

PUMPING MILLS

Multi-blade mills are exclusively used for pumping up water, derived from the profitable mechanical energy generated out of the wind aeolic energy.

Next it is described the different elements that constitute a resort like this.

1.- TOWER

The used lattice towers are made of hot steel galvanized sections and its height can vary between 4 and 12 meters. They can be completely assembled in the floor and then risen up by means of a crane or a similar equipment, or as well, it may be assembled one section after another from the ground. It is important to use a tower higher enough to achieve a good wind exposition in all directions.

2.- ROTOR

It is composed of several hot galvanized steel blades with the appropriate section to take advantage of the variable characteristics of the wind. The rotor diameter may vary between 1,80 and 5 meters. This kind of rotor, due to both his great start- up power and its little rotational speed adapts perfectly to the piston bombs features. The rotor should be located at least 3 meters over any existing obstacle in a 100m ratio, measured out from the location of the pumping mill.

3.- PUMP

The rotor directly enables a connecting rod- crank that works over the pump piston transferring it a to-and-fro motion.

The bar that transmits the movement to the piston, going down the discharge tube, is adapted to the pump traction stress.

The gears, the pinions and the connector rod mechanism balance the charge, for an efficient operation at a minimum wearing.

The used bearings are long term and easily accessible in case of replacement. All the machinery gears are continuously lubricated with oil.

4.- REGULATOR TANK

It is necessary to complete the installation with a water tank that has enough capacity to cover both possible consuming peaks and calm periods.

5.- MAINTENANCE

The pumping mill maintenance is practically insignificant, since it is necessary to replace the oil and a quick machinery check once a year.



Prior to considering both the acquisition and installation of one of these systems, it is fundamental to analyze the available aeolic potential of the location and the water needs of the system users. With this data we can perfectly dimension the resort.

EVALUATION OF THE AEOLIC POTENTIAL OF THE LOCATION

The energetic potential will depend on the aeolic background of the place and it is recommended to carry out the appropriate measures to understand the wind behaviour and its specific characteristics:

- Distribution of both wind speed and direction frequencies.
- Distribution of annual rate speed
- Height- dependant wind variation
- Topographic influences
- Gust rates. Maximum values

For this kind of resorts, normally it is only required the data concerned to both wind speed and annual average frequency, obtained, of course, from the location of the aeolic turbine.

Measuring the average speed of the location can be obtained by following several methods:

- Directly, using anemometers that register wind speed
- Indirectly, using information from nearby locations such as either wind registers from forecasting stations or

The Beaufort reduced scale, as it is shown below:

N° Beaufort	Wind Speed		General Description	Land Criteria
	Km/h	m/s		
0	0/0,7	0/0,2	Calm	Smoke raises vertically.
1	1/5	0,3/1,5	Light Air	Smoke tilts but weather vains are still.
2	6/11	1,6/3,3	Light Breeze	Notorious wind over the face. Leaves move and weather vains rotate.
3	12/19	3,4/5,4	Soft Breeze	Leaves and branches in a continuous motion. Flags wave.
4	20/28	5,5/7,9	Moderated Breeze	Dust and papers rise. Small branches shake.
5	29/38	8,0/10,7	Cool Breeze	Small trees wave. Waves appear in ponds.
6	39/49	10,8/13,8	Strong Breeze	Big branches shake. Wirings vibrate.
7	50/61	13,9/17,1	Moderated Wind	Trees shake. Uncomfortable to face the wind
8	62/74	17,2/20,7	Cool Wind	Small branches crack. Difficult to walk facing the wind.

MEASURING THE INSTALLATION

In order to dimension the pumping installation we should proceed with the following protocol:

1. Consuming estimation.

The next guide table may be used in order to determinate the daily rate of water consumption:

People	250 l/día
Horse, regular cow	60 l/día
Milch cow	150 l/día
Pig	15 l/día
Sheep, goat	10 l/día
100 Chickens	25 l/día
100 Turkeys	90 l/día

2. Pumping needed caudal.

In order to determinate the necessary pumping capacity per hour, we should divide the daily rate of water consumption calculated by five, supposing then that the whole volume will be obtained in the next 5 hours approximately.

3. Pumping height.

The total pumping height will be calculated adding up the depth from where water is going to be pumped and the existing unevenness between the ground and the height where the water is going to be either tanked or consumed.

