Pump ED 101

Sizing Pumps After Sunset - (BEP Sizing)

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Let me begin this tutorial by saying that I hope that you never have to use it. In fact, I thought long and hard before placing it on my web site. It was originally written for several of my distributors as an aid to help them respond to customers who had an immediate emergency or were so remote that there was not time to pay an on site visit. Although better than throwing a dart, it is not a preferred way of sizing a replacement pump.

How often have you had a customer call and ask for a quote on a replacement "40 HP" centrifugal pump? Usually, he has no flow or head information and may not even know the name of the manufacturer -- just 40 HP! Based on my experience it happens more often that we would like. Fortunately, this seldom happens with larger municipal, industrial, and commercial customers. It tends to occur most often in agricultural and small commercial applications. A quick glance at almost any major pump manufacturer's catalog indicates that there are at least twenty 40 HP models to chose from. How then do we select the proper replacement when we are actually working in the dark (ie after sunset)?

Obviously, the best and most accurate method of sizing a replacement pump is to have reliable head and flow requirements for the application. If these are not available the second most reliable method is to use the operating pressure of the existing pump, obtained from a pressure gauge on the pump's discharge, to find its flow point. In order to use this method, you will need the make and model of the pump, its impeller trim, and a copy of the performance curve. Often this information is not readily available. So, what can you do if neither of these two options are feasible? Well, there is another way, BEP Sizing, that can work pretty well if one makes several assumptions and, is a little lucky.

The first assumption is that the pump to be replaced utilizes a "standard" and not a special purpose impeller. Standard impellers, regardless of their size,

are designed to produce an optimum flow rate at the highest possible efficiency. Special purpose impeller designs are not as concerned about efficiency as they are about meeting a certain duty point. An good example is the restricted vane impeller. If you reduce the vane size of a 9" impeller the result is higher heads at flows much lower than those of a standard impeller. This assumption can be considered valid much of the time since most general purpose pumps incorporate standard impellers.

The second assumption is that the existing pump was sized correctly in the first place. By this, I mean that the pump is operating at or near its Best Efficiency Point (BEP). A pump's BEP is defined as the point on the head / capacity curve that has the highest hydraulic efficiency. Unfortunately this assumption can be invalid in many instances because pumps are often oversized and application conditions can change over time. Fortunately, from a replacement standpoint, this is not always of great importance. After all, if the existing pump performed satisfactorily, the replacement should also even if it is not sized for optimum performance.

