

Cordless Drill Hydro Generator

(9 May 05)

Pico-Hydro Power using a Cordless Drill as DC Generator

Water wheel construction: One soon will get tired of hand cranking and will want to find a better way. In the near continuous raining condition as is predicted after a PS, water flow in uneven land conditions creates some interesting opportunities. Even small areas collecting water will create a significant amount of run off water flow. All one need do is position a portable constructed paddle wheel where there is as small as 1 to 1.5 foot water flow drop at a rate of at least about 20 gallons/min and use two cordless drills wired in series as generators.

To properly choose, prepare, and wire the individual cordless drill generators see "Converting a Portable Cordless Drill to a Hand Crank DC Generator".

12 small plastic containers and several 5 gallon bucket lids can be used to create a water wheel. See <http://home1.gte.net/mikelob/WaterW-9.JPG>



Stack one plastic container on top and nested in the lower one. Drill in a hole in the middle of one of the longer sides. Use a #8-32 by .5" long machine screw and nut to fasten them together. The containers are positioned so the overlap is just barely enough to bolt them together. See <http://home1.gte.net/mikelob/WaterW-1.JPG>



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Use one container of a different color to aid counting revolutions in a given stop watch timed run to determine RPM. One can measure the time it takes for say 20 revolutions to determine RPM. I used 12 containers (Good Buy Mini Container distributed by PTS long Beach Ca) and two 5 gallon bucket lids. These were purchased at a \$.99 store for 3/\$.99. Once all 12 are bolted together on the back side then unbolt the bottom container and place it on top, drilling and bolting it in. Now take a disk sander and sand off the lips on the sides that will be bolted to the bucket lid. This makes it so one has a flat edge to bolt to the lid. Next open the stack of containers into a circle and put the last bolt in to hold it circular. See <http://home1.gte.net/mikelob/WaterW-2.JPG>



Mark and drill holes in one lid then use this lid as a guide to drill the holes in the other lid. Add a ring of “silicon-I” sealer and centered the now circular ring of plastic containers and drill-bolt the buckets to the lid.

Cut a 4.75" long .5" diameter aluminum or copper tubing put 3/8" washers at each end and glue with silicone sealer. I used a threaded rod and a couple of nuts to hold it until the silicone sealer set up. See <http://home1.gte.net/mikelob/WaterW-3.JPG>



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Use this pipe as a spacer between the lids in the center when assembling the last side. One water wheel weight is about 3 lbs two is about 5 lbs. Caution: the 3/8"shaft will bend if nuts are tighten against a pipe that has a non-square end. Use a pipe cutter and get a square end. Don't use a hacksaw. I learned this the hard way. The threaded shaft sticks out about 4.5" on each side. Use in this order a garden hose rubber washer, finder washer, normal washer, lock washer and two nuts locked together to hold the shaft from slipping on the 5 gallon plastic lid. See <http://home1.gte.net/mikelob/WaterW-6.JPG>



To keep the water form over time getting to and rusting the drill chuck (spray with oil at assembly time) of the drill take a small square shaped plastic container and drill a hole in the bottom and pie shape cut the lid. Bend some (3 in my case) of the pies up and all the rest down. Drill a small drain hole at the lowest corner so that if any water leaks in, it will drain out. The pie tabs will be taped to the drill to hold it in place. See <http://home1.gte.net/mikelob/WaterW-5.JPG> and <http://home1.gte.net/mikelob/WaterW-4.JPG> and <http://home1.gte.net/mikelob/WaterW-7.JPG>.



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Measured Water Wheel Output Power

I measured output for one set of 12 cups in one water wheel driving two 14.4 volt cordless drills to be .3 to .7 amps (average .5 amps or .8 watt) when charging one cell. I noticed it was barely able to overcome gear friction to start turning about half the time. Hose running in bucket by it's self is not enough to cause rotation, but dumping in another 5 gallon bucket of water did cause rotation for a short time (about 15 sec). Drill generators were taped into a clear plastic bag, to give water protection. Meter and battery were in a plastic bag with a tie wrap to seal it. Both generators were wired in series. See <http://home1.gte.net/mikelob/WaterW-10.JPG>



I also tested a 1/8" water hose nozzle blasting water out at city water pressure (about 45 lbs/Sq. Inch). This approach would charge two cells at about .45 amps and one cell at about .5 amp or .8 watt. This approach uses the inertia of the water. Both generators were wired in series. See <http://home1.gte.net/mikelob/WaterW-9.JPG> for the setup.

