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Serving the Pacific Northwest

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Boeing Reduces Pump Maintenance & Power Consumption

Steve Manwell, PumpTech Bellevue

PumpTech has been the distributor for MagnaDrive magnetic couplings throughout the Northwest for over 10 years and has an installed base of more than 225 units in several different markets. Installations include a variety of pump, fan, blower and conveyor applications. The industrial sector is by far the largest market with over 150 couplings installed to date. Two of the most popular pump applications in the industrial sector are 3600 RPM centrifugals and hot liquid pumps. 3600 RPM pumps experience a higher degree of wear than 1800 RPM models when operating with misaligned mechanical couplings. Hot liquid pumps experience similar wear due to expansion and contraction.

One of PumpTech's largest industrial customers is **The Boeing Company** with over 35 couplings in operation at 6 facilities in Washington. They were looking for ways to improve motor performance; reduce wear on seals and bearings; and reduce the cost and frequency of maintenance. Boeing

Boeing continues on Page 3

Spruce Woods Pump Station - Retired After 30 Years

Don Carlile, PumpTech Canby

In 1981 Lincoln City needed a small lift station for the Spruce Woods subdivision. The required flow was a meager 188 GPM but a relatively high head of 125 feet was needed to overcome the downstream elevation. Additionally, the space for the wet well was limited and allowed a maximum diameter of 48". Submersibles were not an option due to the limited wet well diameter and self primers could not meet the head requirement at such a modest flow. Hydronix, Inc. recommended their 281 gull wing station equipped with Hydromatic RV4B end suction, solids handling pumps. The original installation is shown in the picture on the left taken earlier this year.

According to Sam Gilmore, Lead Collections Operator for the city, the

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Alderwood - What do you do with a 47 year old pump station?

Doug Davidson, PumpTech Bellevue

Alderwood Water District pump station #1 was built in 1964 and had long fulfilled the district's need for pumping water, provided by the city of Everett, to the district's distribution system and storage tanks. The station consisted of three, 400HP constant speed turbines and two 600HP variable speed turbines operated by old, obsolete VFD's. The pumps were installed in steel suction cans that were cast into the concrete floor. The district's demand had increased significantly over the life of the station and since the existing pumps' performance had deteriorated considerably, they were no longer able to meet demand. There were also major reliability issues due to vibration caused by wear and resonant frequency. Short of designing a complete replacement for the station the engineering firm of Kennedy Jenks in Federal Way was challenged to increase the flow of the station while utilizing as much of the existing infrastructure as possible, especially the suction cans.

During the design process the engineer launched an extensive search for any pump manufacturer that could meet the system conditions and utilize the existing suction cans. The challenge was not only the diameter of the cans but also their limited depth. It was further complicated by a limited height of the ceiling and existing gantry crane (see photo on the right). During their search, Kennedy Jenks contacted PumpTech. We were very familiar with the project and site conditions as we had performed an evaluation of the same station for MWH Engineering in previous years. We presented the engineer with performance curves and dimensional prints showing that the Peerless 18HH and 16 HXB turbines would meet the various design conditions as well as fit the cans. The engineer commented during their review that it appeared that Peerless was the only manufacturer that could meet all the key criteria. With that feedback we began working extensively with Peerless engineering regarding the design and use of vortex suppressors due to higher than recommended velocities caused by the small suction cans. The engineer finished the design specifying the Peerless Pumps and the project went to bid on February 25, 2010 with Prospect Construction being selected for the work. Unfortunately during the bidding process another pump manufacturer assured the contractor that they had pumps that would meet all of the criteria and would be approved by the engineer and, of course, they were lower priced. The contractor submitted numerous times on the less expensive equipment but each time the engineer found them not in full compliance nor would they fit the existing suction cans without modifying them for extra depth (a very expensive and time consuming task) . During this process we stayed in contact with the contractor and continued to offer our products and services with the guarantee that we would be approved. After many resubmittals of the competitors product it became apparent to all that time was running out. The project had a specific timeline for construction and had to be up and operating for the 2011 peak (spring & summer) pumping season. The resubmittal process was eating up valuable construction time and the pumps and motors had a twenty week lead time. In a discussion with the contractor PumpTech and Peerless offered to release the long lead items such as the bowl castings, impellers, and motors for production during the submittal process and by doing so we were able to make up for the delays incurred by the previous manufacturer's submittal issues. Finally, we were awarded the order. The pumps and motors arrived on time and not only did they fit the suction cans but the discharge head bolting matched the existing suction can bolting and piping elevations. We were also able to use the existing gantry crane and through the combined effort of PumpTech and Peerless we were able to meet both the contractor's and the district's deadlines.

