SunRotor®
Solar Products
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# Sizing a Solar Pump System

**Step 1:** Determine whether a submersible pump or surface pump is best. This is based on the nature of the water source. Submersible pumps are sometimes suitable for either deep or surface water sources. Surface pumps can draw water from only 20-25 ft (7-8 m) below ground level, but they can push it far uphill.

**Step 2:** Determine your daily water requirements for your application using the table below:

| Consumer | Daily Requirements | |
|---|---|---|
| Each person, for all purposes | 75 gallons | 285 liters |
| Each milking cow | 30-35 gallons | 113-133 liters |
| Each cow/calf pair | 20 gallons | 76 liters |
| Each horse, dry cow, or beef animal | 15-20 gallons | 57-76 liters |
| Each sheep | 2 gallons | 7.6 liters |
| Each hog | 4 gallons | 15.2 liters |
| Each 100 chickens | 4 gallons | 15.2 liters |

*Gallons per hour = Gallons per day divided by "peak sun hours per day"*
*Gallons per minute = Gallons per hour divided by 60*

Peak sun hours (also known as solar insolation) refers to the average equivalent hours of full sun energy received per day. It varies depending on the geographic location and season. For example, the arid central-west of the U.S. averages 5-6 peak hours in the summer, and dips to as low as 3-4 peak hours in mid-winter. Five hours is a good average figure for summertime pumping applications. For your convenience, we have provided a U.S. and global solar insolation map at the end of this document.

*You can also visit [www.nrel.gov/gis/solar.html](www.nrel.gov/gis/solar.html) for complete solar insolation information.*

Calculation example: Let's say you need to design a solar water pumping system to water 50 cow/calf pairs. By looking at our table, we can see that each pair requires 20 gallons per day. Multiply your daily requirements by the number of pairs to get a total daily of 1,000 gallons. Now, divide the 1,000 gallons by the number of peak sun hours, which in this example we'll say is 5 peak hours, to get 200 gallons per hours required daily. Lastly, divide that number by 60 (minutes) to arrive at ***3.33 gallons per minute.***

This means you will need a pumping system that is capable of pumping at least 3.33 gallons per minute to sustain the daily watering requirements. Due to variations in peak sun hours from summer to winter months, it is best to use this amount as your absolute minimum. From this example, a 4 GPM (gallon per minute) system would yield extra water in the summer months, and still meet the requirements in the winter months.

**Step 3:** The most important question you need to answer is whether or not your water source will produce enough water to supply the application and pump system. You may determine you need 8 GPM, but if your water source only recovers at 3 GPM, you will be unable to sustain your daily water requirements. If the water source is a well or a stream and the flow rate or recovery rate is unknown, a pump test can be performed to calculate this rate.

*We would recommend visiting www.watersystemcouncil.org/infosheets.php for links to numerous sources of information in regards to groundwater and water wells.*

**Step 4:** Determine other key measures crucial in accurately designing a solar water pumping system:

A. If the application is a well, measure the well depth. Total Depth (TD) = _____ ft
B. Water Levels:
   Distance from the casing top to the dynamic water level during pump testing = _____ ft
   Dynamic Water Level = _____ft
   Static Water Level = _____ft
   Water Source Recovery Rate = _____ GPM
   Surface Pump Applications:
      Suction Lift = _____ft
      Pressure Lift = _____ft

   ** For surface pump systems, the suction lift is the distance from the water surface to the pump inlet port. The pressure lift requirement from the pump outlet to the delivery point is required.*

C. If the water delivery points is far from the water source, refer to the pipe sizing charts to determine which pipe size is required for the application flow rate. Also, determine the elevation difference to the total lift requirement.
D. What is the inside diameter of the well casing pipe? _____ inches

   ** Small well casing sizes may prevent the use of some solar pumps*

**Step 5:** Access the SunRotor® data sheets for our pump/controller combinations at www.sunrotor.com/downloads to locate which configuration will work best for your application. The vertical columns represent the various depths in feet, and the horizontal rows reflect the various solar panel configurations available for that pump. The resulting data provides the GPM that each configuration will produce at the listed depths. Please note that the listed depths are the depth limits for each configuration, and if the pumping results are at the low end of your requirements, look to increase your solar panel configuration or visit the next rated pump for better performance.

***SunRotor®*** *Solar Products* will happily assist you in designing a pumping system customized for your specification. Just call us at 1-866-246-7652 or visit www.sunrotor.com/quote and fill out the form to receive a custom quote from the ***SunRotor®*** *Sales Team.* We can get you a free quote by e-mail or phone within minutes. No job is too big or too small for ***SunRotor®***; we can design systems as simple as basic water well pumping systems to a complex solar powered irrigation pumping system.

For more information on your drinking water, the following sites provide up-to-date information with their efforts to protect public water supplies as well as steps you can take as a private owner.

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| Home*A*Syst Program | www.uwex.edu/homeasyst |
| Water Quality Association | www.wqa.org |
| The Groundwater Foundation | www.groundwater.org |
| American Water Works Association | www.awwa.org |