

Alternative Power Source for Dental Hygiene Device

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Problem Statement

NAU Department of Dental Hygiene

- Humanitarian work in remote areas
- No electricity available to power Wig-L-Bug
- Our goal was to build them a working power supply

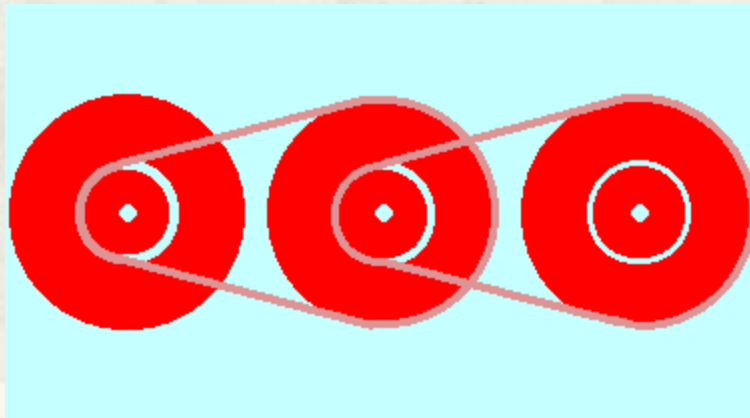


Constraints

- **Must be able to operate device for 10 hours**
- **Cannot weigh more than 20 lb**
- **Must be able to fit in 22 ×18 ×10 in container**
- **Can be assembled on site using local parts**

Mechanical Wig-L-Bug

- Use a hand crank as substitute for electric motor
- 50W Electric motor spins at 5000 RPM
- Hand crank speed 50 RPM
- Gear ratio of 1:100



Mechanical Wig-L-Bug

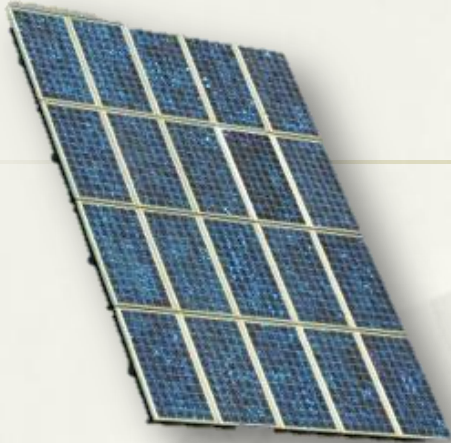
Advantages

- Does not rely on weather
- Compact
- No setup time
- Cheap, simple
- Burns Calories

Disadvantages

- Requires effort

Solar Panel



Local Solar Resource	4.37 kWh/m ² /day
Energy Required	300Wh
Solar Panel Efficiency	0.1-0.21
Calculated Panel Area	0.327-0.686m ²
Practical Panel Area	0.6-1m ²

Advantages and Disadvantages

Advantages	Disadvantages
Environment-friendly	Weather Dependent
Renewable Energy Resource	Large Area
No Noise	Cost a lot
No Manual Work Required	Not portable

Manual Generator

Military Crank Generator:

Output: 60 W
Voltage: 12.5 V
Price: 200 \$
Weight: 4.5 kg



Manual Generator

Bicycle:

A bicycle attached to an alternator.

A battery.



Advantages And Disadvantages For the Manual Generator

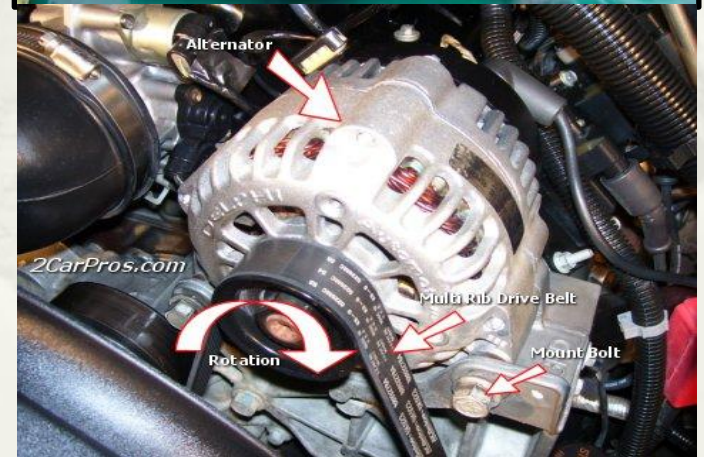
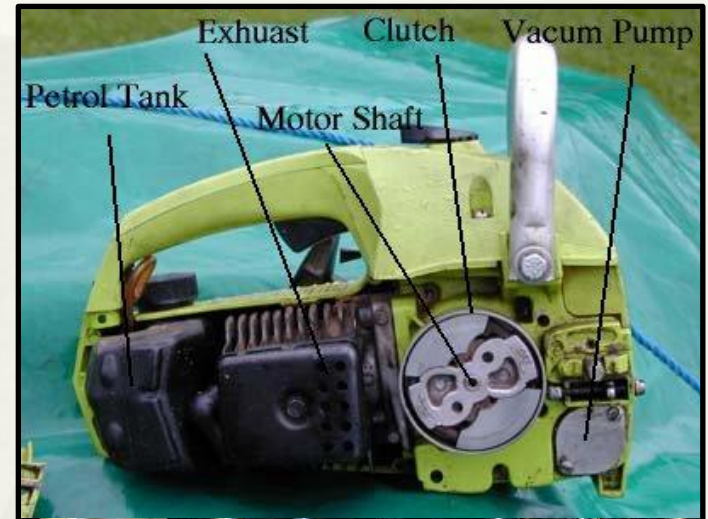
Advantages	Disadvantages
Doesn't need the sun	You have to crank it
Doesn't need the wind	Hands get tired
No gas	
No pollution	
Heavy duty	

