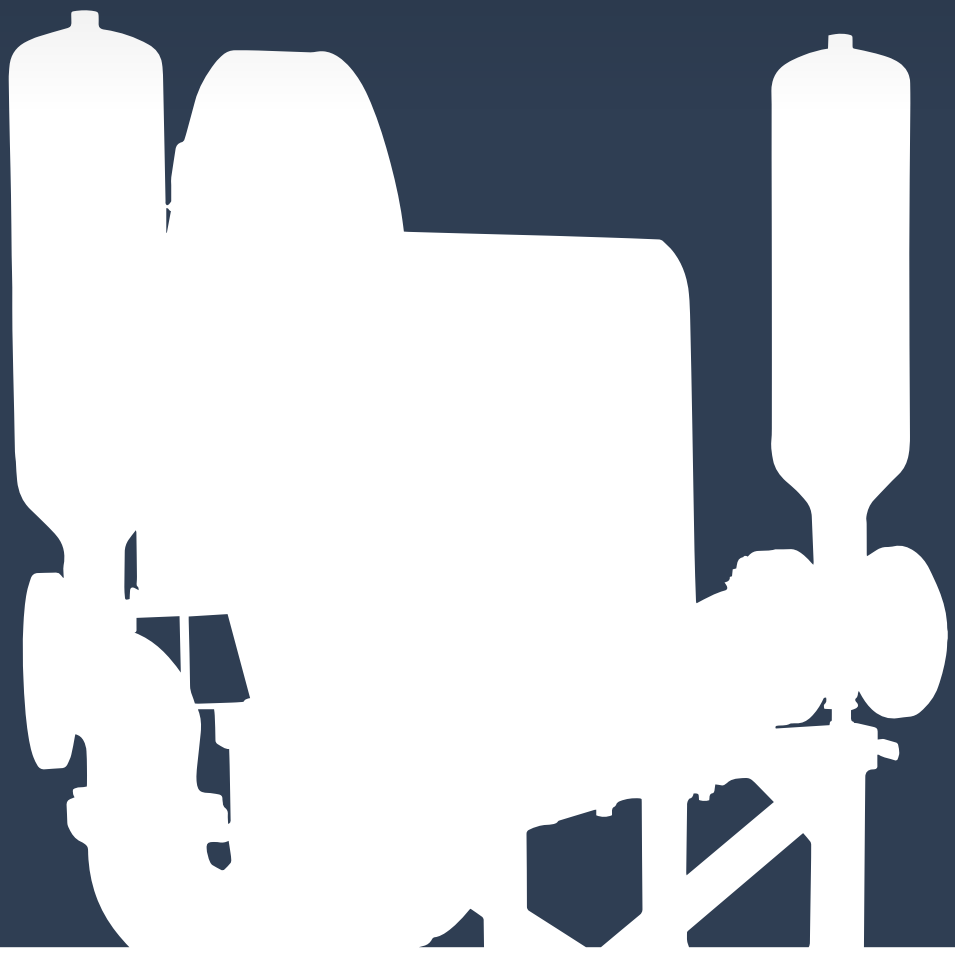
# Pump Technologies for Moving High Percent Solids & Higher Viscosity Liquids



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Penn Valley Pump

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# A Comparison of Pump Technologies for Dewatering Feed Applications

In today's world, finding sustainable practices that don't have a negative impact on the environment is key. Companies that produce or use fluids in their processes are always looking for the best way to dispose of their byproducts without contaminating clean water sources and minimize their impact on the surrounding environment.

Moving high percent solids, like wastewater sludge, scum and slurry, as well as higher viscosity liquids, like fats, oils and grease can be a challenge in many commercial, municipal and industrial environments. Figuring out which pump offers the best technology for transferring these types of substances shouldn't be.

Industrial pumps are at the core of wastewater treatment systems. Positive displacement pumps are used to transfer waste liquids, as well as solid sludge, from one process to another, throughout the wastewater treatment process and to dewatering machines. High-quality industrial pumps that can handle a wide range of fluids in conjunction with suspended solid particles is the key to successful management of higher percent solids and higher viscosity liquids.

**FIGURE 1**

Certain industrial and manufacturing applications dealing with sludge, slurry and scum rely on positive displacement pumps to move waste liquids with suspended solid particles as an integral part of the dewatering feed process.

Two common positive displacement pumping technologies are the rotary pump and the reciprocating pump, like a double disc pump. Both pump technologies are capable of moving sludge, liquid and solids through a wastewater treatment facility, however, each with a specific set of attributes that should be reviewed and applied to your specific processing needs.

## Design of a Rotary Pump

Rotary pump technologies, like a progressive cavity or rotary lobe style, operate using rotary elements. They are designed with a fixed stator or casing that has a rotor or two intermeshing lobes that are activated by the rotation of the drive shaft. As the rotor or lobes rotate in the casing, fluid is moved through the pump. The rotor contacting the stator or lobes contacting each other and the casing move liquid through the pump.

