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Efficiency of 12/24V and 240V Pumps

To test the efficiency of a pump, its application first needs to be determined so we may emulate daily use. In an energy efficient house, it could be that 1 shower and 1 kitchen/laundry tap are running at the same time for perhaps 1 hour per day.

Two types of pump were tested and found to have positive and negative aspects:

A 12/24v variable-speed pump is capable of running the above requirements at reasonable pressure. However, the 12/24v pump is not capable of doing more, and diaphragm replacement every 2 years can be discouraging. Variable speed 12/24v pumps negate the requirement for a pressure tank and allow soft starting and half-power running when the flow is low.

A 240v pump (a DAB 750w centrifugal) certainly can produce more flow, and will also allow the user more pressure for hoses and other uses. The 240v pumps, however, do not have variable speed controllers on the small scale (household pressure) models, but are instead fitted with a flow sensor switch that ensures the pump continuously runs even if flow is very low. This means that the backpressure on the pump during low flow operation is extremely high, and the pressure build-up is only curtailed by the natural slip characteristics of centrifugal pumps. This is not an efficient method of flow smoothing, and the old style pressure switch/pressure tank combination results in a more efficient, reliable, and cost effective pump.

NB: The test of the 240v pump demonstrated that the pump actually drew less power than stated (approximately 620w) at a backpressure typical of a showerhead. The resulting current flow at 12/24v nominal was 70 amps including inverter losses (Selectronic WM1400). The battery voltage was actually an average of 11.9 under load meaning the total power consumption was about 830w. The low voltage pump (a variable speed pump, typical of all larger model 12/24v pumps) drew only 80w at a similar voltage.

Over a period of 1 hour, each pump was run to establish how much water could be moved in that period of time and how much power is required.

The results showed that the 240v pump would move twice the quantity of water in one hour compared with the 12/24v pump, but took over ten times the power.

This fact, in combination with the surge requirements for stop-start operation, makes the 240v pump unsuitable for all but the largest power systems. Even if the 240v pump was half the wattage (there are some 300w models available), the efficiency would still be too low to compete with the power efficiency of 12/24v models.

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