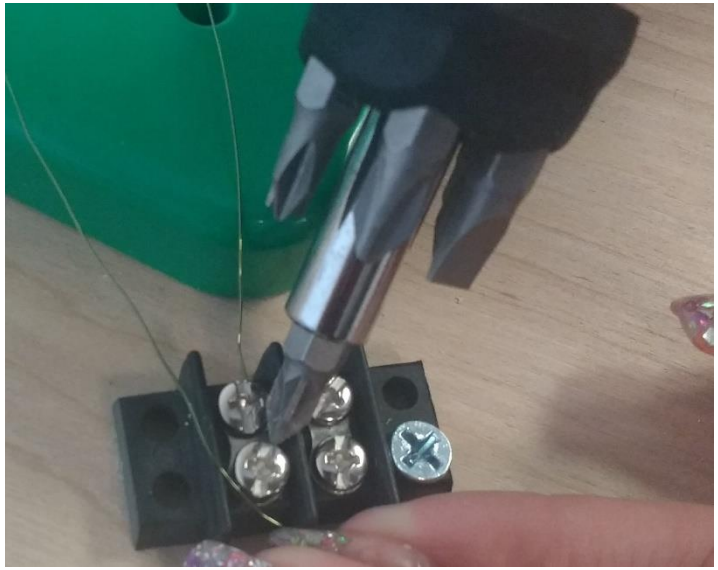
Step 1V

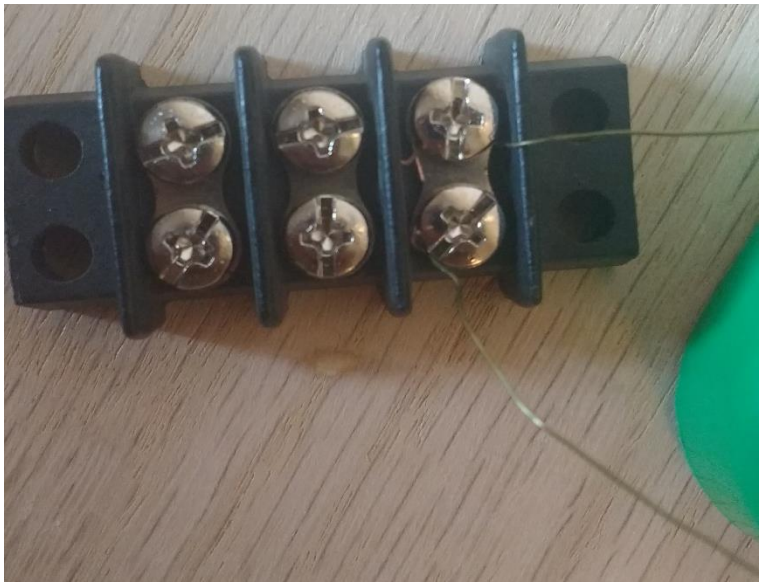
- Sand the ends of the coils.



- Place the coils with ends in alternating direction and tape the ends and at the top.

