Pump ED 101

Breadth of Efficiency

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In 2012, I wrote a six part article on centrifugal pump efficiency. In part five, I touched on the importance of the breadth of efficiency and how it can be more useful than the peak BEP efficiency. Over the past year, I have received a number of requests to revisit this topic and show some examples. I hope that this article will answer your questions.

I define breadth of efficiency as the range of flow at BEP and within a couple of percentage points on either side of BEP. Why is this range important? There are two reasons. Let me address the first one with a question. How often does a pump, running at full speed, operate at BEP? Answer - - seldom. Simple systems will often operate at BEP. More complex systems, upgrades to existing systems with older pipe and "build/design" systems usually do not. The second reason is that a wide efficiency range will allow higher operating efficiency when pump speed is reduced by a VFD. Peak BEP efficiency is also important but, losing one or two points to attain a wider range of efficiency can be a reasonable trade off.

As a rule of thumb, higher flow pumps usually have broader BEP efficiencies than lower flow pumps. However, some low flow designs offer a much broader range of efficiency than do others. Sometimes one manufacturer's pump will have a broader range than those of his competitors. In other cases a single manufacturer will have several different models that produce similar flows at very different efficiency ranges. Let's take a look at two, lower flow pumps with very different efficiency ranges. These are real pumps and I downloaded the pump curves from the manufacturer's electronic catalogs.

Figure 1 shows the variable speed curves for a 3X4X13, end suction pump (Pump A) operating against an ideal system curve that intersects the center of the BEP range at 60 hz. The red dots show the BEP range. BEP efficiency remains at 75% from approximately 465 gpm to 530 gpm (a 65 gpm range). At full speed, efficiency drops to about 68% at 400 gpm. Under VFD control efficiency drops to about 71% at 400 gpm (approximately 54 hz) and at 300 gpm (50 hz) efficiency drops to 65%. In a variable speed application, designed for flows from 250 to 500 gpm, pump efficiency will range from 60% to 75%.

