Pump ED 101

Calculating Energy Savings & Payback

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Energy efficiency and reduced consumption are very important issues in the pump and motor marketplace. Over the long term, the cost of electricity will continue to increase regardless of our actions. This will be due to increasing fuel costs and inflation but if programs that limit CO_2 emissions are enacted, energy costs will skyrocket. I belong to that group of those "not so green" scientists who do not believe that anthropogenic CO_2 emissions have any measureable impact on global temperatures. That said, I am completely in favor of reducing energy consumption but for a very different reason - - economics.

There are several ways to reduce energy costs in pumping applications. The first and probably most important is the application design. Well designed systems are usually far more efficient that poorly designed ones. Also, increasing pump hydraulic efficiency at the H/Q point reduces the BHP required. A reduction in BHP reduces the energy required per gallon pumped. Motor efficiency can also have a significant impact. Increased motor efficiency reduces the energy required to produce a certain BHP. When taken together, application design and wire to water efficiency can significantly reduce electrical consumption.

There are, however, times when pump efficiency can take a back seat to other important issues. For example, the efficiency of a vortex sewage pump can be 25 points lower than a standard non-clog pump with a similar flow and head (see my August 2007 column for more information). But, if plugging is a problem and you have to pull that non-clog weekly, your maintenance costs will far exceed the increased power cost of the vortex pump. Even if a lower efficiency pump is the best choice for an application, a higher efficiency motor will still decrease the overall operating costs.

Figure 1 is a screen shot of my Excel based, Wire to Water Energy Calculator. It is available for download in the "Pump Sizing & Selection Tools" section of my web site (www.PumpEd101.com). The calculator will allow you to evaluate the electrical consumption of various pumps with the same motor, various motors with the same pump, or various combinations of each. It also provides a simple "payback" analysis when you compare two different pump and motor combinations.

Wire to Water Energy Calculator

REQUIRED DATA	PUMP 1	PUMP 2	
Pump Operation - Hours / Day	8	8	Note: When comparing two pumps,
Pump Operation - Days / Year	365	365	place the lower efficiency pump/motor
Pump Flow - GPM	1000	1000	in the Pump 2 column.
Pump Head - Feet	88	88	
Pump Efficiency - %	80%	74%	
Motor Efficiency - %	94.1%	87.5%	
Energy Cost in $/KWH	$0.10	$0.10	

RESULTS			PAYBACK	
BHP At Design Point	27.8	30.0	Annual Savings - $$	$1,045.73
Wire to Water Efficiency - %	75%	65%	Annual Savings - %	13.99%
Annual Energy Cost	$6,430.28	$7,476.00	Cost of Pump 1	$9,000.00
KW Per 1000 Gallons Pumped	0.367	0.427	Cost of Pump 2	$7,200.00
Cost Per 1000 Gallons Pumped	$0.037	$0.043	Payback - Years	1.7

After entering the required data, the calculator will produce a number of results including the BHP required, wire to water efficiency, and the annual energy cost. KW and cost per thousand gallons pumped is also displayed. When you compare two different pump/motor combinations and enter the cost of each, the calculator will produce a simple payback analysis that displays annual savings and payback in years. Payback is simply the pump/motor cost differential divided by annual savings. Although a present value analysis may be needed in some instances, simple payback will usually provide the information you need to make a selection decision.

Joe Evans is responsible for customer and employee education at PumpTech Inc, a pumps and packaged systems manufacturer and distributor with branches throughout the Pacific Northwest. He can be reached via his website www.pumped101.com. If there are topics that you would like to see discussed in future columns, drop him an email.