- Screw the ends for the adjacent coils to the terminal

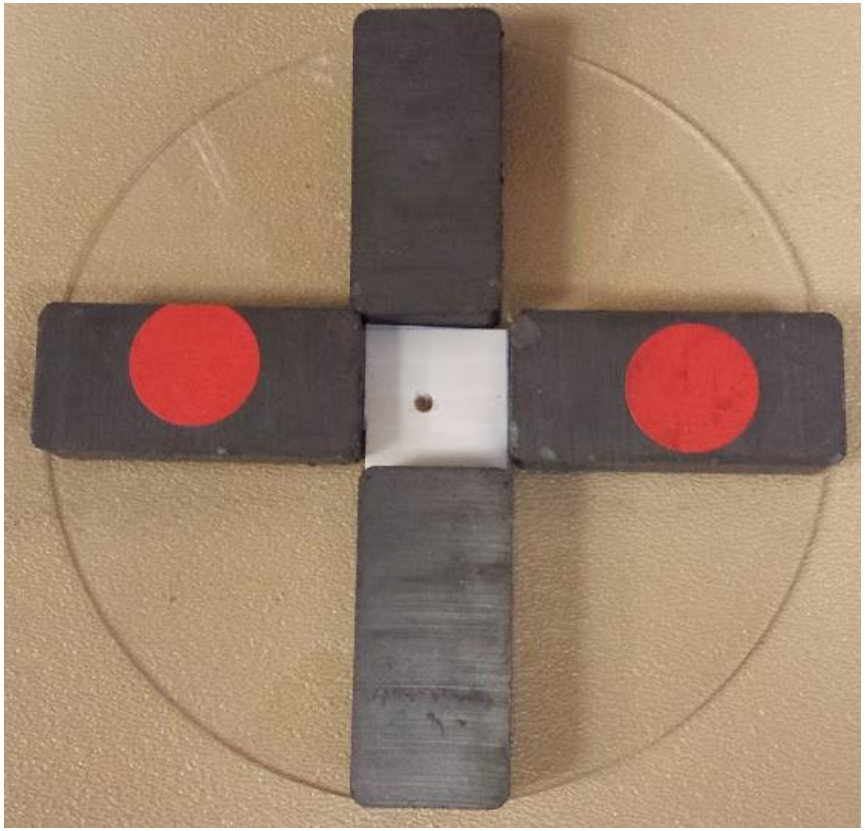




StepV

- Sharpen the longest dowel
- Please peel off both side of the plastics of the rotor disc.
- Make sure the magnet is alternating around the disc with a stabilizer at center.

- line up the stabilizer hole with the disc hole and make sure the stabilizer hole is in the center of the disc hole (use GLUE GUNS).

