Grid Interactive Energy Efficient PMSM Based Solar Water Pumping System

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Abstract:
In India, traditional water pumps are commonly powered by diesel, electricity, or gasoline, offering low initial costs and widespread availability. However, solar water pumps are gaining attraction particularly in rural areas, due to their eco-friendly nature, ability to reduce electricity bills, and independence from fossil fuels. Solar water pumping systems offer farmers the flexibility to irrigate at any time, independent of the utility grid, and can generate additional revenue, improving farmers' financial conditions. To enhance the performance of solar water pumping systems, this paper highlighted the integration of an adaptive technique for solar and grid utilization for solar water pumping system with Space Vector Pulse Width Modulation (SVPWM) technique for controlling the Permanent Magnet Synchronous Motor (PMSM) drive. The bidirectional power flow between the grid and the DC bus of voltage source inverter (VSI) is effectively implemented which feeds a PMSM motor required for solar water pumping system.

Keywords:
Permanent Magnet Synchronous Motor (PMSM), Solar water pumping systems, Space Vector Pulse Width Modulation (SVPWM) , voltage source inverter (VSI).