

DIY 1000 watt wind turbine

by [spence](#) on June 2, 2006

Table of Contents

intro: DIY 1000 watt wind turbine	2
step 1: Build the magnet disks	2
step 2: Build the coil disk	3
step 3: Build the bearing assembly	4
step 4: construct the blades	4
step 5: Bolt it all together	4
Related Instructables	4
Advertisements	5
Customized Instructable T-shirts	5
Comments	5

intro: DIY 1000 watt wind turbine

We built a 1000 watt wind turbine to help charge the battery bank that powers our offgrid home. It's a permanent magnet alternator, generating 3 phase ac, rectified to dc, and fed to a charge controller. The magnets spin with the wind, the coils are fixed, so no brushes or slip rings necessary.



step 1: Build the magnet disks

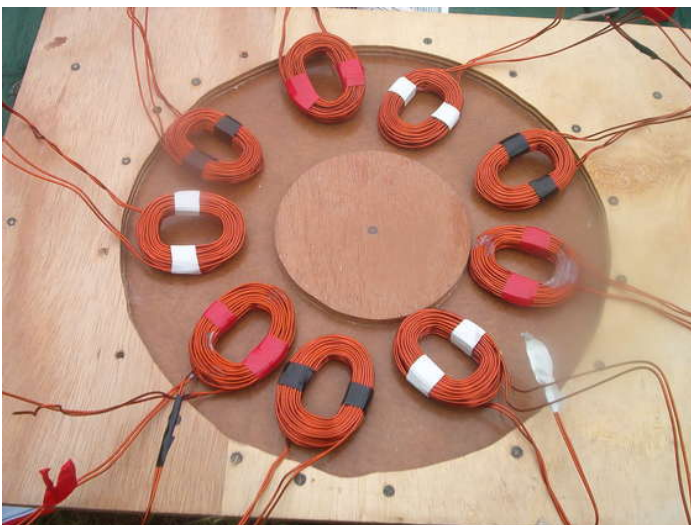
We had 12" steel disks hydro cut. We cut a template for mounting the magnets. Then we mounted 12 grade n50 magnets around the outside edge. We then built a form, and poured the resin with hardner.

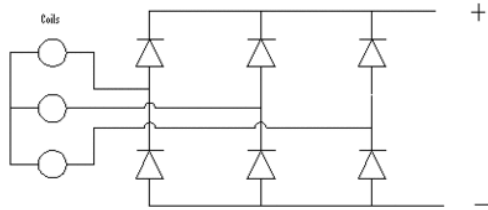




step 2: Build the coil disk

We wound the nine individual coils, soldered them in a 3 phase wye configuration, and encased them in resin. We used 35 turns of 2 parallel strands of 14 gauge enameled wire for 12 volts. Use 35 turns of single strand for 24 volts.





step 3: Build the bearing assembly

Two Harley Davidson wheel bearings are inserted into the pipe, with a smaller pipe locked between them to keep them in place.



step 4: construct the blades

The blades are 2" x 6" pine, cut at 10 degrees on a table saw, and sanded into a rough airfoil. Not perfect, but close enough.

More can be found at

<http://tech.groups.yahoo.com/group/axialflux/>

<http://www.green-trust.org>

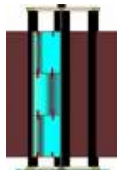
<http://youtube.com/watch?v=o9EEHFKEckM>

step 5: Bolt it all together

Related Instructables



How I built an electricity producing wind turbine by mdavis19



Faroun Savonius Wind Turbine by faroun



Pringles Wind Turbine (Pleech) - Version One by mikejedw



Cardboard Savonius Wind Turbine by rhackenb



Parasitic Wind Turbine by Tool Using Animal



Wind Power (guide) by PKM



Windbelt Redux 21st Century Micro Power Generation by Tool Using Animal




4" v8-savonius,vertical axis,wind turbine,ametek by faroun




Comments

50 comments [Add Comment](#)

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 **terry1947** says: Jan 14, 2009. 2:23 PM [REPLY](#)
hi I am very impressed with your design and build I am curious about magnets and polarity on disc,s are they 1north 1south facing stator.
or north south center to outer edge


 **sspence** says: Jan 14, 2009. 3:10 PM [REPLY](#)
polarity is on the flat faces, and the alternate N, S, N, S facing the stator.