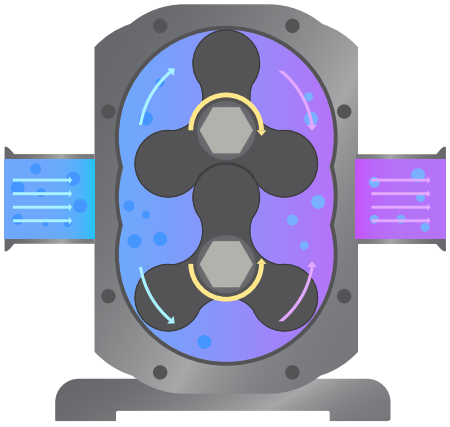


**FIGURE 2**

The lobes of this rotary pump rotate in the casing to move fluid through the pump.

The progressive cavity and rotary lobe pumps feature close tolerance designs that rely on a rubbing action to generate flow. By design, this rubbing action creates “friction wear” even on relatively clean sludges. The typical operating life range for these pump designs is 3,000 – 5,000 hours.

As a rotary pump wears over time, it loses efficiency. This loss in efficiency leads to a decreasing flow rate over time. Once the pump wears to a certain point a rebuild is required to reestablish the required flow rate. These pumps are very expensive to rebuild, with spare parts costs being 50%, 75% and sometimes 100% of the initial capital purchase price (depending on parts required). With the increased run hours required by the rotary pump in dewatering feed applications using smaller machines, the user will now see a much higher cost of ownership with this close tolerance pump technology.

These units are typically selected for dewatering applications because they are relatively inexpensive (in initial capital cost) and they do not produce significant pulses that would harm the dewatering process.

## Reciprocating Pump Technology

Reciprocating pumps are a class of positive displacement pumps that include piston pumps, plunger pumps, diaphragm pumps and the unique double disc pump. They are simpler in design and typically have fewer moving parts.  Reciprocating pumps do not rely on close tolerances but rather rely on internal valving that creates vacuum and pressure as the pump rotates to generate flow.

### What Makes Double Disc Pumps Unique

Double disc pumps were created as an alternative to traditional piston/plunger pumps and diaphragm pumps. A true double disc pump is unique because it is based on the induced flow principle. Two free discs are used simultaneously to create both vacuum and pressure during each revolution to move fluid through the pump. The discs are not captive in the pump housing, eliminating the flex fatigue failures that captive diaphragm pumps experience.

## Anatomy of a Double Disc Pump

Pumps are designed for specific purposes, and the double disc pump is no exception. When evaluating different pump technologies, make sure you don't let marketing-speak cloud your judgement, so you can be assured you are getting a truly reliable, low maintenance double disc pump. **A *true* Double Disc Pump:**

- Never uses a ball check valve, but a unique non-captive free-disc design that allows the pump to pass larger solids, rags and debris.
- Has a short stroke length cam arrangement for smooth pulses that reduces large spikes in flow.
- Can run dry without damage to the pump mechanism due to low friction design.
- Has integral reinforced elastomeric components for both pumping and valving (no external metal components).
- PVP pump body is made from cast iron. Only the pedestals are made from aluminum.
- There are no greasing/re-greasing requirements, no need for oil lubrication and no mechanical seals or seal water.

Double disc pumps also have a very short stroke length and provide a small displacement per stroke, allowing it to operate at higher speeds. This small displacement per revolution provides a relatively smooth flow as compared to traditional reciprocating pumps. The use of pulsation dampeners helps to reduce the small pulse in flow. This allows the pump to be used for pulse-sensitive dewatering operations that cannot be handled by typical reciprocating pumps.

### How a Double Disc Pump Works

Through a drive shaft, connecting rod and cam arrangement, the discs are rotated, performing the duties of both pumping and valving, during operation. During the suction cycle, the suction disc lifts off its seat, creating a vacuum, while the discharge disc is seated, filling the cavity within the pump.

The discharge cycle creates pressure above the suction disc causing this disc to seat and forcing flow out through the discharge. Since the discs are mechanically placed on the seating surface, they positively valve on every revolution, reducing the potential for loss of flow due to debris and stringy material.

