



S&L Vacuum Primed Pump Stations vs. Self-Priming Pumping Stations

Important Items to Know



Both Smith & Loveless Vacuum Primed Pump Stations and competing self-priming stations are able to prime themselves by pulling water into the pump volute. However, the vacuum prime design of S&L **EVERLAST**™ Wet Well Mounted Pump Stations and Recessed Wet Well Mounted Pump Stations offer better performance, maintainability and reliability compared to self-priming competitors. Below are some of the reasons why the Smith & Loveless pump station and its vacuum prime pump are superior.

Higher Efficiencies

Less Power Required — S&L pump efficiencies, compared point for point, will be as much as 20 percent more efficient than self-priming pumps, resulting in significant savings in electrical costs. For example, if you are pumping 300 GPM at 80' TDH, the Smith & Loveless station will save you about \$10,000 over a ten-year period. It may also reduce your generator size.

This is because the self-priming pump must do two things: pump and prime. Internal re-circulation is necessary to effect “self-priming”. This inherent re-circulation in self-priming pumps is a result of the porting which enables them to handle air. The S&L pump is designed only to pump, which virtually eliminates internal re-circulation, increasing efficiency. The S&L pump uses a vacuum pump for priming. Because the self-priming pump is doing two things at once, it loses efficiency.

There are additional losses in efficiency in the self-priming pump because of its belt drive design, which results in an additional three to five percent loss in efficiency. S&L pumps are directly connected to the motor for greater efficiency and reduced maintenance.

Also decreasing the efficiency of the self-prime pump is its need to bleed air and water vapor from the upper extremity of the pump

discharge nozzle back to the wet well. In an unattended station, unavoidable amounts of wastewater will be discharged through the bleed line since the line is subject to the pump discharge pressure.

There is also a loss in efficiency associated with the necessity for pump-out vanes on the backshroud of the self-priming impeller. These vanes are used to decrease the pressure on the mechanical seal, and attempt to offset the axial hydraulic thrust imbalance of the semi-open self-priming impeller. These pump-out vanes consume horsepower, but do no useful work.

Quicker Priming

Primes Five Times as Fast — The S&L system normally primes the pump within 30 seconds or less, while the self-primer can take up to three to five minutes. The self-primer's longer priming times require larger wet wells in order to hold the wastewater while the pump is priming. To achieve shorter priming times, the S&L pump uses a vacuum pump capable of handling large quantities of air. Note that depending on RPM, total dynamic suction lift, elevation, suction pipe dia. etc., self-primers typically can actually prime within 60 seconds for most applications. However, it is true that vacuum priming, on average, is a much faster process. Other self-primer manufacturers, for example, will approve designs as long as they do not exceed five minute re-prime time so the five minute statement can be true.

Lower Horsepower to Prime

Fractional Horsepower Pump — The S&L vacuum pump is equipped with a 1/6 or 1/2 Hp motor depending on suction pipe size. The self-priming station uses the main pump motor, and is operating at the equivalent of "deadhead" conditions. A 15 Hp pump can use as much as 5 Hp during the priming operation. Thus, S&L pumps use less horsepower and prime much faster.



The reliable S&L Fractional HP Vacuum Pump uses less horsepower and primes much faster than self-priming mechanisms.

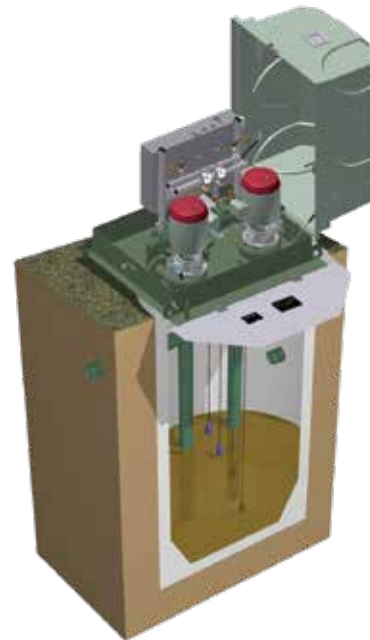
Simple Priming Systems

S&L Priming Advantage No. 1: Reducing Static Suction Lift —

For an S&L wet well mounted pump station, static suction lift is calculated from the pump (off) elevation to the centerline of the pump volute elevation. The centerline of an S&L pump volute is approximately 6"– 8" above grade. For a self-priming station, static suction lift is calculated from the pump (off) elevation to the center line of the pump inlet suction elevation. The centerline of the pump suction for a typical self-priming station is 23"– 28" above grade. This saves nearly two feet of total dynamic suction lift, resulting in faster prime times, energy savings, and system design advantages.