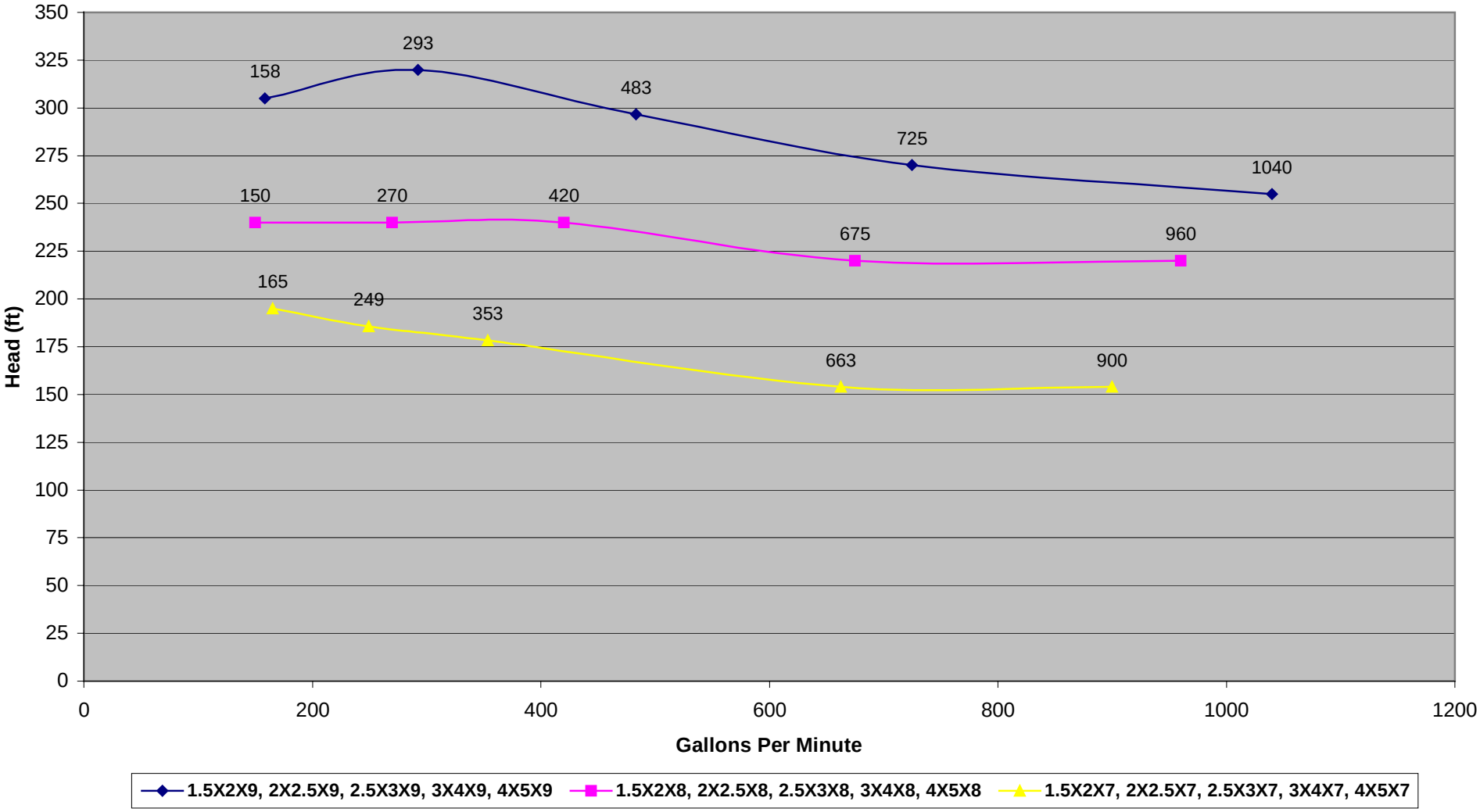
The only information you need to use BEP Sizing is the pump rotational speed (RPM), impeller diameter, suction size, and discharge size. If that part of the pump nameplate is still readable all of this information will be readily available. If not, the suction and discharge connection sizes must be determined and the volute removed so that the impeller can be measured. Once these measurements are obtained you can use the charts on the following pages to help size a replacement pump.

The charts are a compilation of Best Efficiency Points (BEP) by rotational speed and pump size (suction size, discharge size, & impeller diameter). The pumps used to build the BEP curves include Armstrong, Aurora, B&G, Goulds, Paco, Peerless, & Taco and were chosen because of their broad installation base and their use of common suction and discharge sizing. Unlike special purpose lines they belong to a category of pumps that were developed to compete in the municipal and bid & spec markets and therefore have similar hydraulic characteristics. The BEP for each manufacturer's pump size/RPM was entered into a spreadsheet, oddballs were cast aside, and the remainder were used to calculate an average BEP. Over 400 different models were used to develop the BEP averages. I am still not completely satisfied with the compilations but hey are, however, quite usable in their current condition.

