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**PERIHEDRAL SEAL**

Every Verli-Line enclosed impeller has a double surface (perihedral) seal (A & B) effect on the suction skirt caused by a close running clearance. The primary purpose is to minimize any recirculation loss resulting from high pressure areas of the impeller, increasing the operating efficiency of the pump. As the pump wears (C) depending upon many factors including abrasion content of the pumped liquid, the clearances open thereby reducing efficiency. With the Verli-Line double seal design the horizontal seal clearance (D) can be restored by an external adjustment (E) regaining the lost efficiency. This is an exclusive Verli-Line turbine pump design feature.

## Message from Mr. L&B

Hopefully everyone is enjoying the summer! At Layne, we've recently been working on creating a vertical turbine training class. This is definitely not an easy task because turbines are arguably the most complicated pump on the market. To present such a great deal of information in a format suitable for a wide range of audiences adds to the difficulty of the task. The good news is that after many hours of gathering information and creating slides, we're close to finishing the presentations.

Our goal is to have all presentations in PowerPoint and make them readily available for our factory representatives. Right now we plan to cover the following topics:

- Introduce L&B and our History
- Basic Applications
- Construction (Bowl, Column, Head, Driver)
- Metallurgy
- Pump Selection
- Special Applications

The benefit of these presentations is that they can easily evolve as information changes and new subjects added. Look for these presentations to be available in the latter part of 2007.

## Price Pages

As price increases take effect this month, it is a good idea to check that the most current price pages are being used. Below is the list of these pages with the latest multipliers.

Standard Vertical Turbines – **Blue** pages dated February 15, 2007

Quick Ship Vertical Turbines – **Green** pages dated February 1, 2006

**Firepump** Vertical Turbines – Electronic Excel files:

Rev 12 6-19-07 VTFP ELECTRIC-AURORA

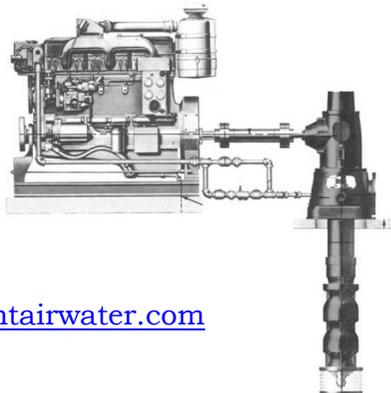
Rev 12 6-19-07 VTFP DIESEL-AURORA

Distributor Price Multiplier Schedule for Pumps and Parts – **Yellow** pages dated July 15, 2007

Distributor Price Multiplier Schedule for Vendor Equipment (Motors and Gears) – **Yellow** pages dated April 1, 2007

## New Firepump Engine Prices

Clarke has just released new prices on their firepump engines. These prices will take effect on all orders starting July 1<sup>st</sup>, 2007. Vertical turbine electronic estimate sheets have been updated and were emailed out the 3<sup>rd</sup> week of June. If you are an Aurora firepump distributor and would like to receive the latest electronic price estimate sheets, please send an email to:



Carolyn Crews  
[carolyn.crews@pentairwater.com](mailto:carolyn.crews@pentairwater.com)

## Contact Information

There have been some recent changes in contacts at Layne / Verti-Line. Note your new contacts, which are highlighted in **GREEN**.

### Layne & Bowler/ Verti-Line

#### Address

3601 Fairbanks Ave.  
Kansas City, KS 66012

**FAX** (913) 748-4030

#### Website (all go to one site)

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

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

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

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

### Pump Sales, Technical Support, Newsletter

Chris Lula, P.E.

(913) 748-4254 phone

[chris.lula@pentairwater.com](mailto:chris.lula@pentairwater.com)

### Parts Sales & Order Entry, Tech. Support

Josh Blanks

(913) 748-4255 phone

[josh.blanks@pentairwater.com](mailto:josh.blanks@pentairwater.com)

### Pump Order Entry

[LVProduct@pentairwater.com](mailto:LVProduct@pentairwater.com)

#### South, West, & Midwest

Carol Hampton

(913) 748-4224 phone

#### East, Canada, and Firepump

Eddie Fears

(913) 748-4282 phone

### Order Status (US & Canada, Pumps Only)

**Melissa Thompson**

[LVDeliveries@pentairwater.com](mailto:LVDeliveries@pentairwater.com)

### Warranty and Field Service

**Connie Groves**

(913) 748-4212 phone

[sara.swofford@pentairwater.com](mailto:sara.swofford@pentairwater.com)

### Firepump Estimate Sheets

Carolyn Crews

(913) 748-4209

[carolyn.crews@pentairwater.com](mailto:carolyn.crews@pentairwater.com)

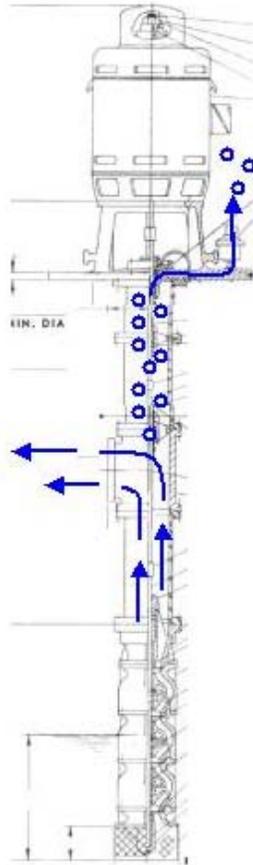
## Air Release Valves

Chris Lula

Now and then we encounter a situation that reiterates the importance of something that usually is not given much thought. The most recent situation I encountered involved air release valves (ARV).