Advantages And Disadvantages For the Bicycle

Advantages	Disadvantages
Doesn't need the sun	We could build the project but they have to buy the bike from India
Doesn't need the wind	legs get tired
No gas	You have to pedal 100 W to get 65 W electric
No pollution	It's big

Gas Generator

- * Chainsaw Motor
- * Alternator
- * Car Battery



Gas Generator

Specifications for Gas Generator	
Output Voltage	12 V
Output Current	80 A
Power	1000 W
Weight	7 kg
Cost	200 \$

Advantages And Disadvantages For Gas Generator

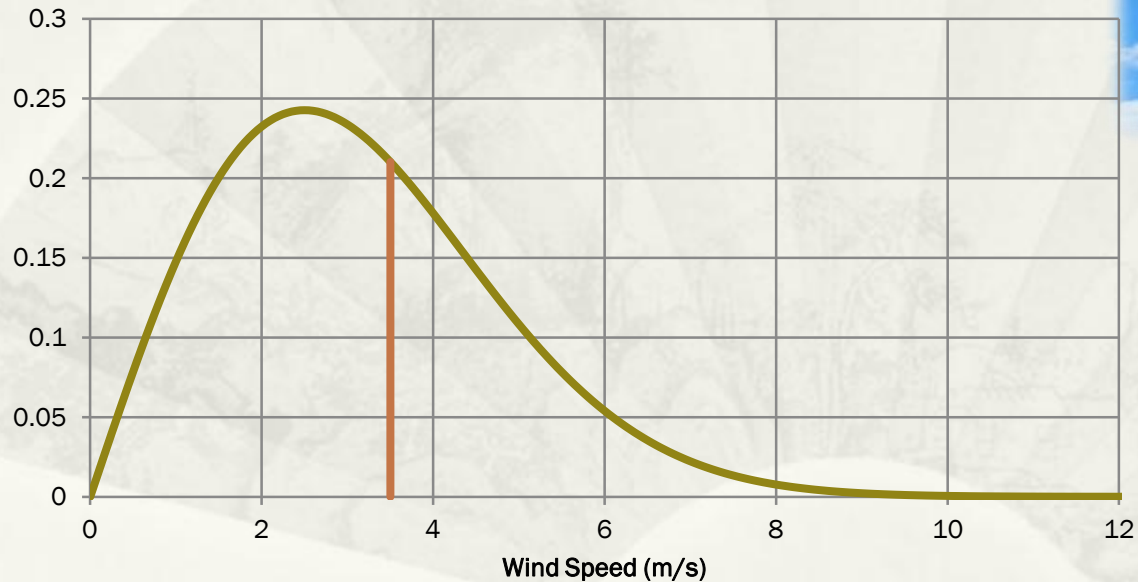
- * Advantage
 - * Supply the most power
 - * No need for wind and sun
- * Disadvantage
 - * Needs gasoline
 - * Makes noise
 - * Emits exhaust



Wind Turbine

* Wind Resource

Wind Speed Distribution in Mainpat



Cut-in wind speed = 3.5 m/s
Rated wind speed = 12 m/s
Rated power = 50 W
Weight = 2.5 kg
Rotor diameter = 830 mm

Conclusion

5 Designs, in order of practicality

1. Mechanical Wig-L-Bug
2. Manual Generator
3. Gasoline Generator
4. Solar Panels
5. Wind Generator

References

- * http://www.bomara.com/powerware/wp_harmonics.htm
- * http://www.stecasolar.com/index.php?Inverter_selection

Questions ?