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Boeing continues

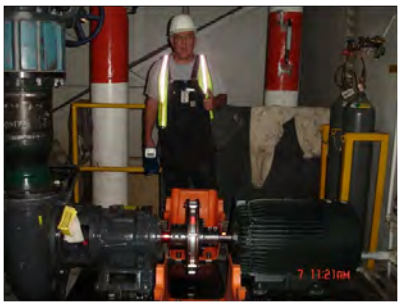
has continuously expanded their usage over the last three years and are now integrating MagnaDrive couplings into their new packaged pump skids and as a part of their “Best Practices” program.

The MagnaDrive coupling operates through an air gap that reduces vibration caused by misalignment and results in less wear to the bearings and seals compared to conventional coupling technology.

Boeing performed a coupling test at its Plant 2 facility on a mechanical room, hot water pump that required frequent coupling adjustment and replacement. The Plant 2 maintenance team observed a significant reduction in vibration as well as a drop in motor amps. The reduction in current draw and the related power savings were a result of original off-BEP operation and the ability to adjust the coupling air gap to reduce pump speed.

The Boeing experience demonstrates the benefits of the MagnaDrive coupling to improve the following:

1) Power consumption
2) Minimize the cost of maintenance over the life cycle
3) Keep wear on seals and bearings to a minimum
4) Keep the end user happy by reducing downtime
5) Do it once and do it right



Initially the Boeing team focused on pumps that operated continuously as they could provide the optimal return on investment. On average, replacement of the original rigid couplings reduced the time spent on maintenance by 40% per pump. This allowed more time for predictive maintenance by reducing the time spent on reactive maintenance .

Due to the results Boeing has seen in Plant 2, this innovation has been shared with crews at other Boeing facilities. These divisions are now implementing this disconnected technology on their high maintenance pumps and fans. These facilities include Everett, Bellevue, Auburn, Renton and Kent and all are experiencing similar reduced maintenance and energy savings as seen in Plant 2. Recently PumpTech began supplying MagnaDrive couplings on all of the new Cornell pump skids built for Boeing by our Hydronix division in Canby, Oregon.

Boeing was founded in Seattle by William E. Boeing in 1916 and has a rich history in both passenger and military aviation. Many of its early aircraft were seaplanes and in the 1930’s the B-314 Clipper (AKA the Pan Am Clipper) made trans-Atlantic and Pacific passenger travel a reality. The B-306 Stratoliner that was introduced in 1938 was the world’s first airliner with a pressurized cabin capable of flying at 20,000 feet -- well above most storms. Their B-17 and B-29 bombers helped win WWII and the B-2 Stealth bomber design won the Collier Trophy for the greatest achievement in aerospace in the USA. In 2011 the 787 Dreamliner (picture on page 1) set a new standard for passenger air travel. Today Boeing is the largest exporter (by value) in the USA and PumpTech is both proud and privileged to have them as one of our customers.

The picture below is the Plant 2 maintenance team. Standing from left to right are: Steve Britten, Del Kleffman, Bob Austin, Mike Crandall, Michael Washburn and Jim Perry. Seated in the front is Paul Burke. These are the people who keep this plant running 24/7 !