S&L Priming Advantage No. 2: Simplifying Design —

The S&L priming system is independent from the pump's mechanical performance. A self-priming pump's suction lift capability is, on the contrary, dependent on the pump shaft speed for low RPM applications. For example, if the hydraulic condition requires a shaft speed of 850 RPM, the maximum total dynamic suction lift for a 6" self-priming pump is 12'. A 6" S&L pump primes up to 20' at the same hydraulic condition and shaft speed because the priming system is independent from the pump performance.



S&L Wet Well Mounted Pump Stations are positioned atop the wet well at ground level and can achieve suction lift up to 20'.

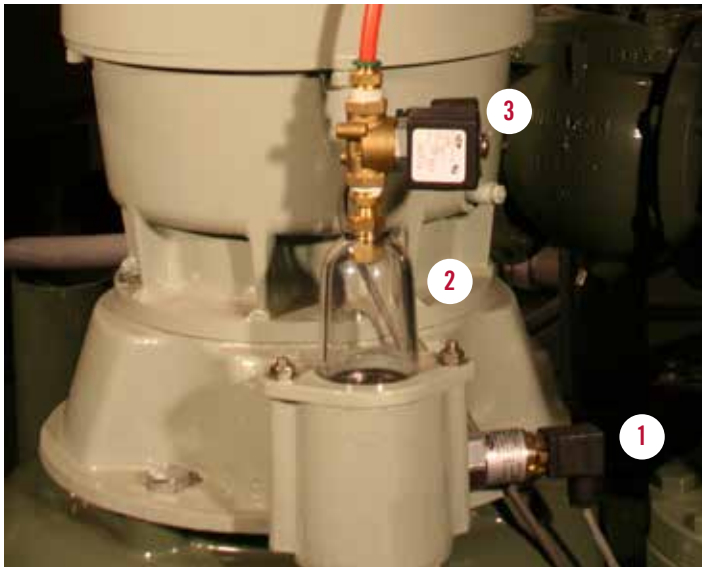
Fewer Valves Required

No Suction Flap Valve or Air Release Valve — Unlike self-priming designs, S&L pumps do not require air release valves or suction flap valves. If the air release valve fails, the pump may not prime. The flap valve could jam open, wear out, could be missing, or a suction flange might be pitted and not allow the flap valve to seat properly causing frequent loss of prime. The air release valve or the valve discharge line has a tendency to clog, or the valve may fail. The flapper valve is considered an energy savings device, however, regular maintenance and replacement is required to ensure proper seating. Self-primers

are designed to re-prime regardless of the existence or condition of the flapper valve as long as the volute is half full. If the air relief valve becomes clogged or fails, the pumps will fail to prime if the discharge pressure is > 7 PSI. Self-primers can typically compress and expel air in the suction line/pump as long the discharge pressure is < 7 PSI. The simpler S&L system does not present these problems.

Simple Freeze Protection

Automatically Drains Water — In colder climates, it is sometimes necessary to “dump prime” to avoid freezing the system. This is not possible with self-priming pumps unless the drain plugs are manually removed. With the S&L system, the pumps can be completely drained by relieving the vacuum manually or with a thermostatically operated solenoid valve.



Components of the S&L vacuum priming system include: 1) the foolproof SONIC START[®] prime sensing probe, 2) a transparent dome for visual inspection of pump prime status, and 3) a large-port solenoid valve.

Safer System

No Steam Hazards — The S&L station is safer because it will not allow the pump to run unless it is primed. The virtually foolproof SONIC START[®] must make contact with the liquid to indicate prime before any pumping starts. Self-priming pumps try to prime, and if it fails, the volute contents will overheat, producing steam. That is why all self-primers have an overheat protection system. If it were not provided, steam produced inside the volute could present a safety hazard for the operator. This could be from either a hot pump casing, or from leaking steam through the relief ports. The heat would also damage components such as the seal.

