



Serving the Pacific Northwest

# PumpTech Pipeline

Providing Knowledgeable Solutions

## PumpTech Services

Jim Joyce, PumpTech Bellevue

Field service has always been one of the key services that PumpTech offers our customers since our founding in 1986. Many of our customers know that we offer field services such as start-up, inspection and trouble shooting. Not everyone is aware of the varied types of services and capabilities we have to offer. Of course, we service what we sell, but we also offer our customers a lot more. Combined with an experienced service staff, the heavy equipment and machinery we own along with our shop facilities, we can do much more

to help our customers keep their equipment operating and in top condition.

One of the recent service projects PumpTech was involved with was an upgrade to a water booster system. The original booster system was still functioning but was showing its age and was no longer operating at its peak efficiency. This project was challenging for two reasons. First,



Services continues on [Page 3](#)

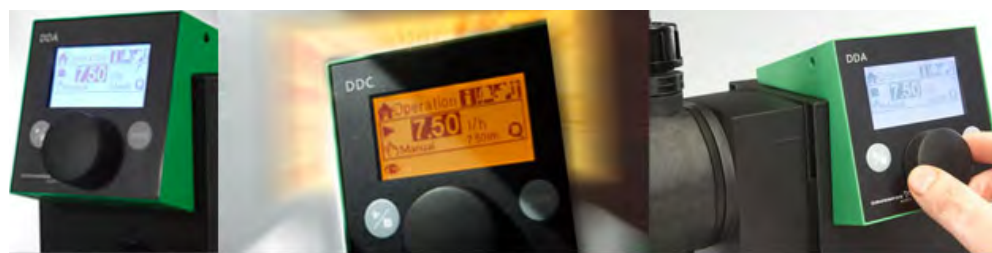
## Product Spotlight - Grundfos Smart Digital Dosing Pumps

In March, Grundfos introduced the next generation of their popular DME series of stepper motor pumps. The new Smart Digital Pump is a state of the art pump that incorporates intelligent digital control with a superior stepper motor that provides accurate and repeatable flow rates of 0.00066 to 8 g/h at pressures up to 232 PSI.

A microprocessor controlled intelligent drive ensures that dosing is performed

precisely with low pulsation even when the pump is pumping high viscosity liquids. The Flow Control system quickly detects malfunctions and displays them in the alarm menu. The Auto Flow Adapt feature automatically adjusts the pump when process conditions, such as varying back pressure, change. This

Spotlight continues on [Page 4](#)



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## 117th Street Pump Station - Clark County, Washington

The 117th street pump station, located in Salmon Creek Park, went into service in 2008. It was built to accommodate future growth in the area and relieve some of the flow from the 36th Avenue station. It pumps untreated wastewater to the Salmon Creek wastewater treatment plant about four miles west. The Salmon Creek WWTP serves about 105,000 residents in the Clark Regional District and the city of Battle Ground. The photo below shows the exterior of the station from the Salmon Creek Park parking lot.



The station was designed by Brown & Caldwell and incorporates a self cleaning wet well and five, 250 HP Cornell 8NHTA horizontal, frame mounted wastewater pumps. The pumps are individually controlled by variable frequency drives. The outflow from the facility utilizes a parallel force main that allows for cleaning without flow interruption. The picture on the right shows the self cleaning wet well with the inlet at the top of the picture.



The pumps were designed for full speed flows of 3,300 GPM and a TDH of 210 feet. Minimum speed flow is 1,560 GPM at a head of 177 feet. The relatively high heads are



due to the length of the force main and the elevation increase at the Cougar Creek crossing. The picture at the bottom of the left hand column shows the lower level of the pump room. The one below shows the upper level and the discharge piping configuration.



The picture below is a close up of one of the pumps and its 250 HP motor. The standard frame size for an 1800 RPM, 250 HP, TEFC motor is the 449T. As you can see, this one appears quite a bit larger. All of the motors were upgraded to 5807 frames to take advantage of the flywheel effect which occurs due to the increased inertia provided by the larger rotor.



PumpTech is the authorized distributor for Cornell Pump Company in the Northwestern United States. Cornell's products are also used in our Hydronix Packaged Pumping Systems. For more information on Cornell's line of Wastewater, Clear Water and Food Processing pumps contact your local PumpTech branch.

Thanks to Kay Hust and Monte Bloemke of the Clark County Department of Public Works for input on this article.

