Windmills

For stock and domestic water supplies

A windmill is a wind powered pump. Its basic structure consists of a tower, windwheel, drive mechanism and a positive displacement pump.

Windmills will always be useful for pumping water for stock and domestic supplies in isolated rural areas. However, this should not be the only reason for installing a windmill.

A windmill may be an economical alternative where:

- wind conditions are reliable
- unattended pumping is required for long periods
- there is no other viable power source
- the user requires environmentally clean power.

The principal advantages and disadvantages of using a windmill are outlined below.

Advantages

- run unattended for long periods
- low maintenance
- suits isolated locations
- no energy costs.

Disadvantages

- high capital costs
- intermittent pumping in very light winds
- requires auxiliary storage.

Site for a windmill

A windmill should be sited as close as is practical to the water source, and with good exposure to the wind. A good site is an open area free from obstructions like trees and buildings. It is preferable to have at least 400 m of clear space surrounding the windmill. If such a site is not available, then a place should be selected that is open to the prevailing winds.

Selecting a windmill

The selection of a windmill should be based on the following criteria:

Wind conditions

The right combination of windmill and pump is one which will work easily in light winds (about 10km/h). This will also depend on the load (total pumping head- see overleaf) placed on the mill. Output from the mill according to the manufacturers pumping table is based on average wind speed.

Before you see a distributor about a mill it is worthwhile checking the performance of existing windmills in your area. These should have similar pumping conditions to your operating conditions.

Source a water supply

A windmill can pump from a dam, creek or river, or from a bore or well.

If the windmill is to pump from a bore an assessment of the bore's capacity, or yield, must be made.

Because winds are variable and there will be periods of no wind, your daily water requirement must be pumped over a relatively short period, say six hours. The bore yield must be able to match this demand.

Water requirements

You will need to estimate your daily water requirement. Information on quantities of water for rural uses is outlined in the fact sheet **'Water Requirements - Stock and domestic purposes.'**

This information is needed to match pump size and wheel size. A range of pump sizes, wheel sizes, total pumping heads and average daily outputs is available in pumping tables from the manufacturer.

Total pumping head

You will need to work out the total pumping head for your system i.e. the vertical height from the pumping depth to the point of discharge, plus friction head due to water flowing in the pipes and fittings.

Refer to Table 1 for a typical pumping table and follow the selection example.

Governing

It is normal for a windmill to have automatic governing. This prevents the mill from overspeeding during periods of high winds and to safeguard against overpumping and damage to the mechanism.

Pumping equipment

Windmill pumping equipment is available in sizes capable of handling discharges from 1000 to 500 000 L per day. They can lift water up to 90 m vertically, either from a bore or from a storage to a hilltop.

The choice of pumping equipment is usually dictated by the source of water supply. For pumping from bores or wells one of the various types of *cylinder pump* is used. If the water supply is from rivers, dams, excavated tanks, etc., a *siphon pump* is normally used.

Auxiliary storage

During periods of very light winds, the supply of water from the mill will be poor. To ensure continuity of water supply, a storage should be installed in the system. The storage should have a volume equal to at least 7 days worth of water needs.

Storages commonly used for stock and domestic supplies are:

- raised earth tanks — Turkey's nests
- excavated tanks
- fabricated tanks e.g. concrete, corrugated iron, fibreglass.

Selection example

A herd of cattle requires a maximum supply of 7000 L per day (L/d).

Case 1 – Supply 7000 L/d from an excavated tank to drinking troughs. Total head required to lift the water is 10 m.

Referring to Table 1 — a 1.8 m windmill and a 65 mm dia. pump would be suitable.

Case 2— Supply 7000 L/d from a bore to a concrete tank and drinking troughs. Total head required to lift the water is 60 m.

Referring to Table 1 — a 3.6 m windmill and a 60 mm dia. pump would be suitable.

Further information

Should you require assistance or advice on this topic, please contact a local consultant specialising in windmills. You will find their contact details in the yellow pages of your telephone directory.

Fact sheets on water and other topics are available from Natural Resources and Water (NRW) offices and service centres or can be downloaded at <www.nrw.qld.gov.au/factsheets>. ■

TABLE 1

	Nominal diameter of pump cylinder (mm)									
	50		60		65		70		75	
Wheel dia (m)	Total head (m)	Av. Output (L/d)	Total head (m)	Av. Output (L/d)	Total head (m)	Av. Output (L/d)	Total head (m)	Av. Output (L/d)	Total head (m)	Av. Output (L/d)
1.8	18	4700	16	6000	13	7400	11	9000	10	10700
2.4	33	5200	28	6600	23	8100	20	9800	17	11700
3.0	60	5100	51	6400	43	7900	37	9600	32	11400
3.6	72	5500	68	7000	58	8600	49	10400	43	12400
4.3	113	4700	95	6000	81	7400	69	8900	60	10500