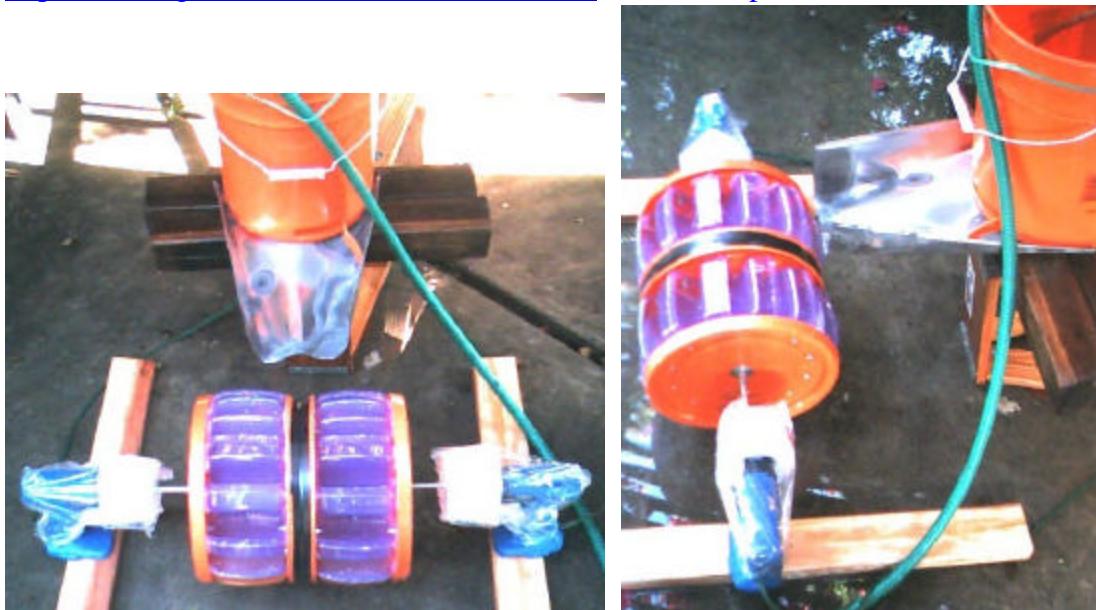
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Next I tested output for two sets or 24 cups making two water wheels driving two 14.4 volt cordless drills. I measured between .5 to 2.9 amps (or .8 to 5.2 watts) charging one cell. Both generators were wired in series.

I used about 20 gallons/minute flow rate for testing. My feeling is less would have also worked. Trying to tune up the process when my tests only lasted 15 sec at a shot (one bucket full) was a bit of a challenge. I did see enough that I feel confident that this unit will turn and generate electricity in a conscious stream of water situation. See <http://home1.gte.net/mikelob/WaterW-11.JPG> for the setup. and <http://home1.gte.net/mikelob/WaterW-12.JPG> for the setup.



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Summary: My tests indicate one can charge a single cell at between .5 and 2.9 amps or about 1 to 5 watts. How long will the plastic gears and bushing bearings last in continuous operation? This is anyone's guess. I think with regular maintenance of opening the gear box and lubricating that it may last for a time. The theoretical maximum sustainable power one could get at drill rated speed of 550 RPM is about 45 watts from this series configuration. Since this is running at well below rated speed and power it should help minimize maintenance. At about \$10-\$20 per generator one could stock up on a few extras.

Power usage for a white LED is about 3.2 volts times .020 ma = .064 Watt. If one averages 4 watts generated 24 hrs/day this would result in 96 watt-hrs (4*24) of stored power. If one uses this over 4 hrs at night for tasks then the rate of usage would be 24 watt/hr (96/4). This would mean one could light 375 (24/.064) white LEDs for the 4 hours or run a 100 watt ham radio unit for slightly less than one hour.

In the long run this approach even at a low power output should produce more stored power than by hand or by pedal bicycle power. Let water flow do the work for you.

Wind power is a possibility, however I tested a 16" propeller from a local hobby shop hooked to a 14.4 volt drill sticking out my car window at 70 miles per hour and could not get it to start turning. I think a correct sized special high torque low speed propeller would need to be designed. Once done it could be heavy, I am not sure the bearings would hold up for very long.

MikeL