[www.PumpTechnw.com](http://www.PumpTechnw.com)

## PumpTech Services (continued)

the customer wanted to increase both the capacity and efficiency of the station without changing the floor space in the building. Second, flow through the station had to be maintained throughout the upgrade project. PumpTech assisted the customer in selecting the right pumps, assembled the required parts, fabricated some of the custom parts needed and installed the pumps, piping and new controls. The pumps and piping were installed in stages so water flow was maintained throughout the duration of the project. Power to the station was off for just a few minutes so the electricians could switch the power from the original control panel to the new VFD panel. Work at the site began on July 19 (photo on left) and was complete on July 21 (photo on right). Because our crews could be scheduled during the off peak hours, there were no impacts to the water system.



Another project involved a sewer lift station. In this case, the lift station not only needed updating but the style of pump needed to be changed to handle the incoming waste stream. The tougher, non-biodegradable fibrous fabrics, now found in waste streams, were causing a major maintenance problem. PumpTech reviewed the customer's needs, selected a pair of pumps better suited for the waste stream, and together with the PumpTech engineering staff came up with a design to retrofit the existing station. Once again timing was critical. Waste flow from the largest buildings could not be stopped during normal use hours. PumpTech coordinated with the customer and all the work was accomplished during the off peak hours. Work began at this site on February 18 (photos below) and was finished the next day. The concrete work (next column) was finished two months later when the weather conditions were suitable.



This customer no longer needs to de-rag their pumps and valves on the almost weekly basis to which they became accustomed. The new, upgraded system has been operating for over a year without any problems, saving the customer time, energy and money.



The ability to perform service is a core requirement for our company. Our repair services are available 24 hours a day, 7 days a week. We are the authorized warranty service center for the manufacturer's we represent. Because of our expertise and capabilities we have repaired most brands, even those we don't represent. Our field service crews have also performed repairs at well sites, water plants and wastewater plants, including repairing large items such as clarifier drives and Archimedes screw pumps.

PumpTech currently owns and operates four boom crane trucks, ranging from 3 tons to 35 tons, eight service trucks, a backhoe with utility trailer and portable welders. Service shops are located in each of the three branches with the machinery needed so the majority of the repair work can be done at our



facilities. We work hand in hand with both our customers and the manufacturers to implement changes for better reliability and operation. With our service capabilities we become an extension of the manufacturer, assuring our customers that a quality product is operating in the field.

For service call your nearest branch or you can call our toll free number below 24/7. See Page 1 for our branch locations and phone numbers.

**PumpTech Toll Free - 888-644-6686**

## Product Spotlight (continued)

integrated flow measurement system eliminates the need for any external monitoring and control equipment. The modular design allows multiple mounting configurations and display positions. The integral display provides detailed system information and even changes color for easy viewing from a distance. The screen is green during operation, gray when the pump is not running, and turns red during an alarm condition. An internal pressure sensor can detect air in the pump and automatically degas it when necessary. The Smart Digital design also supports batch feeding for biocide and defoamer applications.

With the optional E-Box module, pumps can be easily integrated into a Profibus DP network. This allows remote monitoring and setting changes via a fieldbus system. The E-Box attaches directly to the mounting plate and provides a simple plug and play solution.

With highly accurate and repeatable flows and a turn

down ration of 3000 to 1, Smart Digital technology has raised the bar for metering pump performance.

PumpTech is the Northwest Master Distributor for Grundfos dosing pumps and stocks \$100K of Grundfos pumps and parts in the Canby facility. For more information about the new Smart Digital pumps contact Scott Bush at [sbush@pumptechnw.com](mailto:sbush@pumptechnw.com).



## Maintenance Tips

### Pump Efficiency & Wear Ring Clearances

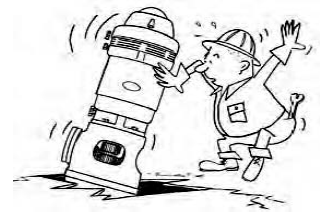
Ed Smith, PumpTech Moses Lake

The total efficiency of a centrifugal pump depends upon three different efficiencies. **1) Mechanical** efficiency accounts for losses in the mechanical components such as the bearings, mechanical seals and packing. Mechanical losses tend to increase with a reduction in flow and reduced Ns (specific speed). **2) Hydraulic** efficiency is based upon losses in the hydraulic components and includes friction in the casing and impeller. Hydraulic losses also increase with a reduction in flow, but Ns has much less of an impact. **3) Volumetric** efficiency is dependent upon leakage losses through the wear rings and balancing holes in the impeller. Leakage losses increase as both flow and Ns decrease and as pressure increases.