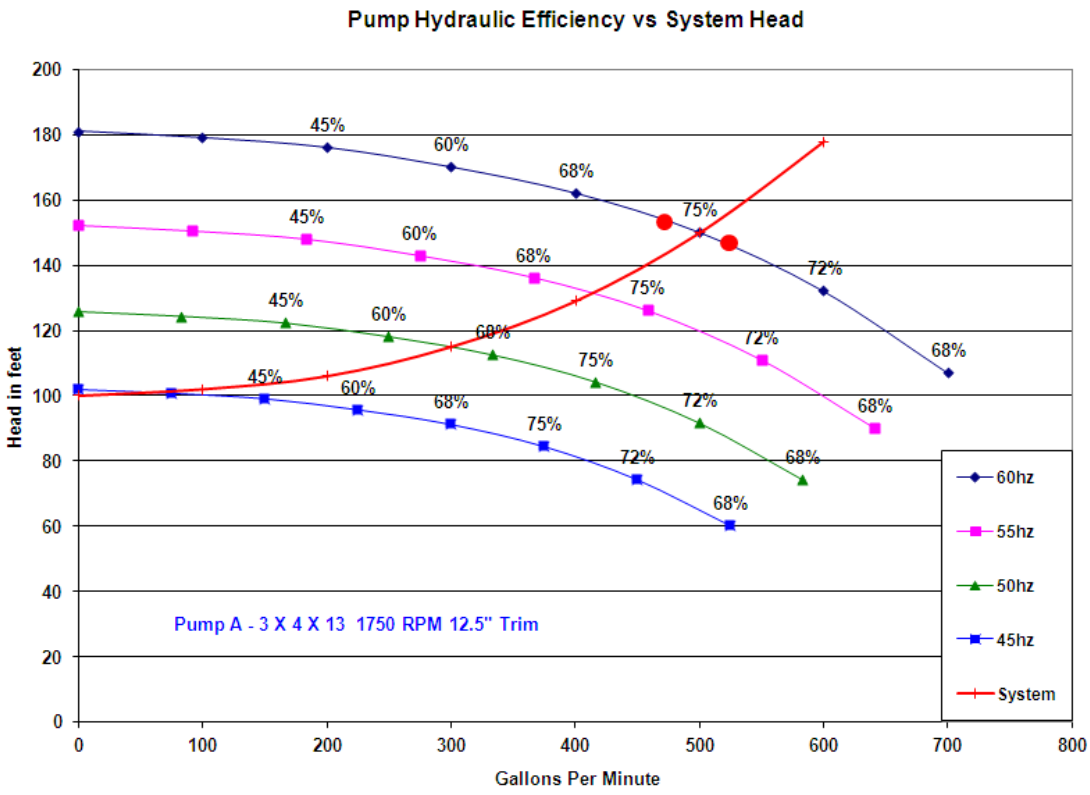
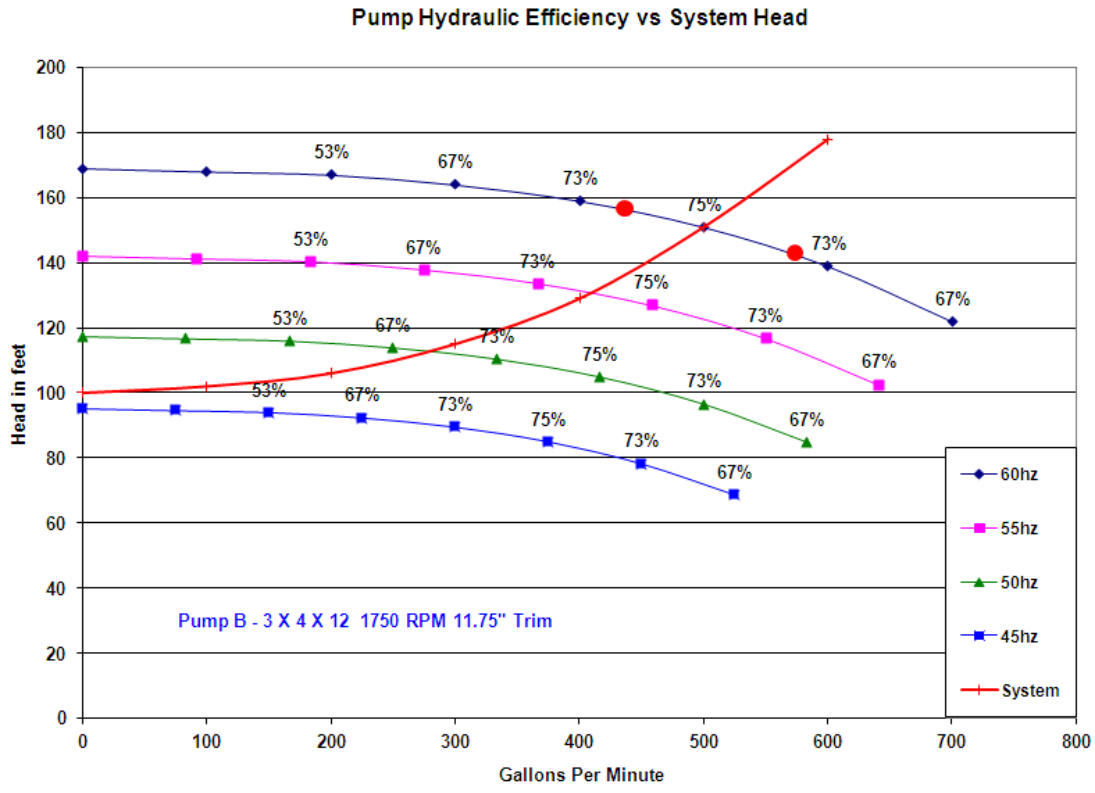


Figure 2 shows the performance curve for a 3X4X12, end suction pump (Pump B) plotted against the same system curve. The BEP efficiency is also 75% but the range is over twice that of the previous example - 425 gpm to 575 gpm (150 gpm range). Full speed efficiency drops just 2 points at 400 gpm and just 1 point when under VFD control. At 300 gpm, variable speed efficiency remains at 71%. In a variable speed application designed for the same range of flow as the previous



example (250 – 500 gpm), Pump B's efficiency ranges from 68% to 75%.

Pump B would be the best choice for both across the line (full speed) and variable speed operation. Its increased range of BEP efficiency provides a better chance of actually hitting BEP when operating at full speed. It will also offer an overall higher efficiency when operating at variable speed. If you look at pumps across the industry you will find many examples where this holds true, especially lower flow pumps. Fortunately, we have many choices when selecting pumps so, take your time and compare several models and manufacturers.

Joe Evans is responsible for customer and employee education at PumpTech Inc, a pump & packaged systems manufacturer & 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.