SOLAR IRRIGATION SYSTEM

Rakesh Kumar

INTRODUCTION

Solar energy is the most abundant source of energy in the world. Solar power is not solution to today's energy crisis but also an environmental friendly form of energy. Photovoltaic generation is an efficient approach for using the solar energy. Solar panels (an array of photovoltaic cells) are nowadays extensively used for running street lights, for powering water heaters and to meet domestic loads. The cost of solar panels has been constantly decreasing which encourages its usage in various sectors. One of the application of this technology is used in irrigation systems for farming. Solar powered irrigation system can be a suitable alternative for farmers in the present state of energy crisis in India. This a green way for energy production which provides free energy once an initial investment is made. In this paper we propose an automatic irrigation system using solar power which drives water pumps to pump water from bore well to a tank and the outlet valve of tank is automatically regulated using controller and moisture sensor to control the flow rate of water from the tank to the irrigation field which optimizes the use of water.

WHY IS IRRIGATION IMPORTANT?

To grow the highest quality crops in the most efficient way they must have the right amount of water at the right time. Too little or too much water will lead to crops wilting, soil erosion and poor nutrient uptake of the plants. Irrigation is the controlled application of water to respond to crop needs.

GETTING WATER TO THE FIELD

Anyone who has lifted water up from a well or river and carried it any distance will know of the energy this takes. It is therefore not surprising that humans have looked for ways to reduce the workload and increase the efficiency of lifting water over the years. The first recorded mechanism for lifting water was in the Egyptian times (over 4000 years ago)!

More recently, pumps requiring either manual labour (treadle pumps) or fuel (petrol, diesel or electricity) have led the way in moving water for irrigation. These water pumps are designed to move more water to the field with less effort for the farmer. They have largely succeeded in this; however, they are still relatively demanding. They require a lot of maintenance, a regular supply of fuel (either human energy or fossil fuel) and someone to watch over them as they operate.

BRINGING SOLAR ENERGY INTO THE MIX

In a single hour, the amount of power from the sun that strikes the Earth is more than the entire world consumes in a year!

But it's only in the last decade, with the price of solar photovoltaic (PV) panels plummeting, that the sun as a source of energy for running water pumps has been available to small-scale farmers. This is a huge opportunity for rural off-grid farms to expand crop production and survive the dry season in an environmentally friendly way. For a Futurepump solar pump, the process of solar energy to water pumped is simple. The sun strikes the solar panel which converts solar energy into electrical energy. This electrical energy turns a motor and a flywheel which operates the piston which sucks water up and pushes water out. The simplicity of this system means fewer moving parts and less maintenance which results in less downtime and expense for the farmer.

What's more, solar energy is free and in abundance during the dry season when crops require the most irrigation water. Farmers who harness this free energy efficiently by pumping water to the fields and into elevated tanks during the day while the sun is the strongest can reap huge benefits.

WHERE IS SOLAR IRRIGATION HAPPENING?

The installation of solar pumps in arid regions such as in Africa, India and South America is also part of many development projects, aiming at increasing local farmers productivity and as a consequence, improving their living conditions. One of the successful example of this is the initiative of a Physics teacher in a school in Blankenese (Germany) where students have developed two solar-powered pumping systems in cooperation with the company SET GmbH from Wedel. They installed these systems in two farms in Nicaragua to pump underground water. This project could also be achieved with the collaboration of the UNAN University in León, which deals a lot with the exploitation of solar energy. Indeed, the project has been running for over 10 years and 30 pumps are in operation now in Nicaragua. It is supervised by the Nicaraguan company Enicalsa that helps farmers benefit from solar irrigation. The use of solar pumps allows the latter to produce all year round, even in dry season and thus to increase their income and strengthen their position in the local market.

Aside from the regions previously mentioned, there is also an increasing interest in solar irrigation systems in Europe. Just a few months ago, a mobile solar drip irrigation system from Austria has reached the production stage. The Austrian company Wien Energy carried out this project which pursues a dual objective: on the one hand, reduction of CO_2 emissions owing to the use of solar energy, on the other hand, achievement of 30% water savings thanks to the drip irrigation method versus the traditional sprinkler irrigation.

The principle of the drip irrigation method is quite simple. With the use of various valves, hoses and

pipes, water drips slowly and at regular intervals to the roots of the plants. Therefore, there is no water waste as water goes directly where it should go, contrary to a sprinkler system in which water evaporates into the air or seeps into soils where no plants grow. Therefore, drip irrigation method enables to grow more crops with less water, turning it into a highly efficient irrigation method.

In the Wien Energy solar irrigation system, a mobile solar energy system with photovoltaic modules (up to 3kW) is connected to a wheeled pump which can pump from wells or rivers. Thanks to an app on your smartphone, you can determine the amount of energy produced by the system. The solar-powered pump then distributes the water through the hoses, directly to the crops. After a successful test on a 3.5-hectare organic cornfield in Guntramsdorf, Austria, this system is now ready for production.

Therefore, in countries which suffer from high temperatures and scarce water resources, the drip irrigation system could contribute to an efficient water management. This is all the more important as farmers have to face three challenges: save water, money and energy. Mobile solar drip irrigation systems shall turn out to be the perfect answer to face these challenges. Although these systems are still quite expensive and complicated to settle, many R&D projects are working on the democratization of the use of solar power in agriculture, which, in the future (and even now), could play a vital part in the management of the food and energy crisis.

CONCLUSION

By implementing the proposed system there are various benefits for the government and the farmers. For the government a solution for energy crisis is proposed. By using the automatic irrigation system it optimizes the usage of water by reducing wastage and reduce the human intervention for farmers.