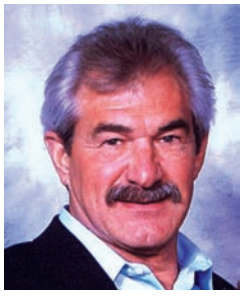
While Installing A PUMP..

By Wayne Kraft



Pump Applications

If you are a designer or consulting engineers dealing with pumping systems you have probably seen a zillion articles written about the correct and accepted practices for the installation of a pump in open systems. The first issue that is usually discussed is reducing turbulence on the suction side of the pump. It is usually recommended that the length of the pipe on the suction side of the pump volute be six to ten times as long as the pipe diameter.

The reason for this concept is to allow the fluid to have time to reduce any turbulence which has been created from the fitting, valves, flange connections between the fluid source and the pump suction. This influent portion of the circulation system supplies the pump with the fluid that needs to be transported elsewhere in the system. The lower the turbulence is as it enters the eye of the impeller the more efficiently the impeller will operate. This means the maximum design performance can be achieved. Basically the maximum efficiency of a pump boils down to its ability to move the desired amount of fluid require for the specific application with the least amount of energy consumed required to accomplish that.

With the sky rocketing price of energy, tweaking pump performance is not the cool thing to do, it is the responsibility of the designing engineer to accomplish that end. So, step one is to minimize turbulence to the eye of the pump impeller.

Net Positive Suction Head

Second, I am not sure there is a number high enough to count how many times there has been articles published about NPSH. In the simplest of terms and with out going into the boring math for the umpteenth time, NPSH is the total pressure differential that the system achieves during its operating cycle. One of the more important components is NSPHA which is the net positive suction head available. In an open loop system this aspect of design is improved by having as much distance as is possible between the surface of the body of water and the impeller eye. 'Simply put the higher the column of water is above the eye the more initial pressure is created by the fluid. So, again in the simplest of terms mount the pump on the floor of the equipment room but don't forget that 31/2" housekeeping pad. If the pipe diameter is larger than the pump suction size the optimum elevation for the pipe entering the equipment room wall should be such that the flange for the pipe has one to two inches of clearance from the finished floor.

Thirdly, on the vertical discharge of the pump volute it is important to come off the pump discharge flange with a concentric increaser that transition the pump flange diameter to the return piping diameter over a reasonable length of transition. The ANSI standards should be adhered to for this part of the design. If an isolation valve is installed it should be sized to the larger diameter of the concentric increaser. Many times contractors will buy a smaller valve which is the size of the small side of the concentric increaser to save money. It will save money for them at the expense of the owner who will have to deal with the disadvantages this creates for the system. They are more turbulence which creates noise and pipe harmonics, increased velocity over the life of the part. Possible erosion of the gate, butterfly, or ball due to this excessive velocity becomes more probable using this poor design. At the very least there is usually more noise associated with this inferior cost reducing application.

In any case restriction of flow on the suction side of the pump can lead to any number of problems. There is one area in particular where pumping water becomes a constant problem and that is in the recreational water industry which includes fountains, swimming pools, architectural water features such as man-made lakes, pond and streams.

These outdoor bodies of water usually have a very large surface area to gallons ratio. This equates to a accelerated collection of foreign objects that get caught on the water surface of the amenity and eventually become transported to the pump suction by the very nature of the circulation system. In this industry in particular putting a suction strainer on the system has been a common practice for many years.

The logical reason for this standard design is justified since it is easier to open a suction hair lint strainer and clean the basket than it is to wait for the pump impeller to become plugged. Cleaning an impeller usually means extracting it from the volute via a gasket and bolt arrangement to service it. It may also require breaking down part of the piping system to allow the pump motor and impeller to be

With the sky rocketing price of energy, tweaking pump performance is not the cool thing to do.

pulled out of the volute. Due to the weight of bigger horse power motors from 10 HP up, this becomes a challenging service venture at best. So, a pump suction strainer makes sense when you consider the alternative.

The problem in the past is since the pump strainer has been one of those necessary evils little attention has been paid to improvements over the years. In fact, this none glorious component to the system has either been copied or ignored. If we look at what is or has been available over the last fifty years you will notice that all pot strainers are basically similar. They all are comprised of a round vertical cylinder with a round vertical basket housed within the cylinder. They are for the most part "T" shaped whereby the fluid enters the side and leaves the other side traveling in a horizontal pattern.

The ProStrainer takes a completely different approach to the pump protection issue. A consulting engineer with forty years of industry experience decides to look for a more efficient way to protect the pump.

The patent pending design of ProStrainer has taken into consideration the inherent problems create by the standard pot strainer and offer a practical and sound solution to the problems they create. Pot style strainers are configured in a manner that is contrary to good pumping system design. All pot strainers are shaped similar to a vertical piece of pipe with a round basket of smaller diameter inside and a removable lid. The fluid enters the side of the body and leave out the other side of the body. As soon as the effluent curvature of the strainer basket start catch debris and plug up it creates a damming effect. The area of blockage forces the fluid to take a more indirect path toward the impeller creating undesirable turbulence.