As long as your bearing and seals are in good shape, there is not much you can do to increase mechanical efficiency. The same is true for hydraulic efficiency, with the exception of upgrading the volute interior by coating. Leakage due to wear ring clearances, however, can change drastically over time due to increased wear that is caused by excess shaft deflection and abrasion.

The clearance between the stationary wear ring and

the rotating ring (or impeller eye) reduces the potential for contact during normal shaft deflection and thermal expansion due to higher temperature liquids. API requires 0.010" plus 0.001" for each inch of wear ring diameter. Other agencies have similar requirements. The typical wear ring clearance for a pump with a 5" suction is about 0.015". If that clearance doubles due to excess shaft deflection or abrasion, you can expect a 2 - 4% reduction in overall pump efficiency. Wear ring clearances should be checked annually. Use our "Wire to Water" energy calculator to see how a 2 - 4% decrease in efficiency can affect your annual operating costs. It is available on the "Resources" page at the PumpTech web site.



During the past ten years there has been a movement in the industrial sector to replace metallic wear rings and sleeve bearings with those made from non-metallic materials. Currently, one of the most popular materials is Vespel CR-6100 which is manufactured by DuPont. Vespel is a polymeric composite that consists of carbon fibers that are held within a matrix

Maintenance Tips continues on [Page 6](#)

## Pump Ed 101– Variable Speed Pump Analysis

By: Joe Evans, Ph.D

When evaluating pumps for variable speed applications, a number of conditions must be evaluated. For example, will the performance allow the range of flow required by the application? Will the frequency range allow stable operation? Will hydraulic efficiency remain high over the range of flow? And, what level of power savings can be expected? These are important questions that should be answered during the pump selection process.

Over the past twenty years, I have written a number of white papers and developed several spreadsheets that address variable speed pump selection. VSPA (VSPAnalysis) combines much of this information into a single, easy to use Excel spreadsheet.

The image below is a screenshot of the data entry tab. If you scroll down below the data entry area, you can view detailed instructions and an overview of the example that is included. The data required includes pump flows and corresponding heads, hydraulic efficiency at each flow point, design point information,

BEP information, motor information and utility charges. If you enter the static and friction heads at each flow point, a system curve will be generated.

The tabs at the bottom labeled Pump Head, Pump Efficiency, Pump BHP, kW per 1000 Gal and Cost per 1000 Gal show the variable speed curves plotted against the system curve and design point. Although the curves are the same in each tab, the data labels are specific to the tab name. The example on Page 6 shows the information provided by the “Pump Efficiency” tab. This particular pump has a hydraulic efficiency of 85% at the design point (full flow) and maintains 84% at minimum flow (1000 gpm). Mid range flows average 86%.

The “Useful Calculations” tab (not shown) provides some automatic calculations such Specific Speed (Ns), Suction Specific Speed (Nss) and Suction Energy (SE). Nss and SE are calculated for each speed. Also Pump Efficiency, Pump BHP, kW per

Pump Ed 101 continues on [Page 6](#)

### Variable Speed Pump Analysis (VSPAnalysis) - with Autoplot

Joe Evans, Ph.D 10/1/2010

<http://www.PumpEd101.com>

<http://www.PumpTechnw.com>



Follow the steps below to view the operating characteristics and potential power savings of a centrifugal pump under VFD control. Scroll down for more detailed instructions and an explanation of the included example.

- 1) Enter the pump description in the yellow box to the right
- 2) Enter eight 60 hertz flows in Q1 - Q8  
See instructions for fewer than eight points  
Enter the corresponding heads (in ft) in H1 - H8
- 3) Enter the pump's hydraulic efficiencies (.xx) in Ef 1 - Ef 8 that correspond to the flows in Q1 - Q8.
- 4) Enter the design point flow, head & Ef (.xx) in Qd, Hd & Efd
- 5) Enter BEP Q, H, Ef (.xx) & NPSHr in Qb, Hb, Efb & Nrb
- 6) Enter motor efficiency (.xx) in Efm, speed (RPM) in RPM and electrical power cost per kWh (.xxx) in \$/kWH
- 7) To plot a system or constant pressure curve, enter the system heads (in ft) in SH1 - SH8 that correspond to the flows in Q1 - Q8. (See Instructions below)