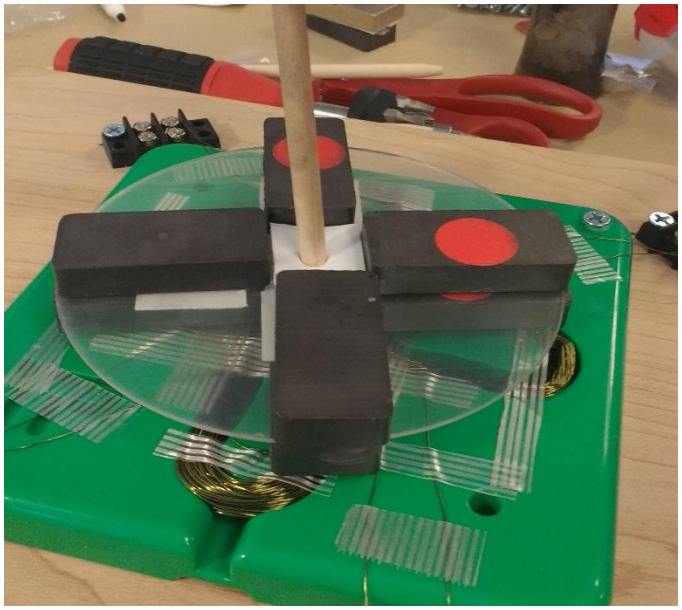


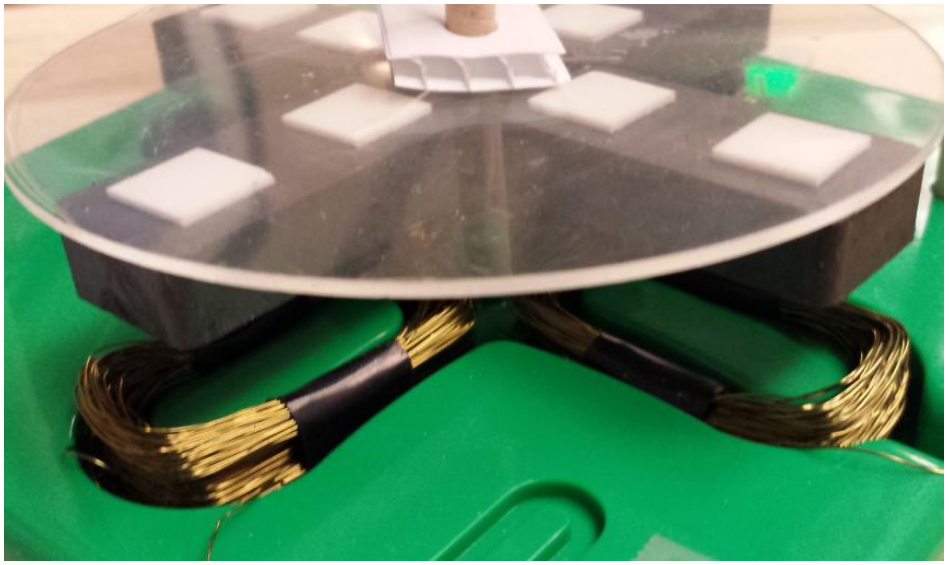
- Gently insert the sharpened dowel through the disc hole. The rotor disc may break. (Make sure the hole of stabilizers are big enough)

- Make sure all the components attached to the center dowel can rotate altogether.

Step VI

- Place the dowel on the rotor disc on the base.





- Keep the distance between the magnets and the wires as small as possible BUT make sure they DO NOT touch each other.

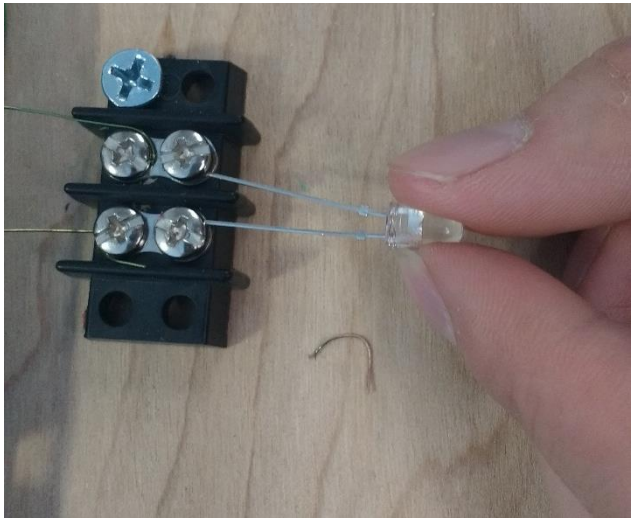
Step VII

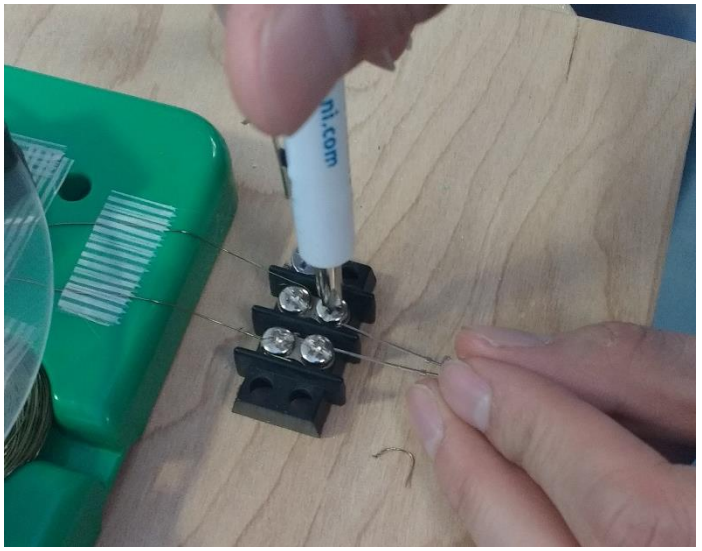
- Put the S – Frame and Blade sheet in the dowel.

- Put the frame on it and the other two dowels on the holes of the base.

