

Case Study | VACON® 100

Less emissions and more energy savings thanks to the VACON® 100 solar pump application, with MPPT⁴ algorithm



35%

increase in
performance

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Sumsol, a company providing photovoltaic solutions, has successfully installed the first solar pump system with automatic power grid backup in Spain. When designing it Sumsol considered VACON® 100 drives to be a key element, which, thanks to the Solar Pump application with MPPT⁴ algorithm, manage to extract the maximum solar power at every moment of the day. The result? A significant annual reduction in polluting emissions and significant annual financial savings with a short amortization period.



Amongst others, corn and sugar beet were the intensive crops which one of Sumsol's customers, an irrigation company, wanted to irrigate covering an area of 150 hectares of land. In order to supply such a large area of land, and taking the irrigation requirements of intensive crops into account, the monthly expenditure on electricity needed to power all the equipment involved in the process was high. Specifically, the system used four submersible pumps, which supplied a 49,000 m³ water basin, and two vertical shaft pumps, which supplied water to the irrigation system from the tank.

In order to reduce the electricity consumption from the grid, Sumsol designed a 300 kWp solar pump system with automatic power grid backup for this company. The arrangement consists of 944 modules of 320 Wp, a structure with horizontal axis tracking and a Sumsol pumping system integrated into the same cabinet and completely automated. *"It was the first system installed in Spain with these characteristics"*, noted David Manso, Director of Sumsol's Technical Department.

For the pumping system, Sumsol decided to have 5 VACON® 100 INDUSTRIAL drives between 30 and 110 kW supplied from both, the solar panels and power grid. For a worst case scenario they are even prepared to use an emergency generator set to supply the pumps in case there is a failure on the power grid and no solar power available at the same time. In addition a 37 kW VACON® 100 FLOW drive connected to the power grid operates a jockey pump to serve as a backup at night or during periods of low solar power available.

The drives connected to the solar panels use the solar pump application with MPPT⁴ algorithm, which optimizes the production of energy avoiding oversizing of the solar field.

"We wanted a reputable manufacturer as a technology partner for this project and that's why we chose Danfoss," David Manso notes.

Why MPPT⁴?

The advantage of using VACON® 100 drives with the Solar Pump application lies in the optimization of the energy flows: on the one hand, solar generation is maximized and, on the other, demand for power is minimized.

The optimization of solar production is due to the MPPT⁴ control. Thanks to its four parallel operating algorithms, the set value, which ensures the extraction of the maximum power available for the environmental conditions, is monitored and controlled at all times. In this way an increase in yield of 35% is achieved, which translates into more water pumped and more operating time.

Furthermore, the drive itself adjusts the consumption of the pumps which it supplies, either through the panels or the network, to the real needs of the customer, reducing the demand for energy by the system.

As a consequence, the energy consumed through the network is reduced and this equates to greater financial savings and a reduction in polluting emissions.

Lower emissions

At present the system of energy distribution is centralized and energy is obtained from large power plants. These plants are often of the traditional type and produce high levels of polluting emissions during their generation processes. An example would be thermal or combined-cycle plants. Therefore, replacing grid-based energy consumption with self-generated energy using emission-free energy sources means a reduction in the pollution generated.

For this farm, and taking into account that during the winter months the crops are not irrigated, it is estimated that the approximate annual solar production is 478,100 kWh.

Using data from the Institute for Energy Diversification and Saving (IDAE) and assuming that all the energy consumed was generated by thermal power plants, there would be annual reductions in emissions of 285 t of CO₂, 635 kg of SO₂ and 798 kg of NO_x.

More savings

By consuming less energy from the network, financial expenditure is reduced. For this farm, the energy savings can be estimated at approximately €52,000 per annum.

Taking into account the cost of materials and installation of the energy part of the system, Sumsol estimates a return on the investment in about 8 years.

In addition, by optimizing energy production with the MPPT⁴ algorithm, oversizing of the solar field is avoided, thereby reducing the initial investment.



The project in figures

Variable	Quantity
Reduction in polluting emissions	
CO2	285 t/year
SO2	635 kg/year
NOx	798 kg/year
Energy production	478,100 kWh/year
Financial savings	€52,000 per year
Basic return on the investment	8 years



Sumsol

Sumsol is a Spanish company operating in the photovoltaic sector since 1999. During the 20 years of its existence, it has been dedicated to providing the best solutions for solar pumping, self-supply, connection to the network and isolated systems. Following its creation in Spain, Sumsol has grown and now has operations in Chile and Mexico.

Its portfolio of products includes photovoltaic modules, structures, batteries, isolated inverters, grid connection inverters, and small and large power pumping systems. It is one of the leading specialists in Spain in the solar pumps sector, supplying more than 600 low and medium-power systems every year.

But Sumsol does not just supply the materials, it also designs tailored solutions for customers. In addition to the one described in this case study, there are direct Solar Pump solutions in two stages with intermediate pool, mixed with generator set, pumping systems with self-supply and zero injection, direct pumping with high-power pool, and they are specialists in solar pump systems with permanent magnet motors. During the most recent

campaigns it supplied customized equipment based on Danfoss drives for more than 25 high-power systems (from 75 to 650 kWp).

Sumsol also offers training courses on photovoltaic topics and develops applications to help its customers access information. An example related to solar pump systems is the AgroPV application, which allows the historical data of solar pump systems stored on a web server to be consulted at any time.

