EPIC Pool Pump Energy Saver

How does reducing the speed of a pump save energy?

Firstly, there needs to be a benefit in reducing the speed. If you are regulating a process such as pressure or flow, then running the pump at the right speed for the process offers immediate benefits.

There is a mathematical explanation as well, and this relates to The Affinity Laws:

1. The flow produced is proportional to the motor speed.
2. The pressure produced is proportional to the motor speed squared.
3. The kW required is proportional to the motor speed cubed.

Let's take an example to put it all into perspective.

You have a pool pump being driven by a 1.8kW motor. This pump running at full speed allows your filtration and chlorination process to function each day for a set time.

What if you found that by reducing the flow (or motor speed) by 30%, your pump still managed to efficiently complete the process?

If you reduced the flow by 30%, then this would reduce the motor speed by 30% as well (point 1 of the Affinity Laws).

The power required (point 3 of the Affinity Laws) would be proportional to the motor speed cubed = $(0.7)^3$= 0.343 multiplied by the motor power of 1.8kW = 0.6174kW.

That's a power saving of 65% just by reducing the speed by 30%!

If your pool pump ran at full speed, as the majority do, for eight hours a day, 365 days a year, that's 2,920 hours x 1.8kW = 5,310 kWh @ 23 cents/kWh = $1,221 per year.

The same equation with the 30% reduced speed = 2,920 hours x 0.6174kW = 1802 kWh @ 23 cents/kWh = $415 per year or a massive saving of $806 per year!

Bear in mind that the above calculations are theoretical and that actual measurements show a slightly better power saving.
In addition, the power costs at 23 cents/kWh is at today's rate (February 2011) – These $ savings will increase as power costs increase.