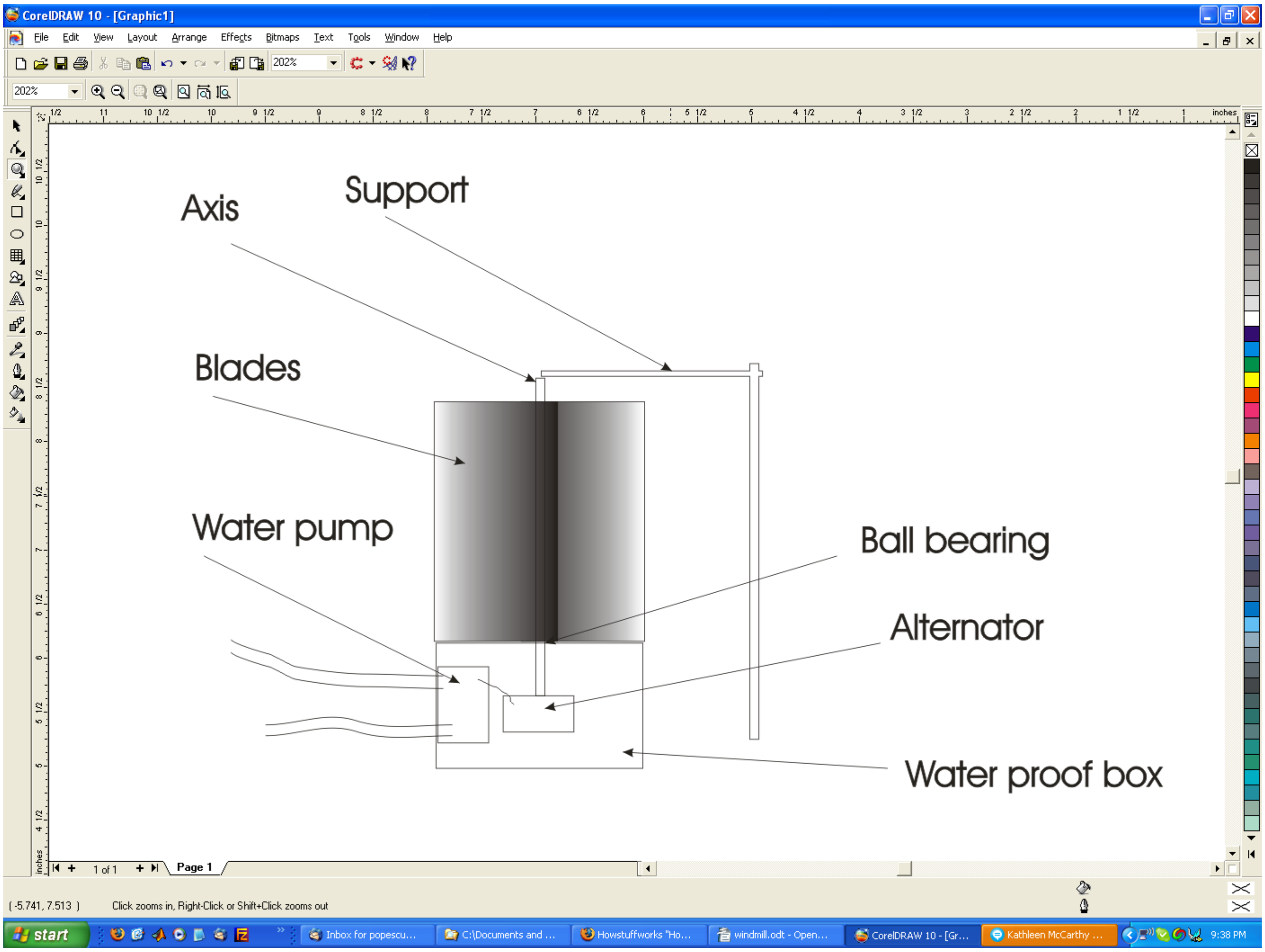
Wind mill for cheap (400$)