Step VIII

- Unscrew the terminal and put LED as shown.



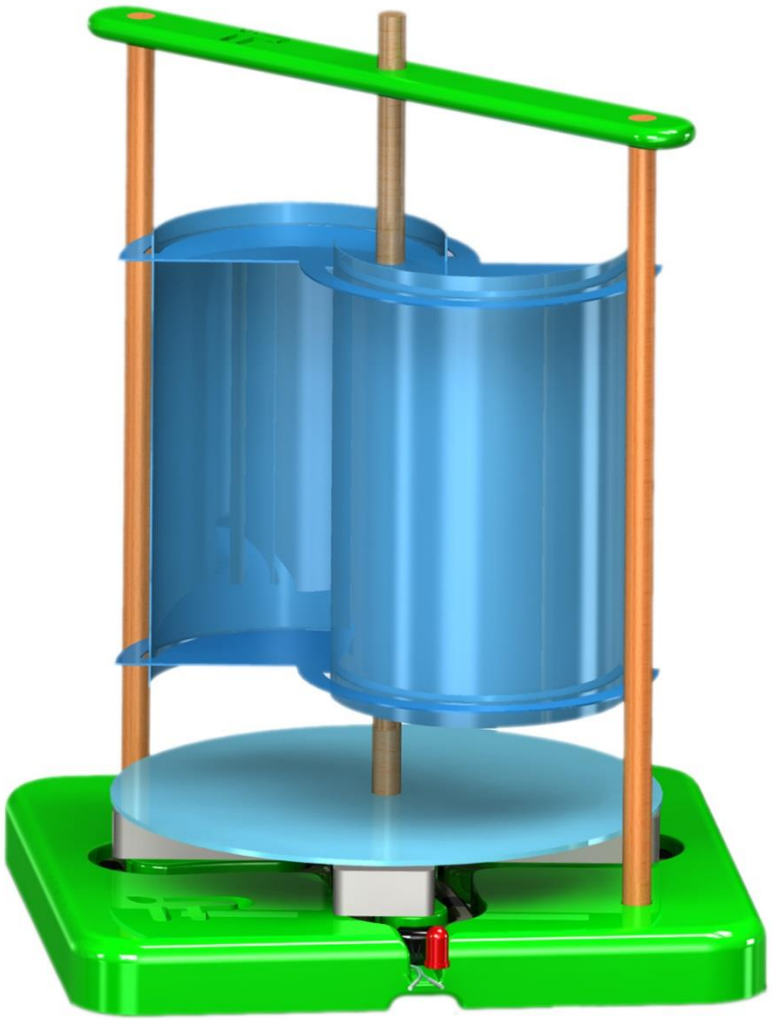


- After placing the LED screw again.

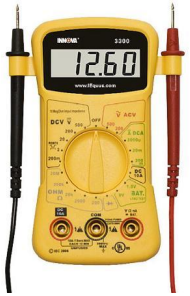
2016 Blackfeet Camp Les: 3.0 Wind Turbo to produce Electricity

INTRODUCTION

DEMONSTRATE PicoTurbine with super magnets with wind machine



2016 Blackfeet Camp Les Joy: Parts Order List OVERALL



30 Midschool and 30 Highschool								Total		
				Delivery	Delivery	Delivery		Cost	Payer	
	Units	Ordered	Vendor	Location	Time	Status	Agent			
2.0 Meter	60									
1.5 Battery										
Solar Cell										
Light Source										
Magnet & Coil (Stripped)										
3.0 Turbine Wind	40									
Wood Base 12"x12"x1"	40		Lowes				Les			4'x8'=32
extra magnets	120						Zichao			
screw Handel	80									
screw Feet	160									
screw Plastic Base										
screw electric terminal										
terminal	200									
4.0 De-engineer solar garden light	60									
5.0 Solar Lantern Browndog	30									
mid-school, solderable										
6.0 Solar USB (iPhone charger)	30									
Basic Kit										
Battery										
Solar Cell										
Demo Unit Commercial	3									
	1				#####	######	Les	$29	Les-cc	
7.0 Breadboard (free play):	5									
8.0 Bear Trap	1									
UHAUL										

