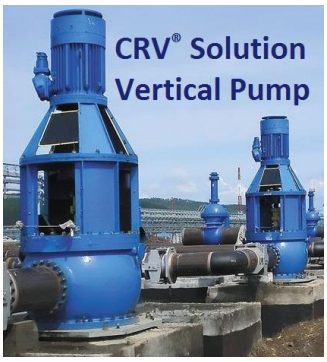
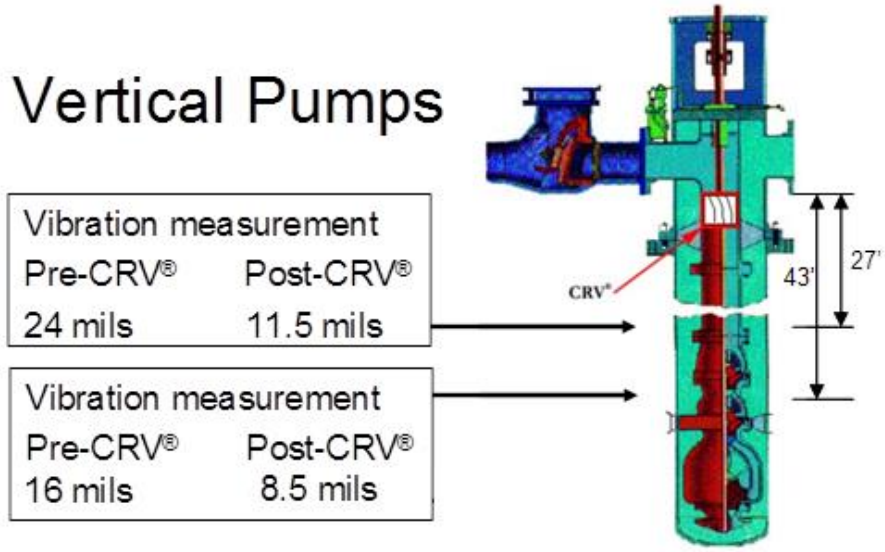


CRV® Benefits to Vertical Pump Application

A Cheng Rotation Vane CRV® at the vertical pump's discharge head elbow, shows that pump performance improves significantly by correcting turbulence caused by the elbow, while eliminating cavitation & vibration.

Vertical pump manufactures have experimented with new pump impeller and bowl designs to increase pump efficiencies, but they have not addressed the internal flow through the "piping portion" of the pump. Unlike horizontal pumps, vertical pumps have interior elbows and turns that cause turbulence and this can impact the overall efficiency of the pump, especially at high flow rates.

The benefits of adding the CRV® shows that the **pumps performance can be improved significantly** by understanding the turbulence caused by the elbow and solving that problem. This will translate into a **significant cost savings** for the customer. Additional savings will also be realized, because the uniform flow created by the CRV® will eliminate the harmful flow effects caused by **fluid separation, turbulence and vibration in the pump**. Eliminating this source of vibration caused by fluid turbulence will **increase shaft and impeller life, bearing and seal wear and reduce pump noise**. This translates into additional cost savings by **reducing maintenance intervals**, with **less downtime** and a **higher operating reliability**.



Pre-CRV® installation: Pulsating back pressure, excessive vibration, head box reakage, bearing wear & shaft breakage.

Post-CRV® installation: Prevents check valve oscillation, reduces pump vibration problems, and increases efficiency.

Benefits of Adding the CRV® to Vertical Pumps

Three Stage Vertical Turbine Pump (FLOaway Report)	**Vertical Axial Flow Pump** (Lawrence)
At Best Efficiency Point (BOP)	
✓ Pump Head Increased By 2%	✓ Pump Cavitation Eliminated
✓ Pump Efficiency Increased By 2%	✓ Pump Increased 5 - 10% in Total Discharge Head
✓ Pump Vibration Decreased By 37%	✓ Pump Increased 2 - 4% in efficiency at rated flows.
✓ Pump Horsepower Need Decreased	

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