High Efficiency Solar Water Pump

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The goal of this Project was to develop a cheap water pump for rural areas in India and Bangladesh. A cost reduction could be reached in two different ways. Firstly by minimizing the size of the solar panel and secondly by manufacturing the whole system in India together with a local company. To keep the solar panel small, the efficiency of the system has to be as high as possible.

Three innovations were made to reach this target.
1. Using a highly efficient brushless DC Motor
2. The Maximum Power Point Tracker which guarantees obtaining the maximum power of the Solar Panel.
3. Power management without energy storage in a battery.

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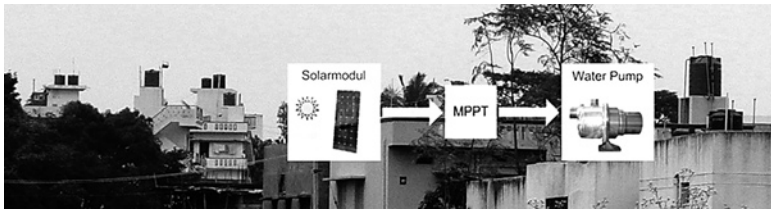
The goal of this diploma thesis was the development of a low-cost water pump for rural regions in India and Bangladesh. Many of these areas are not connected with a power supply system. Using solar power is one possibility to produce electrical energy directly there. To achieve that many people could buy such a pump, it has to be as cheap as possible.
Keeping the solar panel small will bring the highest reduction in costs, because it's still the most expensive part of such a pump system.
High efficiency of the system has the effect that the solar panel surface can be reduced to a minimum. An increase of the efficiency could be reached in three different elements.

First, the system uses a brushless DC Motor. This type of motor has a permanent magnet as rotor and electronic commutation. So it needs no brushes, which reduces the losses and brings the efficiency up to around 70 %. The second element is the Maximum Power Point Tracker. It makes sure that the solar panel can deliver the maximum available power on a permanent basis. The third and last element is the power management. The developed system doesn't need a battery for intermediate storage of the energy. Getting rid of a battery has two advantages: There are no losses in charge and discharge, and of course, the money for buying a battery and its maintenance and replacement costs can be saved.
The whole system will be manufactured in an Indian company, using only components which are available on the Indian market. These components are usually cheaper and easier to get than equivalent components obtainable in Europe. To obtain the knowledge of manufacturing and to test the hardware in a real environment, the diploma students developed parts of the hardware and software during a two month stay at the RV College of Engineering in Bangalore (South India) in cooperation with MATTOO Enterprises as manufacturer for the future.



Water tanks on Indian roofs