



Flowrox Peristaltic Pump Delivers Lime Slurry to Water Treatment Plant with Unprecedented Reliability

Flowrox Peristaltic Pumps Effectively and Efficiently Deliver 10% Lime Slurry at 20 gal per Minute in
Palm Bay, FL

Palm Bay, FL utilities department has three water treatment plants and one aquifer storage recovery well. The North Regional water treatment plant uses both lime-softening and reverse osmosis treatment processes. The product from each treatment process is blended in a clear well prior to distribution. The North Regional water treatment plant is also home to 100 million gallon aquifer storage recovery well, which can be utilized if necessary when demand is high or in times of drought. The lime-softening treatment plant can treat up to 10 million gallons per day and the reverse osmosis treatment plant is capable of treating 1.5 million gallons per day.

The North Regional water treatment plant of Palm Bay, Florida evaluated possible pumps to deliver a 10% lime slurry at 25 psig and 20 gallons per minute. The superintendent of the facility was examining shoe design peristaltic pumps and single rolling design peristaltic pumps. The superintendent realized that a single roller design compresses the rubber hose only 1 time per 360 degree revolution, whereas the shoe design pumps compress their rubber hoses twice per every 360 degree revolution. This guarantees that hose life in the single roller design will last at least two times longer. Additionally, a single roller design generates no heat, whereas the shoe design generates significant heat. Heat adds to further degradation of the rubber hoses. The heat added by shoe design peristaltic pumps further reduces hose life, and the superintendent realized the operating costs would be significantly higher for the shoe design peristaltic pumps. He also realized that the Flowrox single roller pumps only requires approximately 10% of the food grade glycerin when compared to shoe design pumps. The decreased glycerin consumption also helped the city to select the better pump for lime slurry pumping. The superintendent specified Flowrox LPP-T 1.5” pumps based on the technical merits and reduced operating costs of the single rolling design. The city of Palm Bay North Regional water treatment plant ordered three Flowrox 1.5” rolling design peristaltic pumps to minimize operating costs for the city. The superintendent at the North Regional Water Treatment Plant of Palm Bay said, “These eccentric rolling design pumps are great, they just run and run.”

The city of Palm Bay, North Regional Water Treatment plant has shared that the first hoses in the Flowrox

pumps lasted approximately 9 months, while pumping abrasive lime slurry. The Flowrox hoses had 11 million revolutions. Lime has two attributes that make it very aggressive and abrasive in valves, pumps and systems. First of all, lime does not dissolve in solution, rather it is a suspended solid. For this reason and pockets, cavities or voids in pumps and valves will slowly be filled in with settling lime particles. These particles after settling will solidify or scale within the valve, pump or piping. Many styles of pumps will fail extremely rapidly due to the abrasive nature of lime slurry and also the scaling. The number of revolutions the Flowrox hoses were able to withstand over the 9 month time frame is truly astounding.

The city of Hamilton Ohio power plant replaced some shoe design pumps 4” peristaltic pumps where the hose lifetime was as little as 518,400 revolutions. When Flowrox replaced the shoe design pumps with a 2.5” Flowrox single roller design pumps the hose lifetime improved to over 2.7 million revolutions. Flowrox saved the customer \$20K annually on spare parts and maintenance by making the change.



Figure 1. Flowrox single roller design peristaltic pumps hoses lasted approximately 9 months and survived in excess of 11 million revolutions while pumping abrasive lime slurry.

		Update	7/29/2008	
Basic parameters in example process			Unit price, conventional 4"	Unit price, LPP-T2.5"
Required flow, gpm	30	lubricant, gallon	\$96.00	
Use hour/a	8,322	Electricity, kWh	\$0.06	
Utilization rate, %	99%	Hose, psc	\$2,300.00	\$1,200.00
Use hours@ min ut.rate,h	8239	work hour	\$43.75	
	LPP-T2.5"		Competitor 4"	
Hose life, revolutions	2,721,600		518,400	
Speed, rpm	21		6	
Revolutions/hour	1,260		360	
Power consumption, kW/h	7.4		12	
Total down time/ hose	15		30	
Glycerine need/hose, gallons	0.75		15.8	
Maintenance time/hose brake	2		4	
Revolutions/a	10,485,720		2,995,920	
Number of spare hoses/a	4.0		6.0	
Maintenance time/a	60		180	
Utilization rate	99.3 %		97.8 %	
Operating costs				
Lubricant	\$348.00		\$9,100.80	
Hoses	\$4,800.00		\$13,800.00	
Electricity	\$3,571.80		\$5,792.11	
Maintenance	\$350.00		\$525.00	
Total	\$9,069.80		\$29,217.91	
Difference to LPP, \$	\$0.00		\$20,148.11	
Difference to LPP-T %	0%		69%	

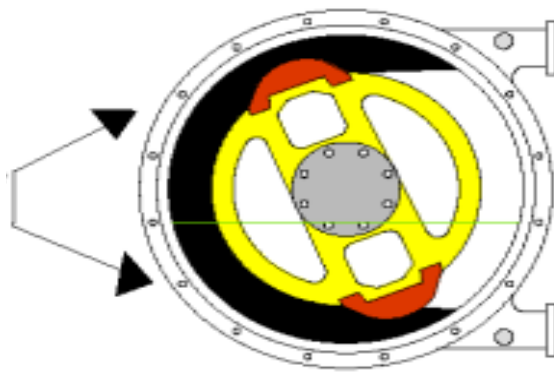
Figure 2. Calculation of hose life and costs of running Flowrox LPP-T 2.5" single rolling peristaltic pump compared to 4" shoe design peristaltic pump. The one year operating cost savings by changing to the Flowrox design was \$20,148.11 each year.