 **philwinds** says: Jan 11, 2009. 1:04 AM [REPLY](#)
<http://pacwind.net> develop a vertical windmill with a similar motor configuration as yours. Do you have an idea how many magnets did they use for their
seahawk model producing 500w at 600rpm.

 **sspence** says: Jan 11, 2009. 11:04 AM [REPLY](#)
None whatsoever.


 **philwinds** says: Jan 11, 2009. 12:31 AM [REPLY](#)
what's the thickness of the plate you used and what's the approximate thickness of the coil disk in the picture?


 **sspence** says: Jan 11, 2009. 11:04 AM [REPLY](#)
The steel plate is 1/4", and the coil pack is about 3/4", depending on how tight your coils are wound.


 **Gridnack572** says: Nov 18, 2008. 11:44 PM [REPLY](#)
would it be possible to build a vertical turbine with this power configuration ??

 **philwinds** says: Jan 11, 2009. 12:44 AM [REPLY](#)
Please visit www.pacwind.net and you will see Vertical windmill with the same power configuration.

 **sspence** says: Nov 19, 2008. 5:27 AM [REPLY](#)
You could, but at greatly reduced output.


 **Davorin** says: Jan 6, 2009. 8:34 AM [REPLY](#)
How did you connect the coils? There is double winding wires. is there one end connect so in one coil current flows parallel up and down or there is some
other way?


 **sspence** says: Jan 6, 2009. 12:01 PM [REPLY](#)
In the coil, the strands are in parallel, both end of each strand are connected to each other. This is to share the current between the strands, it acts as a
larger wire, but is easier to wind. 3 coils are connected in series, and the 3 series are connected in the center, leaving one end of each series to come
down the tower to the rectifier.


 **philwinds** says: Jan 6, 2009. 1:09 AM [REPLY](#)
Hello, nice project. May I know what's the size of N50 magnet did you use? The length, width, height?


 **sspence** says: Jan 6, 2009. 5:28 AM [REPLY](#)
2" x 1" x .5"


 **junits15** says: Jan 5, 2009. 6:20 PM [REPLY](#)
where do you get your magnet wire from?

 **sspence** says: Jan 5, 2009. 8:52 PM [REPLY](#)
<http://www.magnet4less.com/index.php?cPath=9>

 **Davorin** says: Dec 13, 2008. 9:48 AM [REPLY](#)
Hi I'm most interested in this windmill so I have some comment. This N50 magnets you could find in Hard drives from computers, and My pal advised me as more magnet poles you put you will cut needing rpm. with 12 poles U need 600 rpm with 24 poles U need 300 rpm etc.


 **sspence** says: Dec 25, 2008. 6:00 PM [REPLY](#)
Your pal doesn't understand the whole equation. more magnet poles means more coils, different diameter, etc. i.e., a complete redesign of the system.


 **Davorin** says: Jan 4, 2009. 1:36 AM [REPLY](#)
tell me if I turn the magnets on a side it will take a less space on the steel wheel but would it have the same function? Thickness of my magnets is not the same cause I get it from hard drives they are 1mm - 2.5mm.


 **sspence** says: Jan 4, 2009. 6:34 AM [REPLY](#)
On our magnets, the poles are on the face of the magnets. putting them on their sides would mean zero output.

 **joinaqa** says: Dec 27, 2008. 9:52 AM [REPLY](#)
how much did it cost you to build this thing?
i want to make it..how much will it cost in us dollars?

 **sspence** says: Dec 27, 2008. 10:25 AM [REPLY](#)
About \$500 for the turbine, and another \$500 for the tower.

 **conntaxman** says: Dec 25, 2008. 5:42 PM [REPLY](#)
Question.I made some test coils,I used I think about no.28 wire with 200 windings each for the 9 coils.I tested and it showed about 6 volts and point something amps.I for got what the amps read,but were small.I tried to light a small bulb and the bulb would not light.So could this be because their were two many windings with such small wire and the restance was to great.
It would light a LED.The coils that I will make will be either of no. 18-16-14 wire with about 200 windings.
Thanks
Johnny

 **sspence** says: Dec 25, 2008. 6:13 PM [REPLY](#)
200 windings? what voltage are you shooting for? we only use 35 windings for a 12v machine, and 72 for a 24v.

