Pump Protection Sand Separators
For Vertical Turbine & Submersible Pumps

Extends pump life by 4x
Sustains higher pump efficiency
Saves on repairs, replacements & energy costs

LAKOS FILTRATION SOLUTIONS
PPS
Sand Kills Pumps

Premature sand wear. Lost energy efficiency. Increased operating costs. Interrupted water service.

Excessive & abrasive sand erodes the pump impellers, creating imbalanced rotation & vibration, also stressing the pump’s bearings. The wear and lost balance accelerates quickly to dramatically affect flow capacity. Costs include pulling the pump, impeller re-building and often complete pump replacement.

Lost pump efficiency demands longer pumping time to deliver the needed water, resulting in higher energy costs. Agricultural & municipal pumping calculations often reveal annual energy cost increases of $50,000 or more when efficiency drops.

Pump downtime can occur at critical times, risking crop loss, demanding changes to pumping routines, forcing acceptance of higher-rate repair/replacement costs and limiting opportunities for bidding or sourcing more affordable longer-lead-time savings.

Alternative water sources during pump downtime and at peak demand are premium-priced with no time to search limited or better-priced options. Such short-term alternatives disrupt operating routines.
Higher capacity pumps in smaller water wells create greater flow velocity, which carries more sand into water wells.

More pumps operating within an aquifer create more sand movement into water wells.

Changing water tables (both lower and higher) create more movement of sand into water wells.

Abrasive sand directly attacks a pump’s impellers and promotes mechanical damage, lost flow efficiency and increased energy costs.

Old casings, cracks and aging allow more sand to infiltrate water wells.

Shifting ground formations, earthquakes and other casing damages cause increased sand infiltration.
LAKOS Protects Pumps

Exclusive technology prevents pre-mature sand damage. Extends pump life by 4x or more.

**Centrifugal-action performance** keeps unwanted sand out of the pump without screens to clog, backwash or service. Maintenance-free operation inside the well provides continuous protection and long-lasting results.

**Head pressure from submergence** pushes water through the separator to the pump’s intake to provide cleaner water to the pump and to the surface. Note submergence requirements in the chart on page 6.

**Particle removal performance** keeps out 95% of all sand 100-mesh (150 microns). It’s not meant to be a “perfect filter”, but rather a pump protector, extending pump life. Finer sand particles won’t harm the pump and are better removed above-ground by finer sand separators or filters. Rule of thumb: Whatever settles in still water within 2 minutes or less is separable by a LAKOS Pump Protection Sand Separator. Maximum Particle Size: ¼ inch (6.3 mm). Maximum Particle Concentration: 1,000 ppm.

**Sustains optimum pump efficiency** and saves the pump from excessive wear. Keeps pump energy costs lower, too.

**Extends pump life by 4x or more**, reducing downtime, pump repairs/replacements and all the troubles that occur when pumps fail to deliver the water as needed.

**Where does the sand go?**
Separated sand is periodically discharged deep into the well. Experience has proven that accumulation is not an issue to fear. While rare cases occur where the sand accumulation requires bailing of the well, more often the actual flow of the aquifer serves to evacuate much of the sand to prevent troublesome build-up. In addition, extensive research by Ohio State University addressed this exact concern (Water Well Journal, October 1985). Their study revealed that the accumulation of some sand in the well by a PPS Separator actually changes the inflow path into the well (making it less likely to carry sand into the well) and acts as a secondary filter (as the incoming water into the well now must also pass through the added layer of sand accumulation).

Flow range: 100 - 3,180 U.S. gpm (23 - 723 m³/hr)
Sub-K models available for lower flow submersible pumps.
Options for VFD (constant pressure/variable flow) pumps available.
How It Works

Sandy water is drawn through tangential inlet slots into separation chamber.

Sand is centrifugally separated from water and tossed to perimeter of chamber.

Sand-free water is drawn to center of separator and up through vortex outlet to pump’s suction.

Sand particles fall downward, along perimeter, to bottom of separator.

Flapper Valve CLOSED – Sand accumulates in separator.

