

POWERED BY NATURE, DRIVEN BY INNOVATION

As solar pumping technologies advance, so do application opportunities for the systems.

By Patrick Sless

Solar-powered water pumping has been on the rise for the past 20 years, thanks to significant technological improvements, focus on environmentally friendly solutions, and the rapid decline in solar panel prices. Advancements in solar pumping have provided access to water across the globe for applications including livestock watering, drinking water, and irrigating crops.

Prior to these advancements, solar pumping installations were often too expensive and required specialized engineers and water well system professionals to design, install, and commission such systems. Today's solutions are much easier to install, more affordable, and deliver built-in protection features that increase longevity of the system.

Harnessing the sun's renewable, emission-free energy is now becoming common for many different applications. So, how did these advancements take form? There has been a steady progression in solar technology since the early 1980s, but 2002 marked a significant change in solar-powered water pumping. That year a solar pump featuring an integrated solar drive in the motor hit the market.

Up to this point, solar installations required an external solar drive to convert DC power generated by solar panels to AC power needed to run the electric motor driving a pump. Before 2002, the process of converting DC to AC power with an external solar drive was costly and inefficient.

This meant industry professionals had for the first time a plug-and-play system that was simple to install and featured an integrated solar drive in the motor. Keeping the solar drive in the motor increased efficiency, improved cooling of the drive, and simplified installation.

Other advancements debuting in 2002 were a flexible electrical system allowing direct AC input from a generator, the grid, or DC power from a solar panel array. This enabled the user to run the pump at night or when the sun was not intense enough to achieve the full flow requirement of the system.

As the decade progressed, further improvements to external inverters increased efficiency of DC to AC power conversion, making it possible to use solar energy for large applications and traditional AC powered pumps requiring up to 50 hp (460 v). New power blending solutions combined DC and AC power into one steady supply source that could be used to seamlessly run pumps off renewable sources and the grid, while ensuring that DC energy was consumed first – reducing costs to end users.

These advancements opened the door to an established and respected network of industry professionals around the globe. Installing solar pumping systems was now more like installing a traditional submersible pump, something many water well contractors were familiar with.

While solar pumps are used in a variety of ways, there are currently three main applications: drinking water systems, water for livestock, and crop irrigation systems. Following are examples of each application.

Drinking Water in South Africa

One in 10 people in the world currently drink water from unprotected sources. In addition, people in developing regions often walk more than an hour each way to collect water.

Solar-powered pumps are changing this and bringing clean and safe water to many of the people who need it. People who once had to travel miles for access to water now have a reliable option bringing clean drinking water right to them.

Take for example the people of the Abantuga community in South Africa. This community of 1800 people had their everyday lives significantly improved by a variety of technological updates in the village, including the addition of a solar-powered pumping system to supply drinking water for the community.

Prior to the solar pump installation, the residents of this community depended on a pump miles away that was powered by the local electric utility. Energy from the utility was often unreliable and extremely expensive to use due to the high cost of electricity - as a result, many went without water for days.

Through generous donations, the community was finally able to hire a contractor to drill a 250-foot-deep well and install a submersible solar pump in it. This new solar pumping system now supplies water to public standpipes, a newly built school, and even a town training center.

The impact of this system is astonishing. Renewable energy water systems will eventually be commonplace in South Africa, as they already are in many parts of the world.

Livestock Watering in the United States

The primary application for solar pumping systems is for watering livestock in the United States. This can be achieved with solar submersible well pumps, or surface pumps used for water transfer.

Consider a northern Californian farmer looking for a way to supply water to his cattle. Faced with the challenge of not having power nearby, he had two options to solve his problem. The first was to bring grid power to a traditional well pump. However, the nearest electrical supply was miles away, and bringing power to the pump would be costly. The second option was to install a windmill-powered pump. Windmill-powered pumps were extremely popular in the past but have lost ground to newer technologies.

The farmer decided on a solar pumping solution, enabling him to be completely independent of grid power. Additional benefits including built-in protection features, low total cost of ownership and reliable operation with minimal maintenance, provided piece of mind.

His new solar pump now delivers 6 gallons per minute of clean drinking water, an adequate amount for his ranch. By the time the project was complete, the system had been modified to include a series of 10,000-gallon storage tanks. Not only did these tanks allow the farmer to meet the demands of the cattle, but they also provided enough water to supply the farm buildings with water for drinking and flushing toilets. The tanks even allow the farm to feature a decorative pond topped off with water from the tanks.

Crop Irrigation in Portugal

Four years ago, Artur Pissarro and Fatima Mourao of Ferreira do Alentejo, Portugal, decided to leave the city for the peace and quiet of the countryside. Equipped with a solid business plan and a loan from the Portuguese Agricultural Institute, they began their quest to grow cucumbers, melons, 700 fruit trees, and an olive grove. There was only one problem: the crops required daily watering and there was no electricity for miles.

To solve the problem, the couple decided to install a solar-powered well pump combine with a surface water boosting pump to meet the irrigation requirements of their greenhouses and olive trees. At dawn, the pumps automatically turn on and work until the end of the day. When there is extra solar power that isn't being used, the couple uses the solar panels to power other small kitchen appliances and a computer.

People are finding more ways to use solar pumping systems each year. Solar power used to be limited to low-flow applications, but it is becoming more common today to see systems capable of pumping 1000 gallons per minute.

And as flow capacities increase, the applications for solar pumps will continue to expand as well. Soon you may see solar pumps supplying water to cities and industrial plants, boosting water in high-rise buildings, and pressurizing offshore fire protection systems—in addition to many other applications not yet defined.

The possibilities are truly endless— as is the source of power from that big yellow star in the sky.

***Patrick Sless** is the Regional Sales Manager for Grundfos groundwater and irrigation products in Eastern USA. He has held multiple sales and business development roles within the company since joining in 2012, and previously worked in the golf irrigation industry for 12 years.*