Turbo Parts list

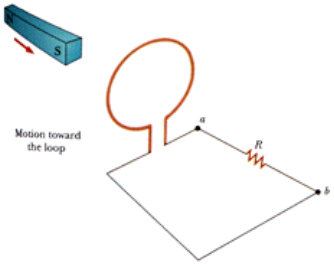
	Turbo Parts List and spare								
			Parts/Instrument						
Status	Quant	Location	Description					X20 long dowels (w	
			Type	Details				X20 plastic discs	
			Instruments	Dremel				X20 magnets	
??	10	Shop	Instruments	Dremel-battery op				X10 coils (I think I l	
??	10	Shop	Instruments	Dremel Charger					
OK	2	Shop/Lab	Instruments	Wind Machine				A list of extra stuff v	
								X20 wood boards	
Need	20		xtra parts	long dowels (we have short dowels)				X80 wood board sta	
Need	20			plastic discs				X40 handles	
Need	20			magnets				X80 wire connector	
Need	10			coils (I think I had one group last year v				X120 screws and X	
								X20 LEDs	
								X10 dremels	
								tape (for fixing the c	
								glue gun	

Prepare Wood base for Plastic Turbine

1. Paste Peglegs on bottom of wood base
2. Mark center spot for green turbine base
3. Use Dremel to secure 2 screws to green turbine base to wood
    2. Hole #1 drill hole through green turbine base and apply #8-1-1/4”screw
    3. Repeat for Hole #2
4. Mark center spot for handles
5. Use Dremel to secure 2 screws handles to wood: #8-1” screw
    2. Repeat for Handle#-1
    3. Repeat for Handle#-2
6. Mark center spot for 4 Black Terminals
7. Use Dremel to secure 2 screws for each terminal to wood

2016 Blackfeet Camp Les: 3.0 Wind Turbo *Mini demo*

Mini demo with Magnets



Faraday's Law ~200 years ago (1820's)

Show the effect of moving a giant magnet through a giant single loop meta
Observe transient voltage using Computer DVM displayed on big screen
Make a LED light up using this method?

Magnets:

Magnetometer
Show the effects of bringing a compass near a magnet
Student use their magnet and coils inside kit
Observe compass needle movement via CAMERA on big screen

Coils:

Test transient voltage of across coil comparing three materials
Compare 3 materials: moving Glass, copper, plastic, and then magnet
Observe transient voltage using Computer DVM displayed on big screen

2016 Blackfeet Camp Les: 3.0 Wind-Turbine: *INTRODUCTION*

Additional instructions beyond kit instructions

STEP 3.1 **Prepare Base Support**

Material: Wood + Legs + Handles + Screws + Terminal strips

Machines: Dremel , Drill Bits

Kit Green Base

STEP 3.2 **Coils**

Sand ends of coils

Place pre-wound coils in green base

Connect coils to terminal strip

STEP 3.3 **Testing**

Check resistance of each coil with Yellow Meter function OHMs – 6 Ohms

Test each Coil with Magnet Moving confirming alternate parity

Test total resistance of total 4 coils in series – 24 OHMS

Test TOTAL with Magnet Moving

Tape coils to green base to ensure coils do not interfere w disk

2016 Blackfeet Camp Les: 3.0 Wind-Turbine: *Assembly*

STEP-3.4 **Disk and Dowel**

Sharpen *Long* Dowel long ***(PRELAB Les)***

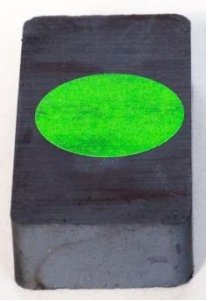
Glue Station with spacer ???????? (Les Joy)