The ProStrainer takes a new and far more beneficial approach to the pump straining issue.

Horizontal Fluid Transfer

The first thing the inventor did was turn the piece of pipe (the body) on its side so that the fluid travells horizontally across the strainer body. With this configuration the fluid will enter from the influent piping at the recommended velocity calculated for good system design. When the fluid enters the main body which has a much larger diameter the fluid velocity slows down. This

Figure 1: Prostrainer Line Up

inherent characteristic allows for more natural separation of the suspended solids. Most of us will remember our science teacher filling a jar with water and a variety of other substances and then vigorously shaking the jar to mix up the various ingredients. The jar was then put down and over time all the suspended particulate settled to the bottom allowing the water to become clear again.

This same anomaly occurs within the body of ProStrainer. Large debris settles to the floor of the multiple basket system, intermediate debris is caught in the perforations of the basket and any air in the fluid raises to the top forming a air bubble under the clear lid at the effluent end of the strainer. One unique feature that occurs with this design is that if there is air in the system it will accumulate and increase the bubble or air pocket size. When this trapped pocket of air reaches a certain size it creates an adequate differential in pressure and a vortex is formed at the impeller eye and the bubble is pulled from the strainer and exhausted by the pump.

This inherent phenomenon helps protect the pump from air entrainment, air entrapment and cavitation all of which lead to pump impeller damage and eventual failure.

The second unique part of the design is that ProStainer has two separate and independent baskets that operate in tandem. As the effluent end of each basket collects debris the fluid mass is allowed to continue moving forward along its horizontal path and dissipate out the top, bottom and sides of each basket. ProStrainer is asemetrical in design which allow each separate basket to perform almost identical to the other. Should one basket accumulate more debris than the other the fluid will take the path of least resistance and load the basket which is less clogged. So, there is a very even dispersion of the collect materials that get trapped.

Open Area

What is "open area"? I have asked hundreds of people if they knew what open area ratio is and probably less than 10% knew. Open area ratio is the area of the influent pipe diameter compared to the total porosity of the baskets (or total area of all the holes in the baskets. ProStrainer offers another distinctive advantage with its multiple basket design. It is the dramatic increase in the "open area ratio" created by the type and large amount of perforation of the baskets. ProStrainer offers a 200 to 400% increase in the open area ratio over the traditional "Pot" strainers. Open area is the single most important factor in strainer performance. The larger the open area the longer it takes to plug up the basket surface. The more the open area is the more efficiently the pump will operate over the loading cycle. This phenomenon also contributes to a lower TDH (Total Dynamic Head) over the loading cycle which will improve overall pump efficiency.

Turbulance Dampening

After the fluid enter the two open ends of the baskets the straining action begins and debris collects at the effluent vertical wall of the strainer. As this damning effect develops the effluent end panel of the baskets, the flow path begins to change. The fluid escapes out the interior and exterior walls of the baskets as well as out the bottom and top of the baskets. Remember with this design all the water is moving horizontally toward the pump and is being strained. A non turbulent stream is being formed along the outside walls of the basket and down the center of between the baskets. These streams come together at the effluent end of the strainer body to form a wall of non turbulent water that leaves the effluent end of the ProStrainer. This flow dampening design equates to what was being accomplished by using the old straight pipe parameters.

Functional Advantages over Pot Strainers

- Flow path separations and collection
- Most open area
- Low pressure drop
- Flow dampening
- Air evacuation via vortexing
- Promotes highest net positive suction head available

Physical Advantages over Pot Strainers

- Smallest foot print
- All stainless steel
- Integral mounting brackets
- Clear see-through lid
- Pressure adjustable draw latch lid closures
- High quality abrasive blast finish
- Abrasive blast weld decontamination
- Lid alignment and capture design

About the Author

Wayne Kraft, President and founder of ProFlo Inc., started his career in the water industry over 45 years ago. In the mid 60's Wayne served an apprentice program learning the basics of pool repair, design and construction. In the 70's he designed and built swimming pools and created "VinylCrete", a revolutionary concept in pool design, which has become the high end standard for today's builders. In the early 80's Wayne engineered alternative energy heating systems for the swimming pool and spa industry. During his tenure as the owner of Institutional Pool Consultants (IPC), Wayne had the opportunity to develop products for the pool industry which dramatically increased the safety of pool operations. His design commitment led to the development of an adjustable surface cleaning system that optimized water quality and assured the owner long term performance on his investment. Because of the need for quality water equipment, Mr. Kraft started ProFlo Inc. in the early 2000's. Over the past decade, ProFlo has refined its complete product line and has set a new standard in the industry for high quality unique products that simply work better and more efficiently. One of the company's most notable achievements came with the reinvention of the pot strainer.

To know more about the author, you can write to us. Your feedback is welcome and should be sent at: mayur@eawater.com. Published letters in each issue will get a one-year complimentary subscription of EverythingAboutWater Magazine.