



# wind pumps



## what are they?

They're devices for moving water, powered solely by the wind. There are 3 main types:

- Direct drive: crank on the axle of the turbine rotor raises and lowers a pump plunger via a rod.
- Geared drive: does the same, but the crank is geared to run more slowly than the turbine; smaller turbines benefit from being geared, to enable a slower pump, but with more volume.
- Electric generator on the turbine: the turbine generates electricity which drives the pump; you can then have the pump some distance from the turbine.

But generally, when people talk about wind pumps, they mean the first two types – a wind generator and a pump being two separate things. Wind pumps have a distinct look – with more and flatter blades than wind generators. This allows them to operate at slower wind speeds, than required for electricity generation.

The way a wind pump works hasn't changed for hundreds of years. The wind causes the turbine rotor to rotate, which turns a crank, which converts the rotation into the up-and-down movement of a transmission rod. The rod raises and lowers a piston in a pump comprising a cylinder and two valves. On the down stroke the cylinder fills with water, and during the up stroke the piston raises the water in the cylinder and riser, taking the water to wherever you want it.

The wind has been used to raise water for over 2000 years, mainly in China and the Middle East, and now no continent is without them. They're most used in areas with cattle and sheep, but low rainfall, such as Australia, the US mid-west and southern Africa. In fact, without wind pumps, there would be no livestock kept in those areas. The typical contemporary wind pump design was developed in the US in the 19th century, with no significant design changes since.

The heyday of wind pumps was in the 1920s, with 6 million in the US alone. With the explosion in the use of fossil fuels after the war, wind pumps almost disappeared from the landscape, but as oil supply peaks and then falls, they may make a comeback – and especially in developing countries where there may be shortages of both oil and potable water.

Wind pumps can also be used domestically, but there's a narrow development 'window' between walking to collect water, and having electricity and/or tap water. But mains electricity and water is not going to reach isolated livestock stations, making wind pumps much more viable.

## what are the benefits?

The main benefits are:

- The energy source is free.
- There are no CO<sub>2</sub> emissions from their use, or the pollution associated with energy generation.
- They're quite low-tech, and easy to install and maintain (if you can maintain your own bicycle, you can maintain a small wind pump).
- They're quite durable, and require very little maintenance – usually only some grease or oil once or twice a year (making them ideal for remote locations).
- Water is set to become a scarce resource – by using a wind pump, you can recycle grey water (or rainwater) to irrigate vegetables or trees in summer.
- If you're at all handy, you can build your own wind pump, in a way that can incorporate scrap materials that you may already have (see our publication, *How to Build a Wind Pump*).



*Wind pumps used to be a very familiar sight in places like the American mid-west; their heyday was in the 1920s, when there were 6 million in use in the US alone.*



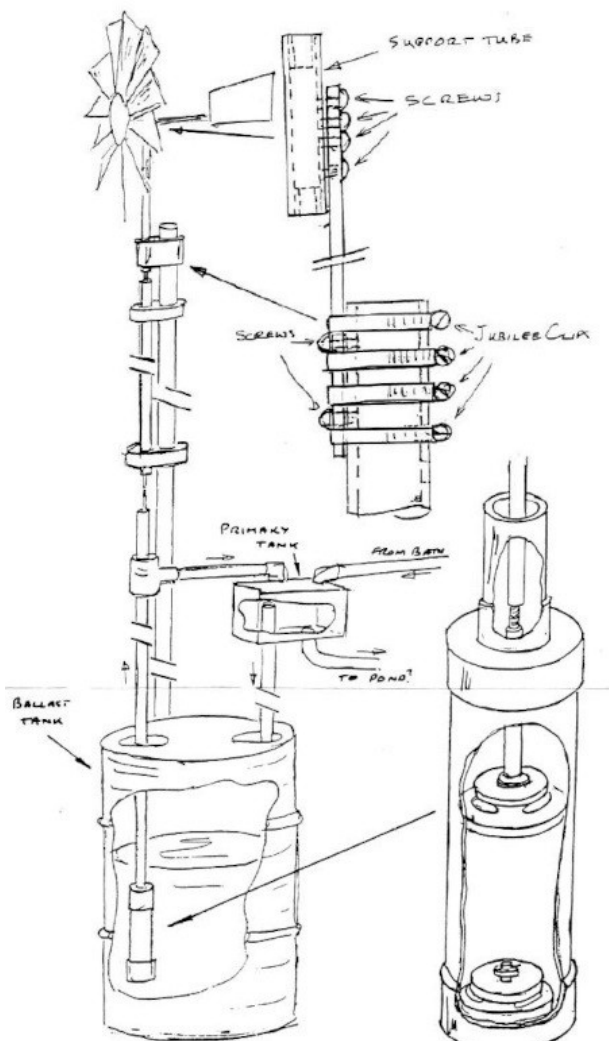
## what can I do?

You're allowed to dig a borehole without planning permission or a licence if you're looking at extracting small amounts (less than 20 cubic metres per day). You can also use a wind pump to raise water from a pond or a tank – obviously in a position that's not going to annoy neighbours; so probably not a good idea in the 'burbs. In other parts of the world, different rules apply, and in remote areas, there's probably very little in the way of regulation.

In the UK, a wind pump could be used by a market gardener or a smallholder to deliver water to a polytunnel or greenhouse. Rainwater or grey water could be collected in a tank, and then



Small home-made windmill for pumping water.



Preliminary drawing for a home-made wind pump.

pumped higher, so that it can flow downhill into an irrigation system. It could also be used by fish farmers to aerate ponds.

Poldaw is a tried and trusted brand of wind pump that can be bought in the UK. However, you can build your own wind pump if you have engineering skills and you like messing about in sheds. See *How to Build a Wind Pump* for detailed instructions on building and maintaining your own wind pump; plus there's advice about pipework, storage and filtering (the wind pump described in the book is smaller than the smallest Poldaw pump; anything smaller than the rotor described in the book wouldn't move any useful volumes of water). Some precision skills are required to build a wind pump, but it's low-tech, it doesn't matter if it rattles, and it can be made from scrap materials.

The wind pump needs to be directly over the body of water you want to move, but if the tank is uphill from the pump, water can be piped downhill to a sump at the base of the pump.

## resources

- see [lowimpact.org/wind-pumps](http://lowimpact.org/wind-pumps) for more info, training, products / services, links & books, inc:
- Jim Barr, *How to Build a Wind Pump*
- Peter Fraenkel, *Wind Pumps: a Guide for Development Workers*
- T Lindsay Baker, *Blades in the Sky*
- Peter Fraenkel, *Water Pumping Devices*
- [bit.ly/2Emsqm0](http://bit.ly/2Emsqm0) – FAO detailed info on wind pumping
- [bit.ly/2G3AtVd](http://bit.ly/2G3AtVd) – technical briefing
- [bit.ly/3iRBW0](http://bit.ly/3iRBW0) – DIY wind-powered pump

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