STEP-3.5 **Attach Magnets**

Check Polarity of Magnet (green spot)

Apply sticker to base of Disk

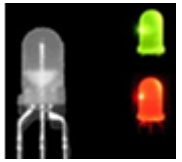
Attach magnet alternate



STEP 3.6 **Attach Disc to Base**

Assemble disk/dowel to base

Ensure proximity between Base/Magnets



STEP- 3.7 **Attach LED**

Attach LED to external terminal-strip

Test with wind

2016 Blackfeet Camp Les: 3.0 Wind Turbo to produce Electricity

THIS IS CORE OF THE TURBINE – MOVE MAGNET OVER A WIRE COIL

Les This morning we start with making a **Wind Turbine Kit**

Boyi ***DEMONSTRATE*** PicoTurbine with super magnets with wind machine

STEP-1 **Make Base Support**

Wood + Legs + Handles Dremel/Screws/Pens

Green Base

Three screws for terminals

One plastic terminal strip

STEP-2 **Coils**

Make coil length long ***(PRELAB Les)***

Sand Ends – Make Rod Coils –

Test each coil OHMs – 6 Ohms

Place in Slot

Test each Coil with Magnet Moving

Make sure alternate

Test total resistance – 24 OHMS

Test TOTAL with Magnet Moving

STEP-3 **Disk and Dowel**

Sharpen Long Dowel long ***(PRELAB Les)***

Glue Station with spacer (Les Joy)

STEP-4 **Attach Magnet**

2016 Blackfeet Camp Les: 3.0 Wind Turbo to produce Electricity

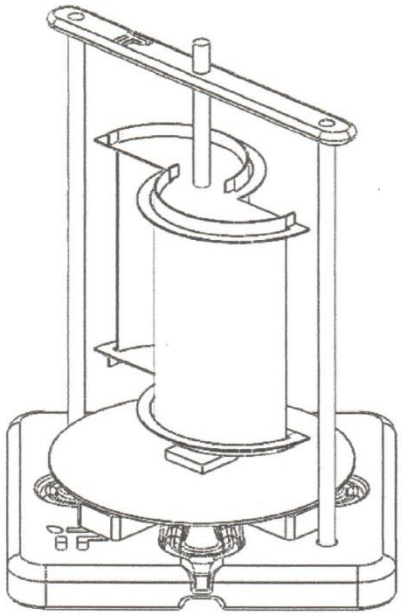
Materials List

Yellow voltmeter
Camera w PC w overhead projector
Computer with Signal Express (software)
(20) Metal screw driver
(20) AA 1.5V Battery
(20) 9V Battery
(10) Magnetic Coil
(10) Solar cell w/wo light

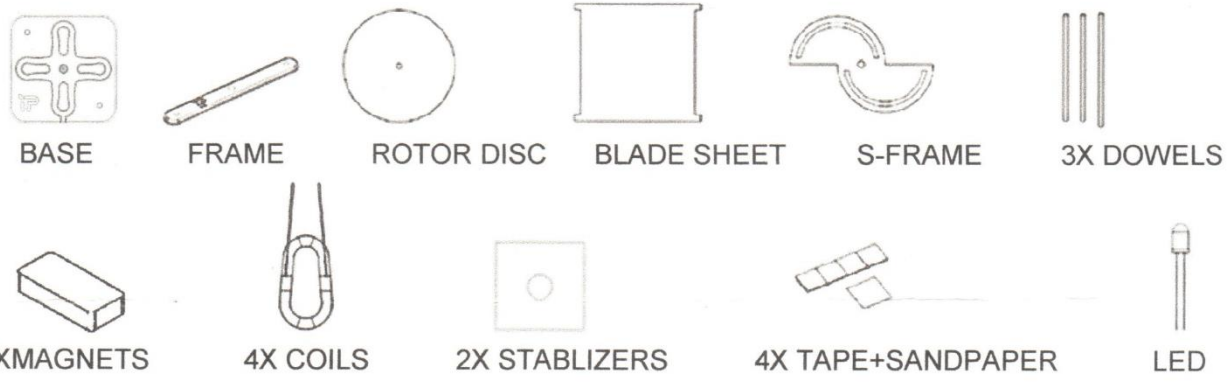
Instructions with kit-1

PicoTurbine
INTERNATIONAL

SAVONIUS V3



SAVONIUS V3 PARTS



Instructions with kit-2

CHECKLIST & OPERATION:

