

Installing a MiniWater Hydro Turbine

These instructions have been written to show you what level of work will be required to install a MiniWater Hydro turbine. These are not "complete" instructions, but simply a guide to what is required. Full instructions will be supplied with your kit, and these will go into more detail than is covered here.

Selecting the site and running the pipe-work

Firstly, you'll need a stream or small burn, passing through your property, preferably one which you own. This stream should run from high up in the surrounding land, and not be prone to "drying up" in the summer months. The rate of descent of the stream is very important, as is the amount of water it contains. In practice, the stream should have a "flow rate" of at least 2 litres per second, and a "drop" of over 20m. A small stream like the one shown below, might be ideal.



To measure the flow rate of your stream, create a small dam using sandbags, and fit a short length of pipe through the dam into the stream. Using a 10 litre bucket, time how long it takes to fill the bucket, and divide 10 by the measured time (in seconds). If the stream can fill the bucket in 5 seconds, then the flow rate = $10/5 = 2$ litres per second.

Once you have calculated the flow rate, you'll need to figure out how much of a "drop" your stream has. This can be done using an altimeter, if you have one, or by careful use of a spirit level and a 2m length of pole. Use the pole to steady the spirit level, standing it vertically in the stream, and the bottom most point of your land. Level the spirit, and look along its top edge to find the next point in the stream to position the 2m pole. You'll need 2 people to do this, and a little practice, but the net result is that you'll be able to calculate how high the stream rises as it passes through your land. It's also a good idea at this stage to measure the distance between each 2m height increment, so that you can sketch a complete picture of your stream as it rises up through your land.

Armed with the height difference between the top of the stream and the bottom, and the distance that this represents, you'll know how much of a

“head” your stream has, and what length of pipe you’ll require in order to capture its power.

If your stream has a “head” of 20m (i.e. a height difference from top to bottom of 20m) and a flow rate of 2 litres per second, then you can now calculate the power that could be extracted from it. The calculation is as follows....

Flow x Head x 5 = expected power generation (in Watts). So for a flow rate of 2 and a head of 20, the calculation would be $2 \times 20 \times 5 = 200W$

A 200W result here may not sound much, but over a 24 hour period, this would result in a total energy production of 4.8kWh (Kilo Watt Hours) or Units of power. Since the average household in the UK consumes only 10 to 12 Units of power per day, this small stream could produce almost 50% of the electrical needs of the house. Given that most streams have a higher winter flow rate than a summer one, your MiniWater Hydro turbine will be fitted with a winter and summer setting, allowing you to take advantage of the wetter months, where the power output may be 5 times that of the summer months. This could amount to a significant power production plant for your house/property. The turbine itself looks like this.



Inside the turbine is a Permanent Magnet Generator and a Pelton or Turgo turbine, like the one shown below. Water is jetted at the turbine cups, which spins the turbine and generator to produce the power. This is a simple but effective way to extract electricity from a steep stream. These turbines are not suitable for rivers and burns which don’t have a high “drop rate” along their length.



In order to capture the power from your stream, you will have to create a small "dam" into which a pipe is fitted. This pipe should have its intake protected by a simple stainless steel mesh "box" to prevent leaves and foreign objects from passing through it. The dam itself can be made using sandbags, but must be strong enough to withstand the force of the water when it's been raining heavily.

Having measured the length of pipe required to run from your dam down to where you intend to fit the MiniWater Hydro Turbine, you need to choose the best pipe for the job. If the pipe run is short (30 to 50m or so) the use 63mm MDP irrigation pipe, which is easy to purchase from plumbing suppliers, or from the web. Use one single piece of pipe for the entire run, if possible. Joints can become a source of problem and irritation in the long term. If the pipe run is to be over 50m, use a larger diameter pipe (3" or 4" if possible), again in a single piece if possible. Route the pipe down the stream, piling stones on to the pipe as you go, to hold it in place. You could run the pipe across a field, in a trench, if this would give you a more direct route. Fit a ball valve at the top and bottom of the pipe, to allow you to turn the water supply on or from both ends of the system.

With the pipe run, you are now ready to fit the turbine housing. This should be mounted on a flat "slab" of concrete, measuring 1m x 1m and only needs to be 5 or 10cm thick. This slab of concrete should be positioned such that all the waste water from your turbine runs naturally back into your stream. You might like to fit a specific drainage route to assist this water return.

Your MiniWater Hydro Turbine will be supplied to you complete with the summer and winter jet sizes fitted to suit your site. This is why we need to carry out a full site survey of your property prior to you purchasing the turbine. Without the correct head and flow rate information, we have no way of supplying you with the correct jet and valve settings for your site.

By carrying out an initial survey yourself, like that described above, you will quickly find out if your stream has the "basics" of being used as a power generating hydro system or not, before calling in the experts.

Please note that the MiniWater Hydro Turbines are suitable for use in installations where the maximum power produced is 2200W. If your stream could produce more power than this, you can install more than one MiniWater Turbine. The maximum amount of power that you can connect on to your household mains supply is 6kW (3.8kW in some areas of the country), and this should be kept in mind when working out how many turbines you'd like to install, if your stream is large enough.

All electrical connections, cable runs and switching should be carried out to the same standards as those shown in the Installing of a MiniWind turbine instruction manual (downloadable separately). Use our "commissioning" service if you are unsure about doing the electrical work yourself.

Planning and other issues to consider

You should consult with your local Planning office before you decide to install a MiniWater Hydro Turbine. They will tell you what their policy is in relation to this kind of installation (if they have one) and will let you know if planning consent is required. To help, you should consider who would be most likely to object to your installation, or be affected by its presence. If you live in the middle of nowhere, then you're hardly likely to object to your own turbine, and so you stand a good chance of having your planning application approved, or not having to get approval in the first place. Ensure that you stress how "small" this installation is, since your planning department may think that you're considering installing a "dam" the size of the Hoover dam in the States, unless you point out differently. They will almost certainly never have come across this size of hydro system in the past, so they will rely on you to tell them as much about the scale and power of your system as possible.

Hydro turbines make a small amount of noise, so be realistic about living with one in your garden. If you don't like the sound that it makes when running, then your neighbours will probably not like it either, and so you will quickly find yourself having to keep it switched off most of the time.

You should also consult with the Environment Agency for your area, letting them know what you plan to do. They may insist that you apply for an "abstraction" license, despite the fact that you are not really taking any water out of the stream. It's worth pointing out the scale of this system to them, since their rules are generally written for much larger 500kW+ hydro schemes, and they will almost certainly never have come across a system that's designed to operate on a few hundred watts. They may decide, if logic prevails, to allow you to proceed without a specific license. They might insist on you providing a "flow analysis" for your stream, showing the winter and summer flow rates, as well as an "environmental impact" assessment, detailing what plants/animals/fish would be affected by the installation of your system.