Monday, June 27, 2016

Bell and Gossett Part Load Efficiency Value Part 2: How to use PLEV

In the last Monday Morning Minutes post, we introduced the PLEV, or Part Load Efficiency Value from Bell and Gossett. This week we look at some selections and how to use PLEV.

Bell & Gossett "PLEV"
Part Load Efficiency Value for pumps

Based on 30% control head

PLEV Formula Weighting Factors & Water Pump Flow Rates

	Weighting	Pump Flow Rate	Pump kw	Run Point	Pump Efficiency	Operating Hours
	1%	100%		A		
	42%	75%		B		
	45%	50%		C		
	12%	25%		D		

$$\text{Pump PLEV} = \frac{1}{\frac{1\%}{A} + \frac{42\%}{B} + \frac{45\%}{C} + \frac{12\%}{D}}$$

expressed in blended efficiency

Bell and Gossett developed PLEV to create a weighted average of the pump efficiency for the HVAC and plumbing industry. This new efficiency average gives the engineer or designer an efficiency that may more closely represent the actual efficiency of a variable volume system.

Using Bell and Gossett's ESP-PLUS for Energy Analysis

Let's use an example to show how the PLEV may be used as part of the selection criteria. Assume we have a heat pump system requirement of 800 GPM at 100 feet of head in a variable volume, variable speed application. The pump selection is shown below.

Bell & Gossett
a xylem brand

Login: **Norman Hall** (NHALL) , REP Code: **7777**
Email: nhall@deppmann.com
SignOff

Bell & Gossett Online Pump Selection

Input Parameters
Flow [GPM]: **800**
Head [Feet]: **100**
Pump Flow [GPM]: **800**
Parallel Pumps: **1**
Minimum HP: **0**

Selection Details
Pump Series :
Pump Model :
Triple Duty Valve :
Suction Diffuser :

Selection	Pump Series	Pump Model	Motor Size [HP]	Duty Point [BHP]	Motor Speed [RPM]	Duty Pt. Pump Eff. [%]	Pump PLEV$_v$ [%]	End of Curve [%]	Impeller [in]	Weight [lb]	Cost Index
Select	e-1510	5EB	30.00	24.51	1770	82.42	73.01	55	10.5	725	135
Select	e-1510	4AD	30.00	25.97	3550	78.27	71.37	78	5.875	565	116
Select	e-1510	3AD	30.00	25.88	3550	78.03	81.79	90	6.625	495	100
Select	e-1510	5GB	40.00	26.35	1770	77.37	71.12	61	10.625	1075	146
Select	e-1510	4GC	30.00	27.05	1770	75.99	77.43	76	11.375	810	129
Select	e-1510	6G	50.00	29.4	1770	69.51	59.86	40	10.25	1200	169
Select	e-1510	5A	40.00	31.46	3550	65.48	57.24	58	6	710	127
Select	e-1510	6E	50.00	31.71	1770	64.88	54.99	33	10.5	1050	166
Select	e-1510	8GB	75.00	48.84	1780	41.76	31.12	22	11	1550	257
Selection	Pump Series	Pump Model	Motor Size [HP]	Duty Point [BHP]	Motor Speed [RPM]	Duty Pt. Pump Eff. [%]	Pump PLEV$_v$ [%]	End of Curve [%]	Impeller [in]	Weight [lb]	Cost Index

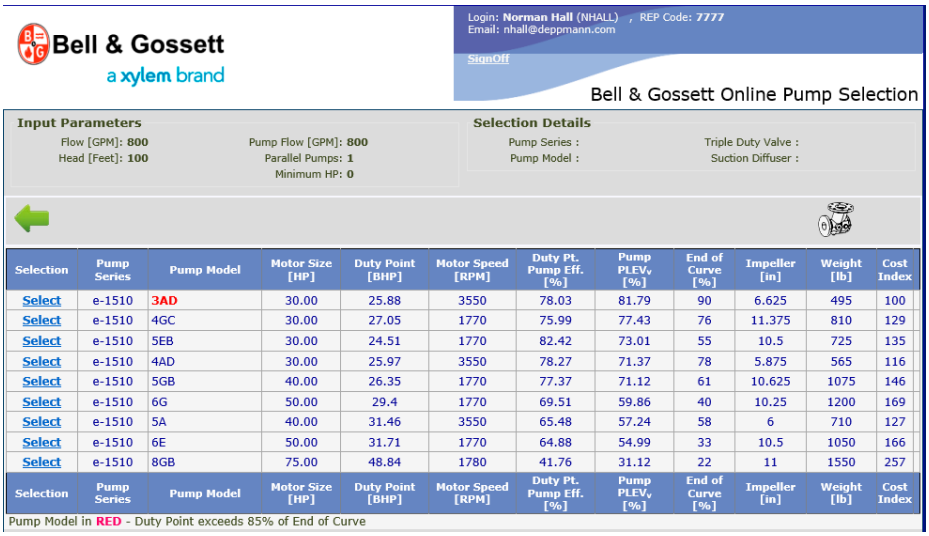
Pump Model in RED - Duty Point exceeds 85% of End of Curve

Notice the traditional duty point efficiency column. The selection is sorted by this column when it first appears. The 1510-5EB with a 30 HP motor is a nice selection. If the pump ran at design flow and head all the time, then the efficiency would be 82.42%. But this is a variable speed, variable volume pump so the efficiency of that selection using the PLEV load profile is 73.01%.

This is what we should use in any system energy analysis software as the average efficiency.

Let's click on the Pump PLEV column and re-sort to see what the most efficient pump will be during variable speed operation.

Once we sort on PLEV we see different selections. The most efficient pump for this application is a 3500 RPM selection. The choice, if we choose to a 1750 selection is the e-1510-4GC with a PLEV of 77.43%.



Selection	Pump Series	Pump Model	Motor Size [HP]	Duty Point [BHP]	Motor Speed [RPM]	Duty Pt. Pump Eff. [%]	Pump PLEV$_q$ [%]	End of Curve [%]	Impeller [in]	Weight [lb]	Cost Index
Select	e-1510	3AD	30.00	25.88	3550	78.03	81.79	90	6.625	495	100
Select	e-1510	4GC	30.00	27.05	1770	75.99	77.43	76	11.375	810	129
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Pump Model in RED - Duty Point exceeds 85% of End of Curve

Visit the [B&G site to get a password] for the selection program.

Next week we will look at these selections and question why we might consider a selection with less efficiency as our choice to schedule and recommend to our client.