- Coils have a 5 – 6 Ohm resistance and Magnets should NOT touch coils.
- Maximize power with a gap of 1-3mm between coils and magnets.
- At 0.9 V the LED lights up RED. As it spins faster the LED turns GREEN.
- A Multi-meter or **PicoTurbine STEM Plus Playoff** are great for experimenting!

SAVONIUS V3 TROUBLESHOOTING

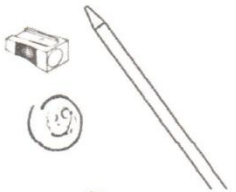
Contact: sales@picoTurbine.com for technical support!

1. Blades do not spin freely or wobble:
    a. Check the magnet coil spacing & level using stabilizers as needed.
    b. Sharpen the center dowel more if needed to minimize friction.
2. LED does not light up when blades are spinning:
    a. Check if the coils are correctly alternating.
    b. Check if the enamel is completely stripped of the coil ends.
    c. Check if the magnets are alternating (dot up and dot down).
    d. Use a multi-meter if you have one to check operating voltage.

Instructions with kit-3

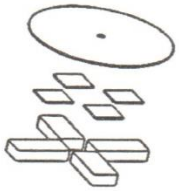
ASSEMBLY STEPS

Step 1



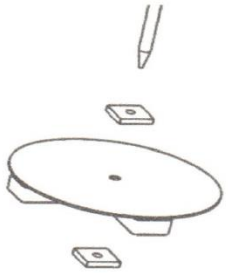
- Sharpen your longest dowel with either a standard electric or hand pencil sharpener.

Step 2
Rotor Assembly



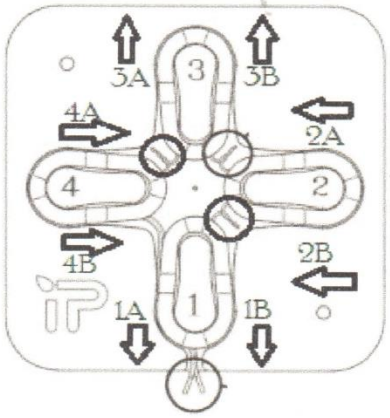
- Line up 4 magnets, alternating between a dot facing up and a dot facing down.
- Place a piece of double sided tape on each magnet.
- Place your rotor disc on a flat surface.
- Line up a stablizer hole with the disc hole.
- Place the magnets around the stabilizer to form a plus shape.
- The dots should be directly across from each other.
- When your magnet placement is set, peel off the other side of tape to hold in place on the rotor disc.

Step 3
Axle and Rotor Assembly



- Flip your rotor disc over.
- Line up your other stablizer hole with the disc hole.
- Insert your sharpened dowel through all 3 holes. (2 stablizers and 1 disc)
- Pick up the rotor assembly by the dowel to ensure it is stable and will not slide off.

Step 4



Coil Assembly

1) Using the sandpaper, remove 1" of enamel on each coil tip to expose the copper.
2) Number each coil 1, 2, 3, & 4
3) Follow the diagram
    a. Coils 1&3 will point outward
    b. Coils 2&4 will point inward

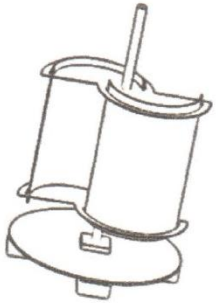
Connection Assembly

Twist the exposed ends together:

1) 2B&1B connect
2) 2A&3B connect
3) 3A&4A connect
4) LED connects to 4B&1A
5) Tuck the connections shown in the diagram circles, securely into the base.
6) Use electrical tape on the other ends of the coils as a suggestion to avoid them sticking out of the base.