For more information on the features and benefits of MagnaDrive couplings contact Steve Manwell or your local PumpTech office.

smanwell@PumpTechnw.com

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Maintenance Tips

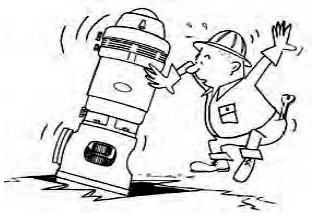
Trending Your Trends

Ed Smith, PumpTech Moses Lake

Trending is, by far the most valuable yet least used technique for monitoring pump and motor performance. Trending your pump equipment will enable you to detect potential problems in time to schedule repairs and avoid costly catastrophic failures and downtime. Regular trending reveals changes in several specific parameters that can be indicative of future pump system failure.

Most maintenance programs can be classified as reactive (run until failure), preventive or predictive. Statistics show that reactive maintenance is used in a majority of pump applications and has the highest long term cost. Preventive maintenance addresses routine requirements such as lubrication, adjustments and other services recommended by the manufacturer. Predictive maintenance (trending) focuses on regularly scheduled tests and inspections that can detect deteriorating conditions and minimize unplanned equipment outages. By trending your pump equipment and collecting data that can be compared and evaluated over time, corrective actions can be implemented on a planned basis.

The "bathtub" failure graph below clearly shows the impact of these three maintenance techniques. The graph shows the typical failure rate for a machine from installation to its end of life and assumes an ideal installation. By ideal, I mean that the machine is sized correctly and is operating at its proper point. The left side of the curve shows failure frequency after installation or during break in. The right side shows failure as it approaches the end of useful life. Point A is where preventive maintenance alone begins to have less of an impact on maximum useful life. Even though it is still required, it may not extend the life of the machine. Point B is where predictive maintenance (when performed in conjunction with preventive maintenance) can predict a potential failure, reduce the cost of repair and potentially extend the useful life. If predictive maintenance is not implemented, a highly skilled technician will be able to detect problems at Point C. Repairs can still be performed before failure but at a much higher cost. The worst case is Point D. At this point, almost anyone can detect an impending failure and the cost of repair (or replacement) will be highest. Points C and D are examples of reactive maintenance.



One of the basic trending techniques is simply using your human senses to track changes in equipment performance. Watch your pumps, listen to them and touch them on a regular basis. Though limited, it can provide some basic information about equipment operation and the need for further inspection. Trending has become much easier and more informative due to modern equipment that can acquire comprehensive data which can more accurately evaluate equipment operation. In the Fall 2011 Pipeline, I will discuss the six most important pump and motor parameters that should be trended. I will also illustrate an actual trending chart and explain how it allowed us to predict potential failures and fix their causes before those failures occurred.

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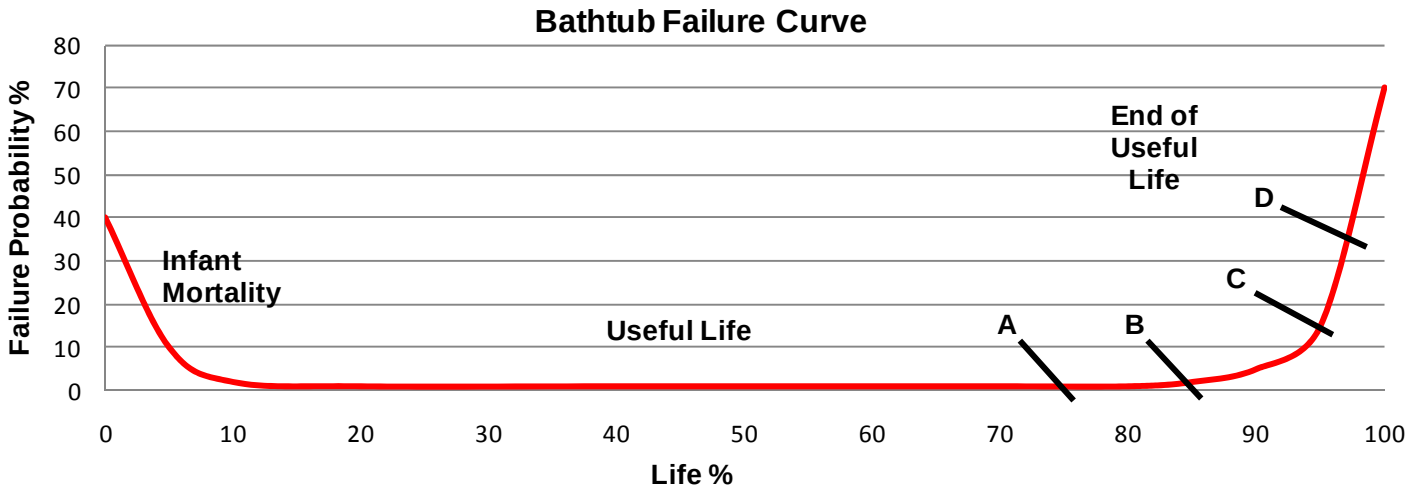