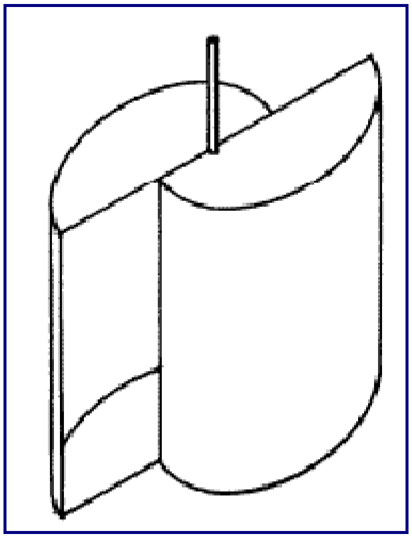


Vertical Axis Wind Turbines (or VAWTs) have the main rotor shaft running vertically. The advantages of this arrangement are that the generator and/or gearbox can be placed at the bottom, near the ground, so the tower doesn't need to support it, and that the turbine doesn't need to be pointed into the wind. Drawbacks are usually the pulsating torque produced during each revolution, and the difficulty of mounting vertical axis turbines on towers, meaning they must operate in the slower, more turbulent air flow near the ground, with lower energy extraction efficiency.

Savonius wind turbine

From Wikipedia, the free encyclopedia

Jump to: navigation, search



Schematic drawing of a two-scoop Savonius turbine

Savonius wind turbines are a type of vertical axis wind turbine, used for converting the power of the wind into torque on a rotating shaft. They were invented by the Finnish engineer S J Savonius in 1922. Savonius turbines are one of the simplest turbines. Aerodynamically, they are drag-type devices, consisting of two or three scoops. Looking down on the rotor from above, a two-scoop machine would look like an "S" shape in cross section. Because of the curvature, the scoops experience less drag when moving against the wind than when moving with the wind. The differential drag causes the Savonius turbine to spin. Because they are drag-type devices, Savonius turbines extract much less of the wind's power than other similarly-sized lift-type turbines. Much of the swept area of a Savonius rotor is near the ground, making the overall energy extraction less effective due to lower wind speed at lower heights.

Savonius turbines are used whenever cost or reliability is much more important than efficiency. For example, most anemometers are Savonius turbines, because efficiency is completely irrelevant for that application. Much larger Savonius turbines have been used to generate electric power on deep-water buoys, which need small amounts of power and get very little maintenance. Design is simplified because no pointing mechanism is required to allow for shifting wind direction, unlike horizontal axis turbines, and the turbine is self-starting. Savonius and other vertical-axis machines are not usually connected to electric power grids. They can sometimes have long helical scoops, to give smooth torque.

The most ubiquitous application of the Savonius wind turbine is the Flettner Ventilator which is commonly seen on the roofs of vans and buses and is used as a cooling device. The ventilator was developed by the German aircraft engineer Anton Flettner in the 1920s. It uses the Savonius wind turbine to drive an extractor fan. The vents are still manufactured in the UK by Flettner Ventilator Limited.

Small Savonius wind turbines are sometimes seen used as advertising signs where the rotation helps to draw attention to the item advertised. They sometimes feature a simple two-frame animation.

Battery charging system

Alternators are used in automobiles to charge the battery and to power all the car's electric systems when its engine is running. Alternators have the great advantage over direct-current generators of not using a commutator, which makes them simpler, lighter, and more rugged than a DC generator. The stronger construction of alternators allows them to turn at higher speed, allowing an automotive alternator to turn at twice engine speed, improving output when the engine is idling. The availability of low-cost solid-state diodes from about 1960 allowed auto manufacturers to substitute alternators for DC generators. Automotive alternators use a set of rectifiers (diode bridge) to convert AC to DC. To provide direct current with low ripple, automotive alternators have a three-phase winding.

Modern automotive alternators have a voltage regulator built into them. Typical car alternators generate the field using a DC current through slip rings. The field current is much smaller than the output current taken from the fixed stator windings, and so heavy duty slip rings are not required. For example, in an alternator rated to produce 70 amperes of DC, the field current will be less than 2 amperes. The voltage regulator operates by modulating the small field current in order to produce a constant voltage at the stator output. In many older designs of car, the field windings are initially supplied via the ignition switch and charge warning light, which is why the light glows when the ignition is on but the engine is not running. Once the engine runs and the alternator is generating, a diode feeds the field current from the alternator main output, thus equalizing the voltage across the warning light which goes out. The wire supplying the field current is often referred to as the "exciter" wire. Because no permanent magnets are used and the field current is fully controlled, the efficiency with which mechanical work is converted to electric power is remarkably high at around 90%. In comparison, the best permanent magnet generators, such as those used for bicycle lighting systems, achieve an efficiency of around only 60%.