Air release valves evacuate air trapped inside the column pipe when a pump starts up. Critical on pumps with below ground discharges, trapped air prevents water from coming up the column to lubricate bearings and the shaft sealing assembly. Resulting damage can include bent shafts, scored bearings and sleeves, and leaky packing boxes or mechanical seals.

One installation I visited had a 125 hp turbine with 14" column and below ground discharge. When the pump fired up, there was a loud whistle from the stuffing box that lasted for about 10 to 15 seconds. At that point, water finally hit the box and enough blew out to operate a car wash. A closer look at the floor around the pump revealed bronze shavings, most likely from a worn packing box bushing running dry at startup. Though the ARV looked big enough, it was plugged. This pump a good example of the damage caused by not evacuating air fast enough.



ARV's can have disastrous affects on pumps when undersized, as I observed on a large propeller pump with below ground discharge. A 4-CFM (cubic feet per minute) ARV was supplied to evacuate 70 cubic feet of air. Consequently, the pump ran dry for some time and scored lineshaft bearings, sleeves, and packing box bearing.



*The upper rubber lineshaft bearing burned up on the sleeve, fell out of its retainer and slid down the shaft.*



*Original 1" ARV is now replaced with a 2" ARV*



Because they are relatively inexpensive accessories to the pump, ARV's can easily be overlooked. They can also be very costly if not sized properly. Just remember, you can never size an ARV too big.

## Technical Q&A

*Question: What is a "Perihedral" seal?*

The "Perihedral" seal is a unique impeller seal that was designed and patented by Verti-Line. This design feature was included when Verti-Line was written into bid specifications. Current production bowls of Verti-Line origin that employ this design are the 8R, 12R, 12FH, 14R, and 14FH. On larger bowls where double wear rings are not employed, patterns may be modified to incorporate a perihedral seal. Contact the factory for more information regarding specific applications. The following article is a reprint from Aurora Pump that discusses the perihedral seal in detail.

### The "Perihedral" Two Way Vertical Turbine Pump Impeller Seal

APTNEWS, Vol. 1, No. 37

In a vertical turbine type pump, fluid enters the suction side of the impeller and then, by centrifugal force due to the revolving impeller, exits at a higher pressure at the discharge side. With the differential pressure thus produced, the fluid wants to return to the suction side around the outside of the impeller. It is desirable to minimize this return flow since it represents a loss of useful capacity and, hence, efficiency.

The most commonly used device to restrict this flow is the wear ring seal, Fig. 1, which is simply a close clearance between the rotating impeller skirt and the stationary wear ring. This close clearance results in a throttling action, which reduces the return flow to acceptable limits. However, since most fluids contain some abrasive particles, the radial clearance increases with time due to wear, Fig. 2, the return flow increases, and efficiency is reduced.

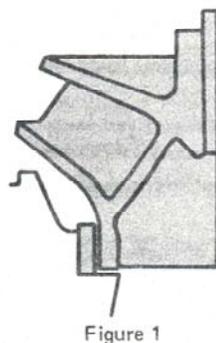


Figure 1

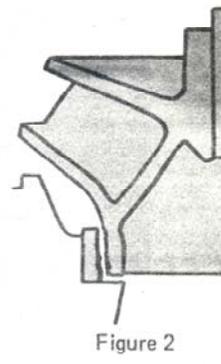


Figure 2

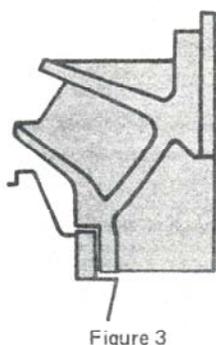


Figure 3

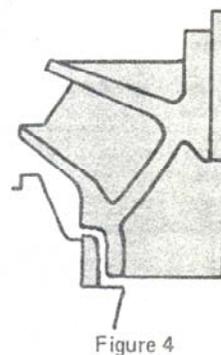


Figure 4

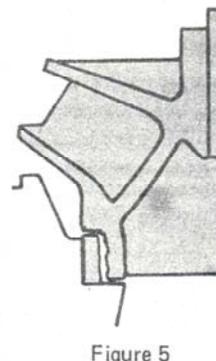


Figure 5

In order to maintain high efficiency over a longer period of time, Verti-Line uses a step type two-way seal (which originally patented) between the impeller and bowl called a "Perihedral" Seal, Fig. 3. The word is a combination of the prefix "peri" meaning all around, and "hedral" which used in a combined adjective form means many surfaces. As the perihedral seal wears, both radial and axial clearances increase, Fig. 4.

In order to restore "as new" performance, the impeller is simply readjusted to a close axial clearance as shown in Fig. 5. Thus, the throttling action is restored and the pump has new life. This can be done many times until wear on the axial faces becomes so great that the impeller discharge port no longer lines up properly with the bowl vanes, at which time, performance is adversely affected.

Normal repairs must be affected. The metal pad added to comprise the horizontal seal, however, is of ample size to add appreciable life to the pump. This is particularly impressive when compared to semi-open impeller designs in which water passage wear may commence immediately.