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Pump Ed 101– Suction Specific Speed Revisited

Joe Evans, Ph.D Education & Training

In the Winter 2011 issue of PipeLine I introduced you to my Suction Specific Speed and Suction Energy calculators and how they can be used to predict suction recirculation. Over the past several months I have had a number of requests to revisit this topic and its application to wastewater pumps.

Clear water impellers are usually designed for high efficiency but, they can also be designed for low NPSHr. Increasing the eye diameter decreases the inlet velocity and thus the NPSH required to maintain uniform flow. It is this reduction in inlet velocity that causes NPSHr to drop as flow moves to the left of a typical H/Q curve and when the rotational speed of the same pump is reduced. These impeller designs work well as long as flow remains at or near BEP. If flow moves to far to the left of BEP, overall momentum is reduced and suction recirculation will occur. During recirculation, water changes direction and will flow back out of the impeller. The intense vortices that occur during recirculation cause low pressure areas that will lead to cavitation. The effect of impeller eye diameter on potential suction recirculation can be evaluated using Suction Specific Speed (S or Nss).

Suction Specific Speed was developed in 1937 by Igor Karassik at Worthington Pump. It is a dimensionless number that describes the suction conditions that occur due to the relationship of rotative speed, flow and NPSHr. Its development overcame the limitations of the Thoma-Moody constant which attempted to describe suction conditions by relating head to NPSHr. S can range from about 5,000 to over 20,000 and is computed by the equation $S = N\sqrt{Q}/NPSHr^{3/4}$ where N is the rotational speed, Q is BEP flow and NPSHr is the NPSHr at BEP. Several pump organizations including HI and API recommend an S of under 10,000 in order to maintain a reasonable range of flows without the potential for suction recirculation.

Wastewater pump impellers are not intentionally designed for low NPSHr but the relatively large eye required to pass solids will often lower their NPSHr and increase the value of S. The H/Q curves for many higher flow wastewater pumps show a continuous increase in NPSHr as flow moves to the left of BEP. This is exactly opposite to the NPSHr versus flow for clear water pumps with normal eye diameters.

The image on the left shows the S calculation for an 8", 1780 RPM wastewater pump with a BEP flow and head of 3000 GPM @ 135' and a Specific Speed (Ns) of 2450. BEP efficiency and NPSHr are 82% and 10'. The calculated value for S is 17,337.

The graph to the right shows the minimum BEP flow that a pump with a given Ns and S can operate without suction recirculation. The Y axis is S and the X axis is percent of BEP flow. The three curves represent various pump Specific Speeds (Ns). Our example has an Ns of 2450 so we will use the upper curve. The red horizontal arrow at Y = 17,337 intersects the curve at X = 80%. Therefore this pump could potentially begin suction recirculation when flow drops below 85% of BEP flow. If you evaluate the suction energy ratio (Winter 2011 Pipeline) of this pump you will find that an NPSHa to NPSHr margin of 3.8 could be required to provide stable operation at or below 80% of BEP flow. jevans@PumpTechnw.com