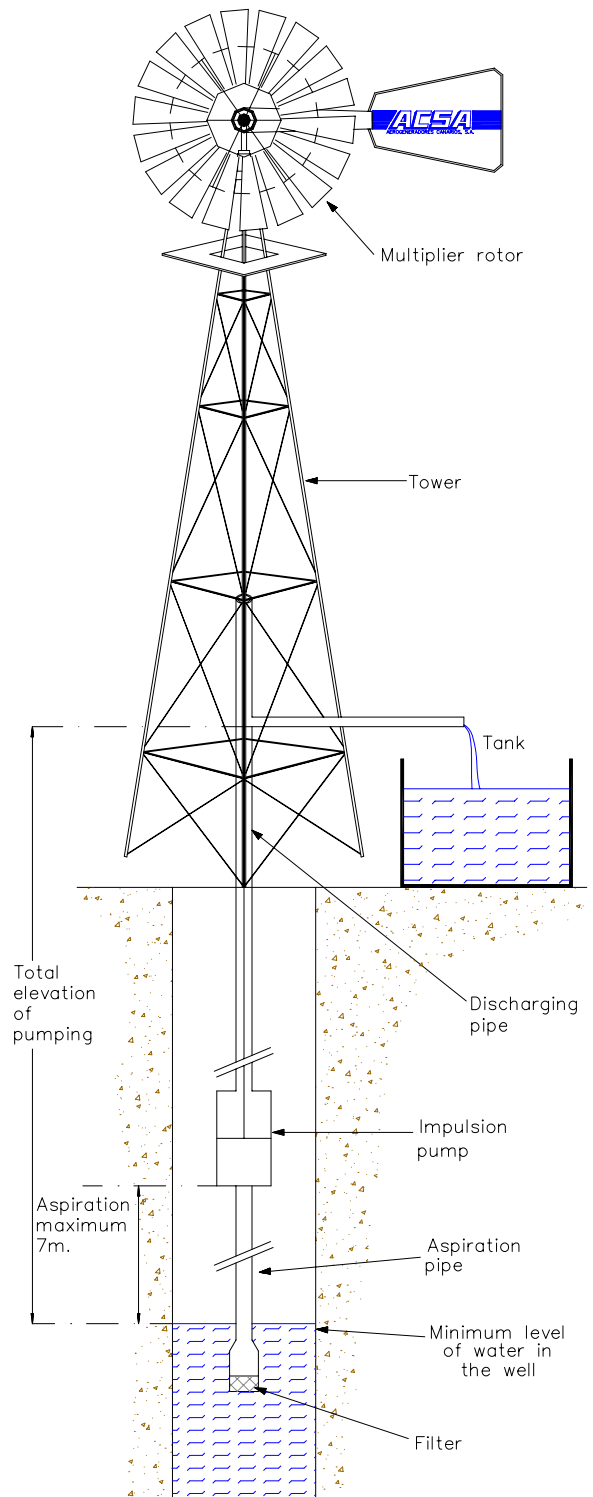
4. Pumping mill best choice.

On next page a table is included to make a first evaluation of the pumping mill that best fit your needs.

Looking at the pumping volume and the pumping total rising out of the table, we will know the rotor diameter that we require.

The results of this table are obtained according to an average wind speed of 30 km/h, that is, number 5 of the Beaufort scale.

5. Pump and other accessories.



PUMPING MILL DIMENSIONAL TABLE

Maximum pumping volume, in liters per hour	Total rise of the pumping, in meters				
	20 meters	30 meters	40 meters	50 meters	60 meters
1000 l/h	20 meters	30 meters	40 meters	50 meters	60 meters
1200 l/h	15 meters	20 meters	30 meters	40 meters	50 meters
1800 l/h	10 meters	15 meters	20 meters	30 meters	40 meters
2400 l/h	--	10 meters	15 meters	20 meters	30 meters
5000 l/h	--	--	15 meters	20 meters	30 meters
7500 l/h	--	--	10 meters	15 meters	20 meters
Rotor diameter	1,80 meters	2,60 meters	3,00 meters	4,00 meters	5,00 meters

PUMPING MILL DIMENSIONING EXAMPLE

Let's suppose that we have the following data:

Pumping height: 50 meters
 Consumption estimation: 12 l/day. As seen on 'section 2' table, the necessary pumping volume will be of $12.000/5=2.400$ l/hour

For these conditions, darkened in the dimensioning table, we know that the appropriate diameter of the rotor will be of 3'00 meters.

PUMPING MILLS APPLICATIONS

Multi-blade mills are exclusively used for pumping up water, since they turn aeolic energy into mechanical energy.

They are specially recommended, among other usages, for:

- Water delivery for towns that are not connected to the public utility.
- Watering of small agricultural resorts or big farms.
- Supply of water for animals and other cattle breed usages.
- Supply for fountains, ponds or either public or private gardens.
- Pouring water between dams of different levels.
- Drying of marshes.

All the technical specifications are subjected to changes without notification by the manufacturer.

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