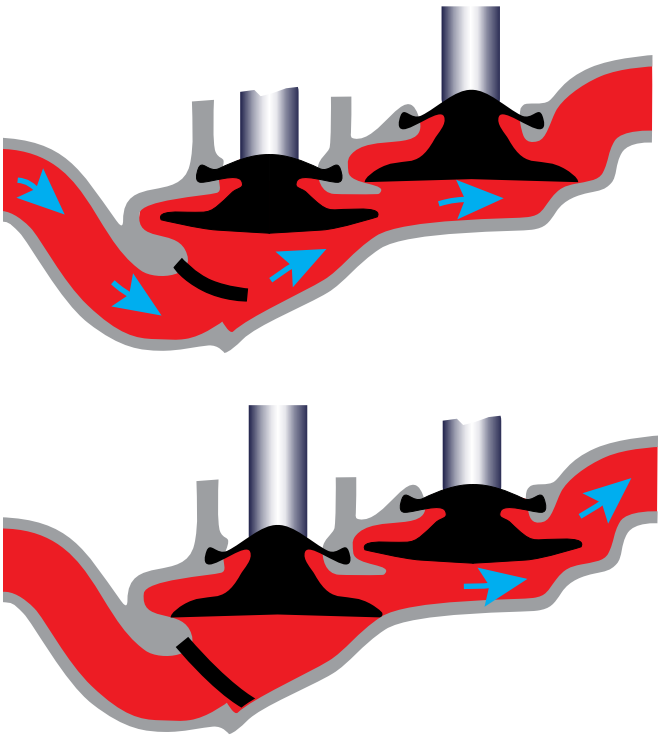


**FIGURE 3**

The discs of a Double Disc Pump work in unison to perform the duties of both the pumping element and valving element, creating a double acting, non-clogging, pumping action. The hydraulic interaction between the discs moves fluid from suction to discharge.

This is uniquely different than reciprocating pumps with internal flapper or ball check valves that rely on gravity seating to positively seal. When debris is trapped under a flapper or ball check valve, the pump will stop pumping and require cleaning of the valve for proper operation to continue.

### Benefits of Using a Double Disc Pump

Unlike many other pumps on the market, double disc pumps do not rely on close tolerances to generate flow. They work based on a reciprocating valving action that produces a light, low friction touching of the discs on the seat, which correlates to a very low wear rate. With a non-close tolerance design, applications with grit and abrasives do not impact the wear rate, as happens in other types of pumps. If more robust internal protection is needed from chemical or highly abrasive environments, double disc pumps can be lined with materials like porcelain glass, powder coating, PVC or neoprene for even more wear resistance.

Because of how double disc pumps are designed, their low friction operation gives them an extremely long operating life, typically lasting from three to five times longer than a rotary style pump performing the same application.

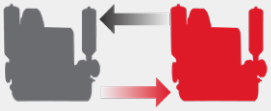
The 'maintain in place' hinged housing design of double disc pumps reduces the complexity of servicing them and allows the units to be rebuilt in place without disturbing the piping. With only five elastomeric components, and a gasket set, the pump can be repaired quickly and be put back into service in no time. There is no need to send the pump out for maintenance and repairs, given the pumps simple design and few replacement parts required.

Plus, replacement parts should be readily available. At Penn Valley Pump, spare parts are kept in stock and can ship immediately to help reduce downtime and customer risk.

The Penn Valley Pump double disc design allows the pump to be highly reliable with very low long-term operational costs or repair costs. With extremely low life-cycle costs, our double disc pump has quickly become a replacement to various different pump technologies on the market.

### Where to Use Double Disc Pumps

Because of their unique technology, double disc pumps are excellent for municipal and industrial wastewater sludge, scum and slurry pumping. They are also ideal for dewatering and thickening feed, such as belt press, centrifuge, screw press, rotary press, volute press, gravity belt as well as rotary drum thickeners. The unique pumps can also help with lime sludge and slurry pumping, fats, oils, grease and food waste pumping, chicken and beef waste processing and rendering plant waste pumping.



## Swap Your Pump, Reduce Your Risk

Reducing risk is part of your job, like making sure your processing equipment works reliably and will hold up for years to come. This is why PVP has offered the Swap Your Pump program for more than 20 years. Before the user actually purchases the replacement pump, we provide assurances that our Double Disc Pump™ will work, and that it is just not "another" pump by offering a free trial opportunity. An application engineer assesses your application needs and sizes the correct pump, which is then manufactured at our Pennsylvania facility (all our pumps are made in the USA).

With a typical trial period from 30 to 90 days, the pump is put into your facility for evaluation. If it works, the process moves on to an official purchase. If not, PVP takes the pump back with no money required on your end. With a 99% satisfaction rate, this program has helped countless municipalities and treatment operators get a suitable pump with far less risk than a typical "spec'ed-in" pump that doesn't perform as intended.

Double disc pumps don't rely on close tolerances to generate flow. Their low friction operation leads to an extremely long operating life. They also require little to no routine maintenance and can even be run dry without incurring damage. All these factors save the user time and money in the long run. The induced flow operating principle of a true double disc pump helps to provide superior versatility in fluids handling. In addition, the large diameter discs can easily handle large solids, rags and plastics that would cause other pumps to fail, up to 2" diameter, depending on the pump size, as well as line-size semi-solids.

### Confidence Where It Counts

There are many options when choosing the right positive displacement pumping technology for your municipal or industrial wastewater application. Double disc pumps offer worry-free operation and reduced risk, which are equally as important as low maintenance and waste handling throughput. Know what factors impact your jobsite's requirements and take stock in what attributes your pump needs to deliver.