Cornell 5RB 1780 RPM 13 5" Trim							
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
500	750	1000	1250	1500	1750	2000	2250
H1	H2	H3	H4	H5	H6	H7	H8
200	195	187	178	165	148	125	100
Ef 1	Ef 2	Ef 3	Ef 4	Ef 5	Ef 6	Ef 7	Ef 8
0.60	0.72	0.80	0.84	0.86	0.86	0.83	0.74
Qd	1850	Hd	140	Efd	0.85		
Qb	1700	Hb	154	Efb	0.86	Nrb	14
Efm	0.90	RPM	1780	\$/kWH		0.100	
SH1	SH2	SH3	SH4	SH5	SH6	SH7	SH8
125	125	125	127	130	137	147	162

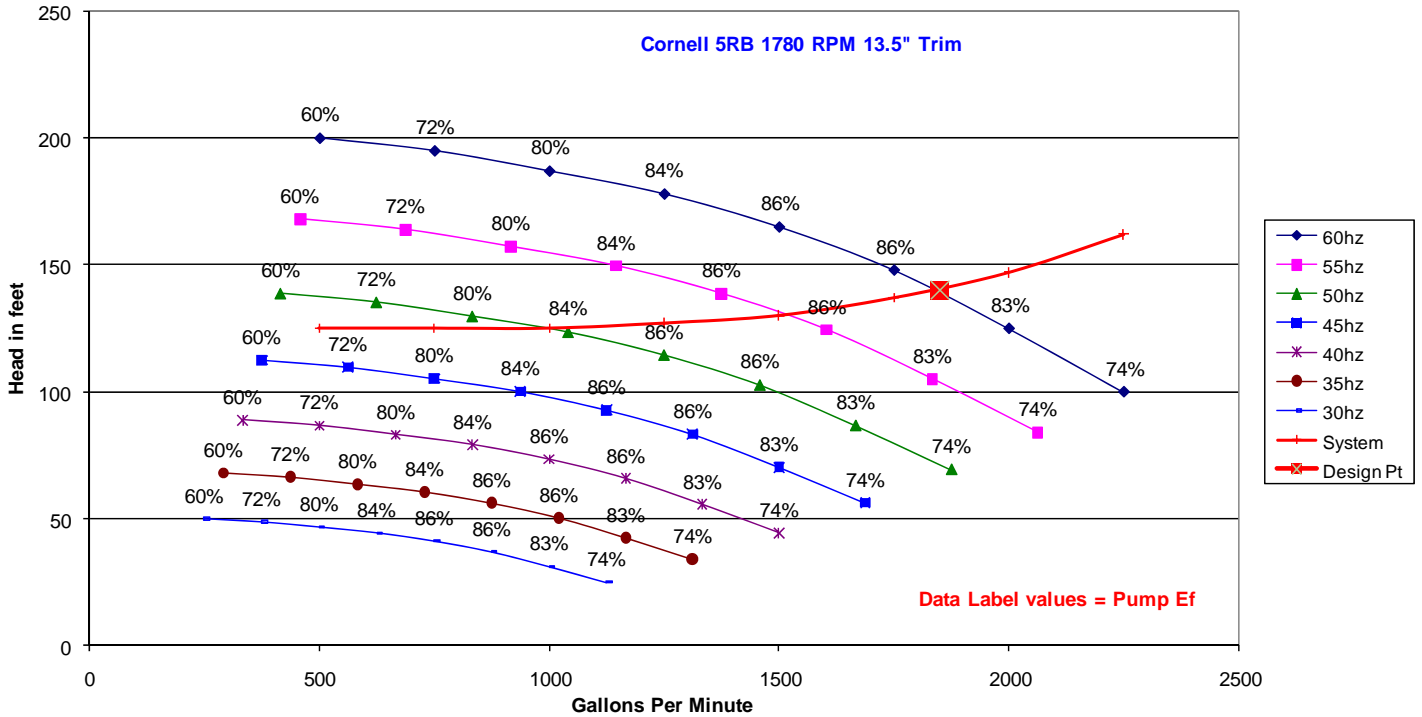
### Pump Ed 101 (continued)

1000 Gallons Pumped and Cost per 1000 Gallons Pumped are calculated for both BEP and the Design Point.

VSPA is available at PumpEd101 or the "Resources" page at PumpTechnw.com.

[www.PumpTechnw.com](http://www.PumpTechnw.com) [www.PumpEd101.com](http://www.PumpEd101.com)  
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**Pump Hydraulic Efficiency vs System Head**



### Maintenance Tips (continued)

of Teflon fluoropolymer resin. It is wear resistant, has a low coefficient of friction and thermal expansion and is non-galling. When used in wear ring construction, these properties can allow clearances to be reduced by 50% and more.