Another Baltimore based chemical company replaced more than 10 shoe design peristaltic pumps with Flowrox single roller design pumps and claim they are saving more than \$150K annually by changing to Flowrox peristaltic pumps.

In many other pump designs, there can be minor changes to impellers, rotors and stators that produce minor advantages to the user. However, with the Flowrox rolling design peristaltic pumps the changes are major and provide tremendous benefits to the user by creating incredible operational cost savings compared to older shoe design peristaltic pumping technologies. In the case of Hamilton, Ohio above the one-year operating cost savings were almost as much as the cost of the complete Flowrox pump. In that scenario, the

customer could almost buy a new Flowrox pump every year with the savings they are achieving. Also, Flowrox pumps can produce more flow than shoe design peristaltic pumps. For instance, if you want to run a 4" shoe design pump 24/7 then the maximum flow rate you will be able to achieve is about 200 gallons per minute. The reason for this limitation is that rubbing action of the shoes generate too much heat to be able to run the pumps at higher revolutions per minute. A Flowrox 4" pump has a continuous 24/7 flow rate of 440 gallons per minute. We can run 24/7 at these flow rates and not generate any significant heat and still provide hose life that is far superior to these other designs. In fact, in many cases Flowrox can supply a pump that is one or two sizes smaller to produce the same flow rate with much longer mean time between failure.

Two fixed shoes grind against the rubber hose, creating two compressions for every 360 degree revolution.



Piping scheme convoluted. Not conducive to conventional piping arrangement.

Lubricant fill line is very high.

Figure 3. Depicts a shoe design hose pump. The pump has a structure and two metal humps or shoes that compress a rubber hose.



Figure 4. Depicts a Flowrox single roller design peristaltic pump. This design compresses the hose only once per revolution. Shoe design and double roller designs compress the hose two times per revolution. For this reason, the Flowrox pump hoses last minimally twice as long because they have one half the number of compressions. Also, since no heat is generated by the Flowrox design the hoses typically last 3 - 5 times longer than shoe designs.

With significant operating expense savings produced by Flowrox single rolling designs, customers have to understand that if they purchase these shoe design pumps that they will pay the very high operating expenses on the shoe design pumps every year. If they purchase the shoe design pumps for lower initial costs or Capex then they will pay dearly on the back end. In the City of Hamilton, OH it would cost \$204,525.37 in operating costs over 7 years to run the shoe design pumps. With the Flowrox design, it would cost only \$63,488.60 over 7 years to operate the Flowrox pumps. The total savings over 7 years by using the Flowrox pumps would be \$141,036.77. In many competing pump manufacturer's designs, the results typically are not this significant.

Many companies are beginning to utilize products or

complete systems that have connectivity and monitoring via the industrial internet of things. Instruments are becoming easier and less expensive to install and monitor all types of products. In 1995, there were roughly 1 million devices connected to the internet of things. By 2015, there were roughly 10 billion connected devices and it is estimated that by 2025, there will be 100 billion connected devices. It is estimated that in the next few years there will 4 - 5 sensors for every person on the planet. If you don't currently have a digitalization strategy, it is very easy to start. Some pump and valve companies are starting to offer digitally connected valves and pumps. Adding digitalization does not require ripping out existing control systems, but rather it can be a new added layer of monitoring information that is more accessible to every user or stakeholder.

In many processes, pumps and pump systems are vital to the performance of that process. However, in many cases pumps are some of the least monitored pieces of equipment. By adding vibration monitoring, pressure sensors, temperature sensors and run time monitors, pumps can be monitored so that these vital assets can be managed better to provide system optimization and also decrease process downtime and cost. The most significant change that occurs with digitalization is that maintenance teams change from reactive maintenance to proactive maintenance. For instance, a pump with a failing bearing can be detected very early with vibration monitoring. That bearing often times can be replaced for a few hundred dollars, but if left to full destruction the bearing failure may destroy the entire pump housing and the cost of the repair can increase to the tens of thousands. Many customers that have completed the digital transformation have stated that success or failure requires a change in the culture at the facility.

The benefits of digitalization can be quite impressive. Some companies that have gone to system wide monitoring are boasting as much as one full month of additional production per year. They are also indicating profitability increases up to 10%, decreased fuel or energy is 2 - 3%, decrease of maintenance costs of 2 - 3% and productivity gains of up to 10%.

About the Author:

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Figure 5. Flowrox digitalized pump and valve monitoring allows for early detection of required maintenance. Customers are able to reduce downtime, maintenance costs and speed repair. Flowrox digital platform is called Malibu and can be used to monitor performance of Flowrox products, as well as, any asset found in a customer's process. Malibu is also capable to perform complete system wide monitoring.

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