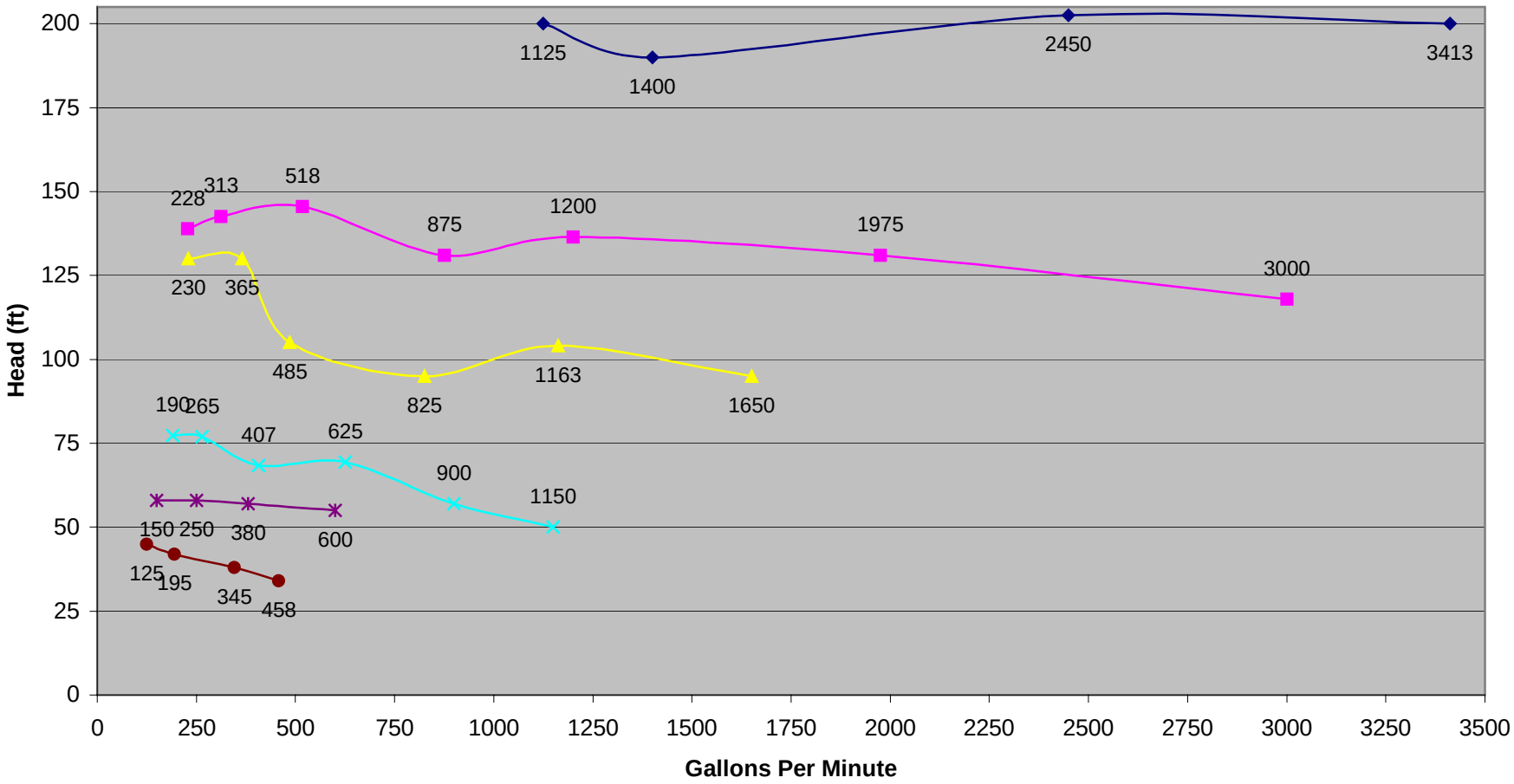
There are three BEP curve series based on pump rotational speed (RPM) -- 3450, 1750, and 1150. Within any of these three RPM series, the color coded curves represent a particular impeller diameter. Each point on the colored curve (from left to right) represents the specific discharge and suction size specified in the legend (also from left to right). To find an existing pump's average BEP, select the proper RPM chart and then locate the point that represents its discharge, suction, and impeller size. The BEP flow is indicated above the point and the BEP head can be found on the Y axis. Use this information along with the HP of the existing pump to find a replacement of similar HP. Impeller diameters other than those indicated must be interpolated.

Please note that these are "average" BEP curves and they will not necessarily match any single BEP nor will they look like an individual composite or characteristic curve. Although they follow the affinity laws, the average BEP will often create an "up and down" motion of the series curve.

3450 RPM BEP CURVES



1750 RPM BEP CURVES



4X5X15, 5X6X15, 6X8X15, 8X10X15

2X2.5X12, 2.5X3X12, 3X4X12, 4X5X12, 5X6X12, 6X8X12, 8X10X12

2X2.5X11, 2.5X3X11, 3X4X11, 4X5X11, 5X6X11, 6X8X11

2X2.5X9, 2.5X3X9, 3X4X9, 4X5X9, 5X6X9, 6X8X9

2X2.5X8, 2.5X3X8, 3X4X8, 4X5X8

2X2.5X7, 2.5X3X7, 3X4X7, 4X5X7

1150 RPM BEP CURVES