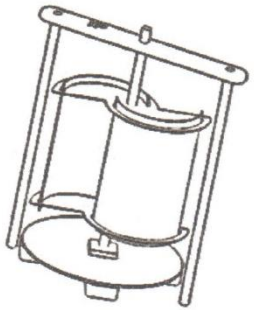
Instructions with kit-4

Step 5
Blade Assembly



- Connect S-Foil & Blade Sheets as seen in diagram; they will form two half cups.
- Slide the Blade setup onto the long dowel connected to your magnet rotor disc.

Step 6
Frame and Full Kit Assembly

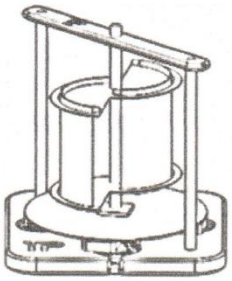


- Insert each short dowel into the Frame hole ends.
  - If they swell slightly, sand them to fit
- Center and place the Frame setup over the Blade and Rotor assembly.
- Insert the ends of the side dowels into the base.

Spin Test

- Hand spin the rotor to test for friction and efficiency.
- Make sure the magnets are not brushing against the coils but make sure they are as close as possible for maxium power.
- If the rotor is sliding down, push the axle through further or secure with electrical tape if it wears down.

Step 7



Finished Working Model

To Power use:

- Hair Dryer
- Wind

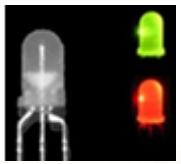
2016 Blackfeet Camp Les: 3.0 Wind-Turbine: *Assembly*

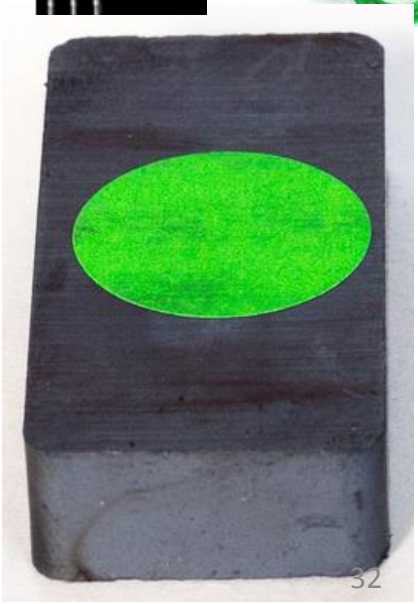
Sharpen Long Dowel long ***(PRELAB Les)***
Glue Station with spacer (Les Joy)

STEP-4 **Attach Magnet**
Attach magnet alternate
Attach mounted Magnet to BASE

STEP-5 **Attach LED**
Attach LED to terminal
Test with wind

3.1 magnet and compass
Compare 3 materials
glass copper iron plastic
3.2 make an electromagnet
3.3 test electror





From Boyi 2015

-
- I wrote this Word document last year about something students should pay attention to.
-
- Here is the list of backup we need:
- X20 long dowels (we have short dowels)
- X20 plastic discs
- X20 magnets
- X10 coils (I think I had one group last year with a set of coil broken in the middle which was really hard to find)
-
- A list of extra stuff which is not coming with the kits (quantity not including backup):
- X20 wood boards
- X80 wood board stands (the soft rubber on the back side, don't know the name)
- X40 handles
- X80 wire connectors (the black holder, don't know the name)
- X120 screws and X10 screw drivers (Do we need screws for the black holder? I don't include in "X120".)
- X20 LEDs
- X10 dremels
- tape (for fixing the coils)
- glue gun
- wind
-
- Please correct or add to the list if I forgot something.
- Hope it would be helpful.
-
- Best,
- Boyi Xu