This system is simple and avoids the need for a heavy duty switch in the main alternator output circuit, which can carry very high currents—up to 100 amperes (though typical cars have 40–60 ampere alternators). One drawback of this arrangement is that if the warning light fails or the "exciter" wire is disconnected, no priming current reaches the alternator field windings and so the alternator will not generate any power. However, some alternators will self-excite when the engine is revved to a certain speed. The driver may check for a faulty exciter-circuit by ensuring that the warning light is glowing with the engine stopped. Very large automotive alternators used on heavy equipment or emergency vehicles may produce 300 amperes. Very old automobiles with minimal lighting and electronic devices may have only a 30 ampere alternator. Many alternators are also linked to the vehicles on board computer system and over very recent years many other factors including air flow are considered in the ingrediant to charge the battery.Output of alternators on vehicles manufactered today are between 100 - 150 amps, certain vehicles are fitted with 190 amp units and tend to be cooled by water.

They always self-start (if at least three scoops).

- **Easy to make (1 barrel cut in half).**
- **1 vertical axis (wood)**
- **a mounting platform (which includes the alternator/rectifier and DC battery).**
- **1 ball-bearing**
- **1 support arm (optional)**
- **1 alternator**
- **1 rectifier (included in car alternator)**
- **1 DC car battery (optional)**
- **1 car water pump**

Cost: ... 400$ should fit.

Battery Terms and ratings

- *Ampere-hours* (A·h) is the ratio to time that a battery can deliver a certain amount of current. Generally expressed in the base value of number of hours discharging a current of 1 A.
- *Cranking amps* (CA), also sometimes referred to as *marine cranking amps* (MCA), is the amount of current a battery can provide at 32 °F (0 °C). The rating is defined as the number of amperes a lead-acid battery at that temperature can deliver for 30 seconds and maintain at least 1.2 volts per cell (7.2 volts for a 12 volt battery).
- *Cold cranking amps* (CCA) is the amount of current a battery can provide at 0 °F (−18 °C). The rating is defined as the amperage a lead-acid battery at that temperature can deliver for 30 seconds and maintain at least 1.2 volts per cell (7.2 volts for a 12-volt battery). It is more a demanding test than those at higher temperatures.
- *Hot cranking amps* (HCA) is the amount of current a battery can provide at 80 °F (26.7 °C). The rating is defined as the amperage a lead-acid battery at that temperature can deliver for 30 seconds and maintain at least 1.2 volts per cell (7.2 volts for a 12-volt battery).
- *Reserve capacity minutes* (RCM), also referred to as *reserve capacity* (RC), is a battery's ability to sustain a minimum stated electrical load; it is defined as the time (in minutes) that a lead-acid battery at 80 °F (27 °C) will continuously deliver 25 amperes before its voltage drops below 10.5 volts. The value is calculated by Peukert's equation:

$$C = I^n T$$

where: C is the theoretical capacity of the battery, I is the current, T is time, and n is the Peukert number, a constant for the given battery. The equation captures the fact that at higher currents, there is less available energy in the battery. The Peukert number is determined empirically and reflects the internal resistance of the battery. To calculate Peukert's exponent for a battery it is discharged twice using two different currents and the time is taken for each. The two currents and the two times are entered into the following equation:

$$n = \frac{\log t_2 - \log t_1}{\log I_1 - \log I_2}$$

A value close to 1 indicates a well-performing battery with little loss. A higher number reflects a less efficient battery. The Peukert number of a battery is exponential and is between 1.3 and 1.4 for lead acid types.

- The hydrometer measures the amount of sulfuric acid in the electrolyte. A low reading means that sulfate is stuck to the battery plates. Upon recharge of the battery, the sulfate returns to the electrolyte.
- The *open circuit voltage*, measured when the engine is off. It can be approximately related to the charge of the battery by:

Open Circuit Voltage	~ State-of-charge
12.65 V	100 %
12.45 V	75 %
12.24 V	50 %
12.06 V	25 %

11.89 V	0 %

The following is common for lead-acid batteries:

- Quiescent (open-circuit) voltage at full charge: 12.6 V
- Unloading-end: 11.8 V
- Charge with 13.2-14.4 V
- Gassing voltage: 14.4 V
- Continuous-preservation charge with max. 13.2 V
- After full charge the terminal voltage will drop quickly to 13.2 V and then slowly to 12.6 V.

The energy to weight ratio, or specific energy, is in the range of 108 kJ/kg (30 W·h/kg).

Turbine : 300 W.h

Alternator Efficiency : 90%

Rectifier efficiency : ?? high

Problem : obtaining AC ... run pump on DC.

300 watts , at 12 V and 0.81 efficiency = 20 amps ...

Tools :

Car tools, hand tools , ...
Oscilloscope , voltmeter ...
Power grinder , power drill (with bits, and hole making ...).
Saw
Garden hose.
400$.