 **conntaxman** says: Dec 25, 2008. 9:04 PM [REPLY](#)
sspence,Im making a vawt and want to try to get some amprage at about 25 rpm.I do know that you can only get so much out of the amount of wind.With the huge amount of tourk I know that it should produce some ele. at that low rpm.You asked how much voltage I was trying to get out of it.About 4.5 out of each set of coils which it can do.But the amprage is very low when produceing just 12 volts,I think that it is because the wire is so small I measured it with a micromator and it came out to be about number 27 magnet wire.
Before I spend about \$200.00 for either no.18-16-14 I would like to know this answer.
I think that you said that you used 2 strands to wrap your coils.Im trying to stay away from the thickness of the wire with that many windings 200.
Im using the 1/2 x 1 x 2 I think their the no.42 neo. magnets.
Right now im making Fiberglass blades instead of metal,they will be lighter for the sq in. area.
Thank again.
Johnny



sspence says:

Dec 26, 2008. 6:06 AM [REPLY](#)

200 windings per coil does not make sense in this design. this design is for 35 windings per coil (12v), and we use dual strand 14g to handle the 1000 watt load. It's designed for 650 rpm for full output, and need a 12:9 ratio (12 per rotor, 2 rotors) of magnets to coils to work right. running it slower with more windings will affect the whole power output. I can't advise you on such a radical departure of the design.



conntaxman says:

Dec 26, 2008. 7:24 AM [REPLY](#)

sspence, The mill that I'm making is a VAWT. not a HAWT.
I'm trying to make a TEST coil first. The rpm of the VAWT that I want to start to make electricity would be around 25 rpm. I have made 9 test coils 3 sets out of 27g. They did produce about 4.5 volts but NO amperage. This is the question, was their no or hardly any amperage because of the small size of wire that I used for the test coil. Like I said it did light up L E D .
I hate to spend \$200.00 dollars for wire and not have them work. The coils will take about 1800 ft of wire.
tk
Johnny.....also at only 24 rpm it has a lot of torque.



sspence says:

Dec 26, 2008. 10:15 AM [REPLY](#)

alternators do not make amperage without a load, they supply amperage when a load asks for it. The only way to test this is to mount all the coils, wire it up to a 3 phase rectifier, and attach a battery that needs charging. yes, your wire is way too small, you will burn up the coils trying to supply a heavy load. if you follow the recipe everything will work right. you need to understand the original, before trying new things.



toxickschaun says:

Dec 25, 2008. 5:29 AM [REPLY](#)

Hello Sspence.. your project is exciting me!!! ohhh hahaha here I have questions about rpm, wind speed and loads..

I read at 30mph wind your mill spins at 650ish rpm..
is that outputting 1000ish watt?

can you give me an idea of output watts at 50rpm
100rpm, 200rpm and 400rpm.

also the mill spins at 600ish at 30mph if wind is 15mph is that going to be about 300rpm? and so on for 60mph winds..

what happens if wind speed is too high?

does the windmill spin faster with no load?

sorry about the long flooded post but like I said I am excited and want info for a possible build..

can you give me an idea of weight also for the 24 magnets as I want to calculate for international shipping costs.

thanks so much... and merry christmas.



sspence says:

Dec 25, 2008. 6:11 PM [REPLY](#)

30 mph will produce about 1000 watts. at speeds less than 30, the power drops off sharply, as explained here,
<http://www.windpower.org/en/tour/wres/enrspeed.htm>

the tail vane pushes the blades out of line with the wind to keep the mill at about 650 rpm.

The magnets are heavy (8 lbs or so), I suggest you find a local source.



jhon2891 says:

Nov 18, 2008. 3:12 AM [REPLY](#)

how much did it cost for all of that copper wire, just so I can get a rough estimate.



sspence says:

Nov 18, 2008. 5:25 AM [REPLY](#)

About \$100 for a 12v turbine (200' of 14g enameled, close to 4 lbs.)



jhon2891 says:

Nov 20, 2008. 3:29 AM [REPLY](#)

do you mean 100\$ for all of the coils or just one?



sspence says:

Nov 20, 2008. 5:37 AM [REPLY](#)

All. each coil (there are 9) is about 2" x 1" (a bit less than 4" per turn), and it's 35 turns of dual strand per coil.



jhon2891 says:

Dec 14, 2008. 12:35 PM [REPLY](#)

How many feet of wire does it take to build all of the coils in the configuration?



sspence says:

As per above, 200' for a 12v and 24v turbine (the 12v uses dual strands).