No Spillage

A Cleaner Environment — The S&L rotating assembly can be removed from the volute by removing eight cap screws. When this

task is performed, all of the wastewater flows directly into the wet well without spilling any in the station, providing a clean and safe working environment. With self-primers, removal of the cover plate is required. In doing so, the full contents of the volute will spill onto the floor where maintenance personnel will be working, directly exposing the worker to contaminated raw sewage. The S&L technology provides a safer and cleaner environment for the operator.

Easier Operation and Maintenance

No Wear Plates Required — A self primer utilizes a wear plate that must maintain a .001" clearance from the impeller or the priming capability is reduced or will cease to function. Shimless wear plates must be replaced periodically, requiring a partial pump teardown. This complicated and time-consuming maintenance is not required with the S&L system.

Fewer Bearings — Self-priming pumps use a belt drive system. This means that there are four bearings and two shafts, as opposed to the S&L design with only one shaft and two bearings. Bearing loads associated with belt drive systems are also eliminated.

No Belts To Wear — With the S&L system, there are no belts that wear out or require tightening. Some have said that a belt drive system provides more flexibility in changing pump speeds and pump capacity. Generally speaking, pumping rates are not frequently adjusted, and if they are, it is only every 5 to 10 years. The S&L impeller is easily trimmed or replaced to achieve the same results, while eliminating years of belt maintenance.

Easy Impeller Removal — The S&L pump uses a tapered shaft and tapered impeller bore to allow for easy removal of the impeller from the shaft. Self-primers use a screwed connection on a steel shaft, which can freeze or rust together, making impeller removal difficult and time consuming.



S&L's impellers feature a tapered shaft and bore for easy and quick removal from the pump shaft.

Easy Access to the Station — S&L has designed its station and enclosure to provide the easiest access possible to all of the

equipment. Opening the S&L enclosure is no more difficult than raising the hood of your car due to the use of hydraulic hood lift assist units on the **EVERLAST™** stations. Access may also be accomplished by using a two-piece, split top enclosure. Self-primers, on the other hand, typically use removable side panels for routine maintenance that do not always provide enough room for the operator. For major maintenance, the entire cover must be lifted completely off of the station — a time consuming task.

More Access Room — The vertical pump design used by S&L provides more access room in the station compared to the horizontal pump design, which takes much more floor space.

Easy Removal Of Rotating Assembly — S&L provides a lifting stanchion with each station to lift the rotating assembly, allowing for ease of access to the impeller or rotating assembly.



S&L pump stations include various enclosure options and a lifting stanchion to provide the easiest, quickest and most operator-friendly access of any station.

No Routine Seal Maintenance — The S&L pump incorporates a single face seal requiring no routine seal maintenance, and uses the wastewater as the seal lubricant. As opposed to the self-priming approach with oil filled seal requiring periodic checking and filling, and more difficult disassembly. There are also much higher replacement costs associated with the self-priming pump seal.

Longer Seal Life

Better Seal Housing — S&L uses a bronze seal housing rather than the cast iron housing used in self-primers. Cast iron has a heat transfer rate of 1300 BTU/hr/sq. ft./°F, while bronze has a transfer rate of 5300 BTU/hr/sq. ft./°F. Because bronze transfers heat at a much faster rate, the life of the S&L seal is much longer. Additionally,

S&L uses constantly circulated water as a seal lubricant, which also dissipates heat much faster than oil.



The S&L mechanical seal is more efficient at dissipating heat and offers a longer service life than other seal elements.

Bigger Pump Shaft — The S&L pump uses the biggest pump shaft in the industry. The shaft is made of stainless steel and is a minimum 1-7/8" diameter and can be as large as 3" diameter. The smallest pump shaft in the vacuum prime pump station is bigger than the largest pump shaft used in self-primers. The bigger pump shaft will provide for longer seal life because of less deflection, longer bearing life due to larger bearings, and longer shaft life due to additional strength. Because the S&L shaft is made of stainless steel, it will develop no pitting from rust.



S&L pumps have the largest shaft in the industry — a minimum diameter of 1-7/8" and a maximum of 3" — offering protection for many pump components.

Conclusion

S&L vacuum primed pump stations provide many benefits over self-priming pump stations. They are more reliable, easier to maintain, more efficient, and provide a longer service life with higher performance. The bottom line is that the S&L Wet Well Mounted Pump Station, with its vacuum priming system, has proven its superiority in more than 18,000 installations worldwide.

Learn More at SmithandLoveless.com/Pumping