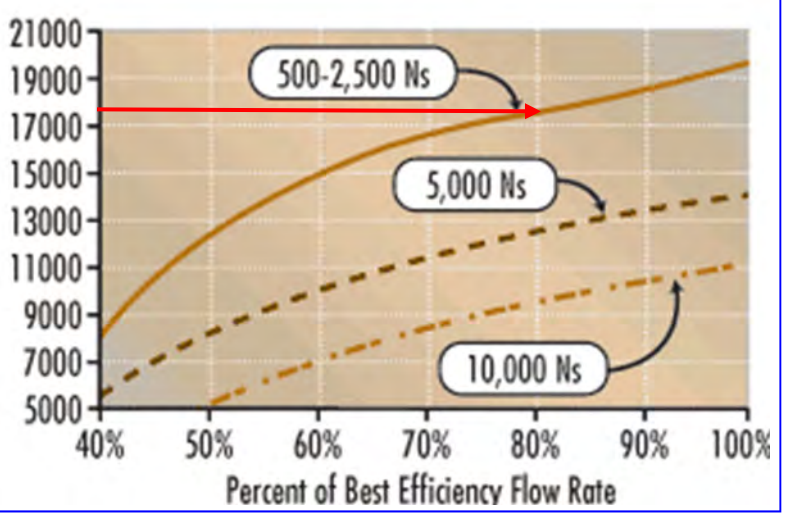
Suction Specific Speed (S or Nss)

$S = N\sqrt{Q} / NPSHr^{0.75}$

Enter the required data in the highlighted cells

Pump RPM (N)	1780
BEP Flow (Q)*	3000
NPSHr @ BEP	10

S = 17,337



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Spruce Woods Pump Station continues

station was extremely reliable, required very little maintenance and the total replacement parts cost during its 30 year life was less than $5,000.00. This year the city decided to upgrade the station and because of their very positive experience with the 281 they asked PumpTech to recommend a replacement (Hydronix became a division of PumpTech in 2002). After a review of the current requirements and system conditions a Hydronix 283VIP (Vacuum Independent Prime) was selected.

The newly designed 283VIP uses Cornell 4NHTA vertically mounted, end suction solids pumps that are primed by an integral vacuum priming system. The system uses two, independent priming chambers powered by a 1/6HP Gast pump. If the water level drops in either chamber air is automatically evacuated by the VIP system. The photograph on the left shows the interior of the station. The 283VIP provides a high head, lower flow option that often cannot be achieved by self priming and submersible pumps. The fiberglass gull wing enclosure has a small footprint and protects the pumps, valves and controls from rainfall during periodic maintenance and inspection. The base arch assembly is hot dipped galvanized steel and all fasteners are stainless steel. This makes the 283 an excellent choice for installation in costal areas. The entire UL listed system is designed by our engineers and manufactured by PumpTech in Canby Oregon.

The pictures above shows a PumpTech boom truck removing the old 281 and installing the new 283.

The photo on the right shows Scott Thomas & Sam Gilmore of Lincoln City during startup of the new system. For more information on the 283VIP contact Don Carlile.

dcarlile@PumpTechnw.com

MeterMan "Easy Skids" - The Short Term Rental Option

Is there a new chemical that you would like to test in one of your industrial or municipal processes to see if it actually benefits the process? Some can improve the process and others cannot so how can you justify the cost of the trial? Answer - MeterMan Easy Skids.

Easy Skids are rental units that can drastically reduce the cost of a chemical trial and are designed for simple set up and modular plug & play versatility. They are available at a daily, weekly or monthly rate and installation, setup and training can also be provided.

Easy Skids are designed for a variety of applications including chemical and polymer feed and both liquid and dry polymer activation. The best pump for the application is always integrated into the skid. Depending upon the application, flows range from 0.5 GPH to 30 GPM at pressures up to 150 PSI. Custom flows are also available. The photos show several examples of the skid designs that make up the MeterMan rental fleet.

METERMAN Pump Systems "For The Best In Flow Technology"

In addition to the basic skids a number of accessories are also available on a rental basis. These include multiport suction manifolds, dilution manifolds, flowmeters and mixing tanks.

If you are considering a chemical trial at your facility, let PumpTech help you reduce the cost of testing.