Dec 14, 2008. 1:16 PM [REPLY](#)



Budo Titan says:

i dont know if this helps but
www.magnet4less.com has the same magnets(24) for less than \$200 bucks.

Dec 5, 2008. 7:52 PM [REPLY](#)



mcgeejay says:

I'm living in Peru so info is a little hard to come by but if anyone out there can help with a few questions I'll owe you a few beers.
Can anyone tell me which is better, a fewer large magnets or many small ones?
And how will this choice effect design and output?
We get about 8 hours of 25kmph+ per day (closer to 45kmph most days) and use about as much power as an average american home. Is there a formula that I can use to find out how big to build and how many batteries I'll need?
Can you build an inverter? If so where is a good source for info?

Dec 6, 2008. 10:39 PM [REPLY](#)



sspence says:

If you use 9 coils, then you must use 24 magnets, 12 per rotor. The magnets and coil size have to match. Use the spreadsheet and instructions at <http://www.green-trust.org/2003/pvsizing/default.htm> to help you size your production, storage, and inverter.

Dec 7, 2008. 6:36 AM [REPLY](#)



sspence says:

Indeed. \$36 for the magnets, and \$13 for shipping. What a deal. Only N45's, not the N50's, but will work, just less output. About 900 watts or so.

Dec 6, 2008. 8:57 AM [REPLY](#)

http://www.magnet4less.com/product_info.php?products_id=37



Budo Titan says:

if you look further down the page i got n50s the same as yours for the price i mentioned. i also go to <http://www.planetengineers.com/default.asp> for wire.

Dec 7, 2008. 11:10 AM [REPLY](#)

I also get cheap metal disks(no holes though but hey i got a drill) from
http://www.wagnercompanies.com/Disks_and_Plates.aspx?gclid=CJGc8KSPq5cCFQpuGgodiVv9iQ



parat8 says:

if you have 12"rotors half inch thick and double the magnets how much flux are you losing?have you tried the hairpin trick?
parat8

Dec 1, 2008. 11:51 AM [REPLY](#)



sspence says:

Not sure what you mean by doubling the magnets or a hairpin trick. We use 12 magnets on each rotor.

Dec 1, 2008. 3:56 PM [REPLY](#)



gkimmina says:

could you make an car alternator work with this? I have seen some people mention problems with blades spinning too fast, burning up motors, etc., which it seems to me that problem would be solved by using an alternator because it is built for high speeds.

Nov 24, 2008. 8:57 AM [REPLY](#)



sspence says:

Therein lies the problem. These turbines are slow speed units, operating about 650 rpm at 30 mph winds. No power would be produced with a auto alternator. Auto alternators also have a parasitic field coil, consuming a large percent of low speed power production, even if turned at 2k + rpm.

Nov 24, 2008. 2:13 PM [REPLY](#)



fizzymartin says:

Hey Sspence, me again. I'm getting the magnet wire. Having a problem keeping the magnets from snapping together. Is that why you cut the template - to keep them in their place.

Nov 16, 2008. 2:31 PM [REPLY](#)



sspence says:

The template keeps them in place until the glue dries for glued designs like the one seen, or in our new designs, locates the magnets until we get the screws in place.

Nov 16, 2008. 5:24 PM [REPLY](#)



fizzymartin says:

Screws? How are you screwing magnets? The glue will work but the screws sound interesting. If you had a picture I'd love to see it. I'll give you the email if you like. Let me know on the next post.
Thanks

Nov 18, 2008. 9:10 AM [REPLY](#)



sspence says:

Nov 18, 2008. 10:07 AM [REPLY](#)

I don't have a picture of our new magnets, but we had them designed with 2 double countersunk screw holes and mount them with brass screws. No more resin filled rotors. Place the template, insert the magnets, screw them down, remove the template, and give a polyurethane or restoleum cover coat to prevent rust and corrosion.



fizzymartin says:

Nov 19, 2008. 11:53 AM [REPLY](#)

Okay then that fits with my idea. I was going to use reenforced aviary wire as a frame, and fasten the magnets down against the backing. Does the disk HAVE to be conductive or can I use aluminum for the rotor and stator frames. My hope is to reduce weight as much as possible for my configuration.



sspence says:

Nov 19, 2008. 5:43 PM [REPLY](#)

you need a steel plate to complete the magnetic flux on the rotor plate. the stator must not have metal in it. we user fiberglass resin.

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