Pump ED 101

Variable Speed Performance Analyzer – 50hz

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In the late 90's, I used Excel to develop a simple graphical system that showed the variable speed performance of a pump based upon its published 60hz H/Q curve. Over the years I modified it to model several different pumping applications and, today, there are four different versions on my web site. Although they can be very useful tools, they are limited to 60hz data and units of GPM, Ft, and HP. Because of these limitations I have received a number of requests, from our readers, to develop an international version. VPSA50 is the result of several, fairly simple, modifications to one of those versions. It is designed for 50hz data and uses the affinity laws to calculate the lower speed H/Q points and the input power required for each. It also allows the use of any unit of measure.

Variable Speed Performance Analyzer 50 Hertz with "Auto Plot"

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Follow the four steps below to view the potential power savings of a centrifugal pump operating under VFD control.
Scroll down to line 80 for more detailed instructions.

1) Enter the chart title in yellow box # 1
Enter the flow units in yellow box # 2
Enter the head units in yellow box # 3
Enter the power uints in yellow box # 4

1	Aurora 5X6X12 12" Trim 1460RPM
2	Flow = M3/hr
3	Head = Meters
4	Power = kw

2) Enter eight 50 hertz flows In Q1 - Q8 (Cells H22 - O22)
Enter the corresponding heads in H1 - H8 (Cells P22 - W22)
(*See instructions below when entering fewer than eight points)

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	H1	H2	H3	H4	H5	H6	H7	H8
0.0	40.0	80.0	120.0	160.0	200.0	240.0	280.0	33.2	32.9	32.6	32.0	31.3	29.9	28.0	25.6

3) To plot a constant or variable system curve, enter the system heads in SH1 - SH8 (Cells P64 - W64) that correspond to the flows in Q1 - Q8. (See Instructions below)

SH1	SH2	SH3	SH4	SH5	SH6	SH7	SH8
15.0	15.0	16.0	18.0	21.0	25.0	31.0	

4) Enter the pump's power requirements in P1 - P8 (Cells P70 - W70) that correspond to the flows in Q1 - Q8 (See instructions below)

P 1	P 2	P 3	P 4	P 5	P 6	P 7	P 8
	11.9	14.1	16.2	18.2	20.5	22.8	25.6

Click on the "VFD Control" tab to view pump performance.

Figure 1 is a screen shot of the data entry tab of VSPA50. Entering the data requested in Step 1 automatically formats the chart title, the x / y axis values, and the data label values. Step 2 collects the H/Q data for the 50hz performance

curve that is used to compute the lower frequency curves. Step 3 allows the entry or an optional system curve. Finally, in Step 4, the power required for each 50hz H/Q point is entered in the units defined in Step 1. This information is used to produce data labels that show the power requirement for the H/Q points on each of the curves. Detailed instructions can be found below the data entry portion of this screen.

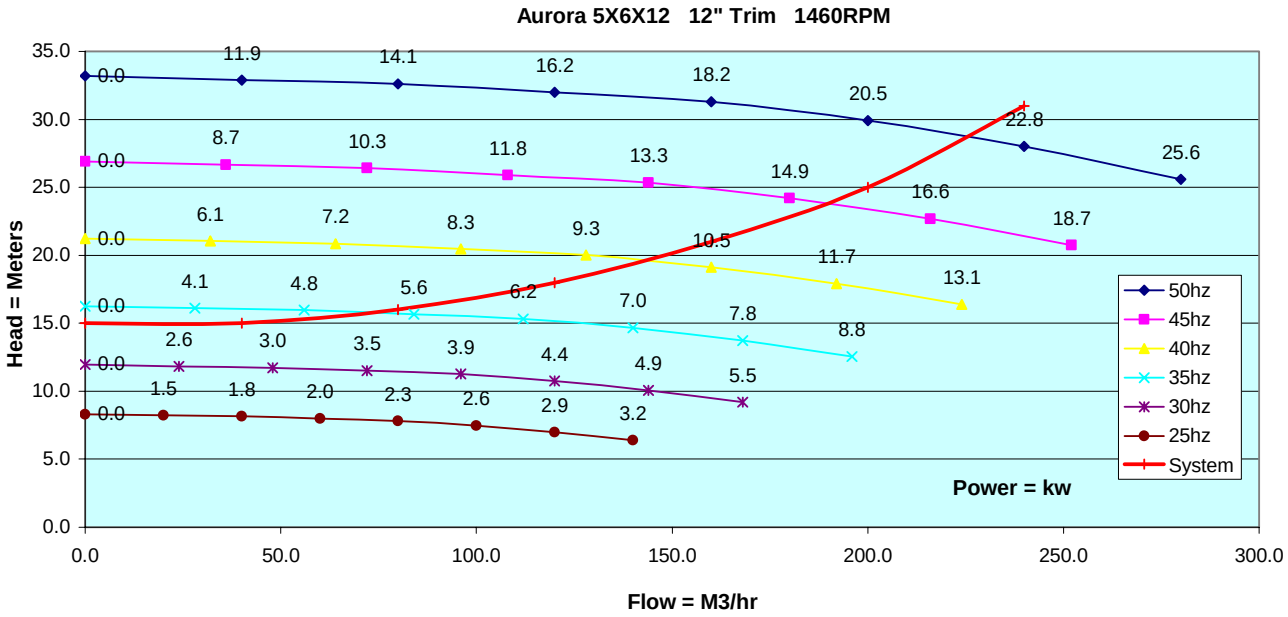

Figure 2 is the chart that is produced from the data entered in Figure 1. The title and units of measure are automatically placed in their proper position and the scale of the x and y axes are proportioned to the H/Q data entered. Although all frequency points between 50hz and 25hz are calculated, only the major ones (in 5hz increments) are displayed on the graph. Each is color coded and identified in the legend box. The data labels on each of the H/Q curves show the power required at that point. The optional system curve, plotted in red, shows the actual variable speed performance at each intersection with the frequency curves.

I also developed a 60hz version for those who may need to use international units of measure when evaluating 60hz pumps. VSPA50 and VPSA60 are available for download at the "Variable Speed Pumping" section of my web site. Both require Microsoft Excel. Please give them a try and send me your feedback.

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