Flapper Valve OPEN – Sand discharges deep into well.

FOR SUBMERSIBLE PUMPS

FOR TURBINE PUMPS

PPS Separator

PPS Separator
Four Simple Steps to Sizing a LAKOS Pump Protection Separator

1. Know and use the actual flow rate. Do not guess or oversize, since flow and performance are related with sand separators. Find your pump’s actual flow in the chart. For VFD pumps, select the highest expected flow (at lower flows in larger pipes, the reduced velocity typically means less sand to worry about).

2. Verify the minimum well ID. The chart identifies the minimum requirement to fit the separator in the well and allow the expected flow around the separator. Note that there are often two or more models with different well ID requirements to accommodate a given pump’s flow rate.

3. Check the required submergence. Does well you have the needed submergence to create head pressure to push water through the separator without causing pump cavitation? See chart. Check other model options for the same flow rate.

4. Be sure to allow for clearance below. A minimum space of 20 feet (6 meters) is recommended between the bottom of the separator and the bottom of the well for separated particle accumulation.

For Submersible Pumps

A pump enclosure shell is necessary with submersible pumps to first direct water through the separator before entering the open area intake of a submersible pump. See illustration at right for details. Key dimensions for proper shell sizing are:

- Overall length of the combined pump & motor assembly
- Largest diameter of the pump/motor assembly
- Size of the submersible pump’s riser connection

Two options are available for most shells. A complete shell assembly can be built by LAKOS and shipped ready-to-install. Typically, a lead-time of 5 days is necessary to build the shell to a pump’s actual dimensions. Alternatively, a submersible shell kit can be shipped immediately with any in-stock LAKOS PPS Separator for faster delivery and less shipping cost. The kit requires only the appropriate length & diameter of shell pipe to be provided at the destination. Two pipe welds and the Shell Kit are ready-to-install.
Optimizing Separator Performance with the Flow Adjustment Collar

Selected models of the PPS Series feature a Flow Adjustment Collar for purposes of fine-tuning the performance of a separator. Properly positioned, the collar maintains optimum acceleration to enhance particle removal for a given flow rate.

Position A is recommended when the pump is operating at the lowest flow range within the separator’s overall range for maximum acceleration at low flow.

Position B opens the slotting to allow for more flow in the mid-range.

Position O essentially uncovers the maximum slot opening for the higher flow range.

When Pumps Operate at High-Flow & Continuous, Long-Term Duty

The LAKOS Tail Pipe is recommended when operating at the high-end of a PPS Separator’s flow range and the pump operates continuously for long periods of time. Instead of the Flapper Valve, the tail pipe is not dependent on flow interruption or influenced by head pressure to open/close the flapper for sand discharge. The small-diameter tail pipe is always open to allow separated sand to continuously discharge without any concern for over-accumulation of sand.

See the illustration at right and the flow recommendations for use of the tail pipe. LAKOS can provide the clamp-on tail pipe adapter connection or the entire tail pipe kit.
**Important Dimensions**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>OUTSIDE DIAMETER in</th>
<th>OUTSIDE DIAMETER mm</th>
<th>LENGTH W/ RISER &amp; FLAPPER VALVE in</th>
<th>LENGTH W/ RISER &amp; FLAPPER VALVE mm</th>
<th>RISER SIZE</th>
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**A long history of pump protection**

It was in the early 1950’s that Claude Laval Jr. first invented downhole camera technology to examine water well conditions deep within a well. This revolutionary equipment provided not only clear details of a water well’s condition, but also confirmed that sand infiltration was a common occurrence, especially when water wells are asked to provide maximum water production with more open area to allow water (and sand) into the well.

Thousands of Pump Protection Sand Separators have been installed over the years. Today, the technology is largely the same. It is superior to pump shrouds or other techniques for keeping sand out of the pump. Water wells in sandy aquifers naturally pass sand. LAKOS Pump Protection Sand Separators provide the only logical alternative without causing reduced flow productivity.

**Other LAKOS Filtration Products**