For more information contact Scott Bush.

sbush@PumpTechnw.com

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PumpTech PumpChat

From the President's Desk

This summer we celebrate PumpTech's 25th anniversary and with it, a reflection on where we have been and where we are going. PumpTech's beginnings 25 years ago started with a small, humble office/shop on Northup Way in Bellevue with a total of

5 employees (4 of whom were owners) and a borrowed forklift. (The photo on the left is the original shop and shows the old forklift that was built from an old Dodge pickup truck.) At that time our primary market area was only Western Washington. When Wayne Olson and I went down to Olympia 25 years ago and presented our check for the bond and received our business license I don't think any of the 4 owners doubted that we could succeed, but never did we imagine that we would grow to having over 55 employees with facilities located in Bellevue, Moses Lake and Canby Oregon.

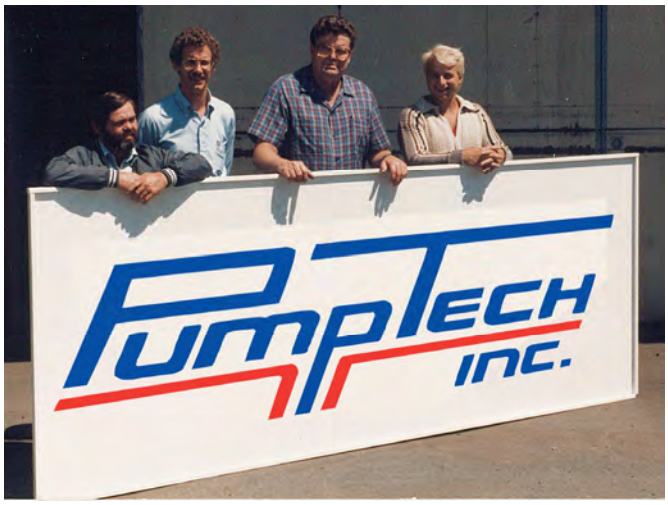
The key to our growth has always been focusing on customer satisfaction and never walking away from a problem. We have always viewed ourselves as the last bastion of quality control for the manufacturers we represent and, as such, we offer warranty, repair and installation services on all of the products we sell, including deep well turbines, food processing pumps, hot oil pumps and chemical injection pumps.

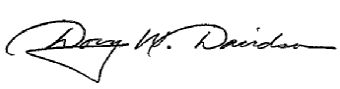
When we first started in 1986 we had only a few product lines and limited service. Since then we have expanded our product offerings and services to meet the needs of both our customers and an expanded geographical area and markets. In addition to the many loyal municipal customers we have built over the years, we are now a key provider to many of the industrial manufacturers, food processors, and pulp and paper plants in Washington, Oregon and Idaho. To support these markets we carry one of the largest inventories of Cornell food and hot oil pumps in the USA. Our Meterman division provides packaged chemical injection skids that have been shipped as far as the Middle East and we are now working on large order going to Peru in South America. Our Hydronix packaged pump station division has manufactured what we believe is the largest diameter and depth fiberglass packaged submersible pump station (12' diameter X 37' deep) that went to Airway Heights just outside of Spokane and last year we provided four packaged pump stations to Astoria, NY for a new natural gas fired generating plant.

As we look to the future it is always difficult to imagine where one will be in 5, 10 or 15 years. But, as a college professor once told me, "if you don't know where you are going, you will probably end up somewhere else". As we look forward, I see continued growth in packaged pump stations for both industrial and municipal applications to handle waste streams and water boosting. I also see an expansion in Meterman chemical injection packages for municipal and industrial customers supported by one of the largest inventories of Grundfos Dosing pumps in the USA in our Canby, Oregon location. As we add a 10 ton overhead crane this summer to our Moses Lake facility we will be able to expand our repair services in Eastern Washington.

It was indeed from humble beginnings that we came and it is with humbleness that we go forward, for without the support of our many loyal customers we would probably be somewhere else.

The photo below shows the original "gang of four". Left to right is Tom Long, Doug Davidson, Wayne Olson and Tom Jzyk.





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8/17 SWIOS, Gardner, ID

9/13 Cornell Pump School, Portland, OR

9/19 PNCWA, Vancouver WA

9/22 Short School , White City, OR

9/29 WETREC, Wenatchee, WA

10/4 ERWOW, Bellingham, WA

10/17 WEFTEC, Los Angeles, CA

10/18 WETREC, Kent, WA

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