Field test studies have shown that the reduction in wear ring clearance allowed by composite materials closely follows the predicted efficiency increases based upon calculations. When testing pumps with an Ns of 1500, a 50% reduction in clearance resulted in an efficiency increase of 2 - 2.5%. As Ns dropped to 1000, efficiency increased as much as 5%. And, at an Ns of 500 and a clearance reduction of 78%, efficiency increased up to 10%.

In addition to increased efficiency, composite wear rings can reduce the potential for ring seizure in high

pressure boiler feed pumps. A horizontally split, seven stage pump with the manufacturer's standard wear ring clearances required a clearance increase of almost 50% to prevent repeated seizures. When the metal rings were replaced with composite rings using the standard clearance (0.016"), seizures were eliminated.

Composite wear rings are considerably more expensive than standard 400 series SS ones and may not justify the additional cost in most municipal installations. They are, however, a potentially cost saving alternative in higher pressure and temperature applications.

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## PumpTech PumpChat

### *From the President's Desk*

Service, Service, Service - it is what really counts!

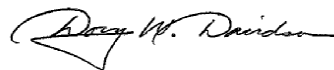
The word service can mean different things to different people, which is why we wanted this issue of our newsletter to focus on the many types of service PumpTech provides. First and foremost is customer service. We strive to provide unparalleled customer service. From the time a customer calls in and is greeted on the phone by a real, live administrative assistant rather than a recording, to our inside sales and service department calling back within either minutes or hours of getting a message and letting you know we have the part you need or how long it will take to get. Additionally we provide educational services to end users and engineers and most of our seminars are accredited for CEU's in both water and wastewater.

When many of our customers think of service they are thinking of our shop or field services. They want help when equipment has broken or help in solving a problem. PumpTech's core strength since our inception in 1986 has been providing field and shop service beyond the normal scope of our competition. PumpTech was the first pump supplier in the Northwest to offer complete installation and removal of deep well turbines utilizing our own crane truck and crew. In addition to those services, we offer preventive maintenance services, laser alignment, vibration analysis, rebuilding of pumps, deep well turbine pump repairs and installation, as well as our complete pump station retrofits and upgrades which Jim Joyce highlights in his article in this issue.

Our field technicians are committed to service and

many have maintenance electrician licenses as well as plumbers licenses and pump installers licenses that enable them to address problems in either mechanical, electrical or plumbing areas. The pump may be the heart of the system, but so often the issues are not all pump related. One example of this is that over 18 years ago we had a customer who complained that a competitor's vertical turbine pump kept breaking shafts every couple of years. We were called in to see if they needed a new pump. In analyzing the problem we noted that the well was out of plumb by 8 degrees. When the previous company had installed the pump they had made sure that the discharge head was plumb and level but not with the well. It looked good to the eye, but it put a heck of a strain on the shafting since the balance of the pumps was wanting to follow the well at 8 degrees out of plumb. That was the cause of the continual shaft breakage. We replaced the housekeeping pad, put the discharge head and motor in alignment with the well, and the pump has run smoothly ever since. However, when you look at the discharge head and motor and line it up with the grout lines of the cement block building, it looks like the leaning tower of Pisa. This is just an example of the in depth service we provide. We not only look for the problem but the root cause of the problem.

When you think of service we hope that you will think of PumpTech. I want to thank you for the opportunity to be of service.



Doug Davidson [ddavidson@pumptechnw.com](mailto:ddavidson@pumptechnw.com)

## PumpTech Engineering Seminars

In April, PumpTech presented three, all day seminars to 80 plus civil & mechanical engineers in the Spokane, Tri-Cities and Boise area. Topics included Centrifugal Pump Hydraulics, AC Power & Motors and Variable Frequency Control. If your engineering firm is interested in attending one of our presentations or if you would like to set up a seminar at your location contact your local PumpTech office. You can also send Joe Evans an email at the address below.

[jevans@pumptechnw.com](mailto:jevans@pumptechnw.com)



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## PumpTech Pipeline

A Publication of



### Upcoming PumpTech Participating Events

- 5/4-6 PNWS AWWA, Boise, ID
- 5/10-12 MSAWWA, Bozeman, MT
- 5/15-18 NIOS, Post Falls, ID
- 5/25-26 WWCPA, Spokane, WA
- 6/7-9 PNCWA, Lynnwood, WA
- 6/21-22 ERWOW, Spokane, WA
- 6/23-24 ERWOW, Kennewick, WA
- 8/8-10 ERWOW, Yakima, WA
- 8/17 SWIOS, Gardner, ID

