

SPOTLIGHT ON ESP MOTOR SELECTION

Every once in a while, we get an email where an engineer questions the accuracy of the Brake Horsepower calculation inside of ESP-PLUS. The engineer wants to know why the BHP result in the ESP program does not look correct for the well known Pump BHP equation:

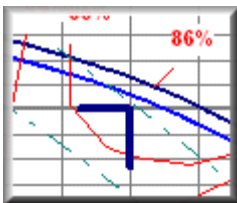
$$\text{BHP} = \frac{\text{Flow (GPM)} * \text{Head (Feet)} * \text{SG}}{3960 * \text{Pump Eff}}$$

Using this screen shot example, when you plug in pump flow, head and efficiency into the BHP equation, the result should be 29.51:

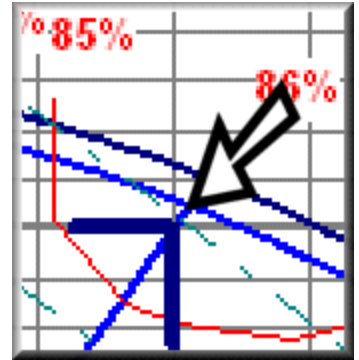
$$\frac{1000 \text{ GPM} * 100 \text{ Feet} * 1}{3960 * .8586}$$

However, ESP returns 30.04 BHP. The difference is small but, still, ESP does not look accurate when compared to the other selection programs which match this equation.

Of course, since this is an ESP Spotlight, you know we are going to tell you that ESP actually has the more accurate result. To understand, let's take a closer look at the pump curve and zoom in on the duty point. B&G trims its impellers to 1/8th inch increments for



most pumps. HSC style pumps are trimmed to 1/10th inch increments. If you look closely, you will see the duty point is actually just a bit below the trimmed curve. ESP selects the closest 'trimmed' curve that is on or above the duty point.

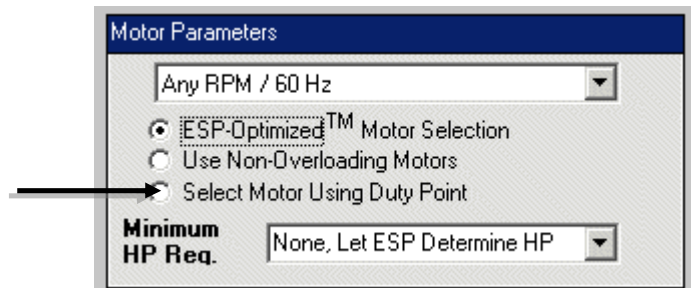


Pump Series:	1510	Pump Size:	5E
Flow Rate: (GPM)	1000	Total Head:(Feet)	100
Pump Speed (RPM)	1750	NPSH req: (Feet)	10.72
Weight: (lbs)	855	Cost Index:	104
Suction Size: (in)	6	Suction Velocity: (fps)	11.1
Discharge Size: (in)	5	Discharge Velocity: (fps)	16
Impeller Diameter: (in)	10.875	Efficiency:	85.56
Max Imp. Dia. : (in)	11		
Max. Flow: (GPM)	1488	Duty Flow/Max Flow (%)	67
Flow @ BEP: (GPM)	1065	Min. Rec. Flow: (GPM)	400
Motor Power, HP:	40	Selected Motor Size (kw)	29.83
Pump Power (BHP):	30.04	Duty-Point Horsepower (kw)	22.4
Max Power (BHP):	34.3	Maximum Power (kw)	25.58
Frame Size:	324T	Aprox. FLA (230/460v):	91.4/45.7

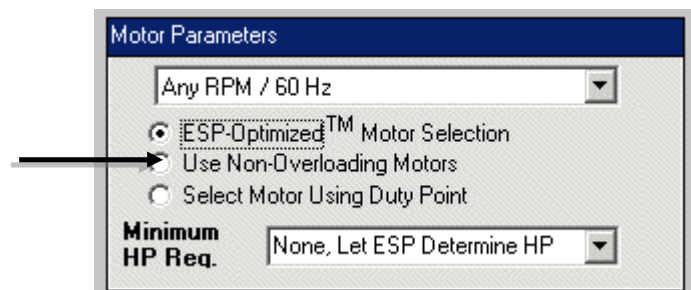
When ESP-PLUS calculates the duty-point BHP, it uses the flow, head and efficiency at the point where the system curve crosses the trimmed impeller curve. This is certainly more accurate and a better predictor of what will actually happen in the field.

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While we are on the topic of BHP, let's talk about motor selection. ESP gives you three methods of selecting the motor size. When you select the duty-point option, ESP will select the smallest motor that will cover the pump BHP discussed above without using any of the motor service factor.



The non-overloading option will select the smallest motor that will cover the largest BHP requirement of any point on the published pump curve without using any service factor. This option is very valuable when selecting pumps for parallel pump operation where a pump may operate further out on its pump curve if one pump were to fail.



Unique to ESP-PLUS, is a third method that more closely follows what an engineer would do when selecting a motor. It uses a series of rules to pick the motor. This option assures the duty point HP is covered without any service factor but will use some service factor when looking at the non-overloading requirement. In addition, there is logic that considers motor/pump combination limitations. The strict rules in the non-overloading method may reject a model that the ESP optimized option will allow and possibly use a smaller motor.

