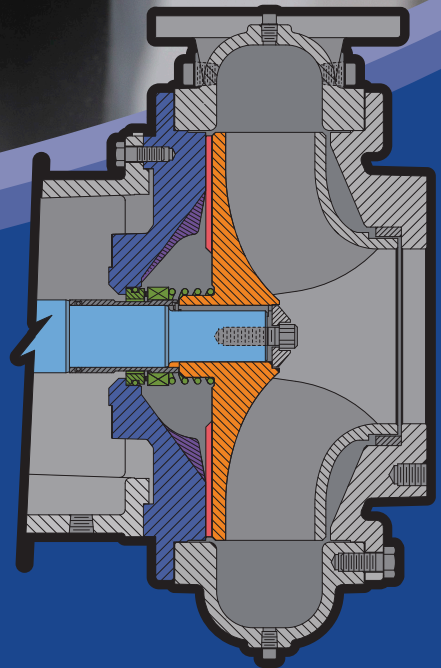


CORNELL PUMP COMPANY

CYCLOSEAL®

PATENTED, LONG LASTING, FLUSHLESS SEALING SYSTEM



CYCLOSEAL® SEALING SYSTEM



OVER 30 YEARS OF EXCEPTIONAL SEAL TECHNOLOGY

Cycloseal was developed to solve the issue of seal failure in municipal pumps. The concept of a mechanical seal that doesn't require a water flush and eliminates leaks was revolutionary when it was introduced in 1994. Today, customers continue to appreciate the reliability and ease of maintenance, resulting in over 250,000 Cycloseal installations across dozens of countries worldwide over the past 30 years.

Cornell Pumps is distinguished from all others by its patented, premium mechanical seal system called Cycloseal®.

Cornell Pumps has a service advantage over competitors due to the patented Cycloseal design, which eliminates the need for venting or flushing water while extending seal life through the removal of solids, abrasive materials, air, and gas pockets. This is made possible by the Cycloseal system's deflector vanes, which work with the impeller back vanes to create the unique cyclo-action. The design is available in all Cornell solids handling pumps and many clear liquids and food handling pumps.

CYCLOSEAL® SAVES YOU FROM FLUSHING AWAY MONEY!

Each pump requiring flush water can incur costs of \$10,000 or more. For instance, a typical 6" pump uses 3 gallons per minute, which may not seem like much. Still, it adds up to over 1.57 million gallons (5,950 m3) annually. Larger pumps, such as 8" and 16" to 24" pumps, consume even more water, with some using 8 million gallons (30,300 m3) or more per year. When you factor in multiple pumps per location and several locations per organization, the amount of water utilized just for seals is HUGE.

Cycloseal® provides an answer:

- REQUIRES NO FLUSH WATER.
- Uses inexpensive and easy-to-change type 1 or 2 mechanical seals.
- Saves \$10,000 or more in flush costs.
- More environmentally friendly alternative.
- Plus, Cornell Pumps are high-efficiency and can save your operation even more money.

COST OF A GALLON OF WATER	GALLONS PER MIN	GALLONS PER DAY	GALLONS PER YEAR	EXPENSE
\$0.02	1	1,440	525,600	\$10,512
\$0.02	3	4,320	1,576,800	\$31,536
\$0.02	5	7,200	2,628,000	\$52,560
\$0.02	8	11,520	4,204,800	\$84,096

The table illustrates the costs involved, with prices per gallon typically paid by a wastewater treatment plant for their water. In some locations, costs can be as high as \$0.22 per gallon, resulting in nearly \$35,000 in flush water for the same 6" pump.

CYCLOSEAL® SEALING SYSTEM



TYPE I & II MECHANICAL SEAL FEATURES

Cycloseal® relies on Type I & II Mechanical seals as part of the Cycloseal system.

The seals provide these benefits:

No Set Screws: Nothing to mar the shaft or sleeve.

Temperature Limits: -40°F to +160°F (Buna); -40°F to +400°F (Viton®)

Seal Faces: Tungsten carbide vs. silicon carbide or carbon vs. ceramic (other material options available).

Elastomeric Bellows Options: Buna-N, Viton® and other materials available.

Hardware: Stainless or plated steel.

Photograph reprinted with the permission of John Crane. ©John Crane 2018

CYCLOSEAL® BENEFITS

No Flush Water or Packing: No need for flush water or packing with Cycloseal, saving on expense, service time, and drips.

Extended Seal Life: Cycloseal design has extended seal life, even in demanding applications such as manure slurry, starch recovery, and food processing, sometimes tripling the expected seal life.

Run-Dry™ Option: Optional Run-Dry feature available for lubricating seal faces even when no liquid is in the pump casing, essential in situations where the pump must run dry for several hours or may lose prime suddenly without being shut off.

System Savings: Cycloseal system requires no external water flush, filters, grease cups, or piping, reducing system costs.

Better for Abrasive Applications: Cycloseal is more resilient than packing and standard mechanical seals against abrasive applications, reducing seal wear..

Greater Reliability: Cornell's Cycloseal system offers greater reliability because of its positive seating feature. This feature enables end-users to check whether the seal is fitted correctly, resulting in longer intervals between services.

Maintenance Savings: Longer-lasting seal leads to less downtime and lower maintenance costs over the pump's lifespan.

Watch the Cycloseal video online to see it in action:

<http://www.cornellpump.com/support/videos.html>



CYCLOSEAL® SEALING SYSTEM

HOW CYCLOSEAL® WORKS

The Cycloseal system is not merely a seal but a comprehensive sealing solution. Initially created by Cornell engineers in the 1990s and continually improved since, the system's brilliance lies in the fact that it employs a conventional Type I or II Mechanical Seal, resulting in significantly extended seal life compared to standard seals.

By creating a pressure gradient, the Cycloseal system eliminates grit and other materials from the seal face, leaving it in an environment with fewer particulates than a typical seal.

The Cycloseal system achieves this by making the following modifications to standard sealing systems:

DISHED BACKPLATE

While most pump manufacturers have a small cavity around the seal, believing the smaller the space the less grit and material can attack the seal, in Cycloseal the area behind the seal is comparatively large. This gives the dirty water enough area to fling/cyclone debris away from the seal.

BACKPLATE DEFLECTOR VANES

Designed at particular pitches, these deflector vanes help create the cyclonic action.

QUALITY MECHANICAL SEAL

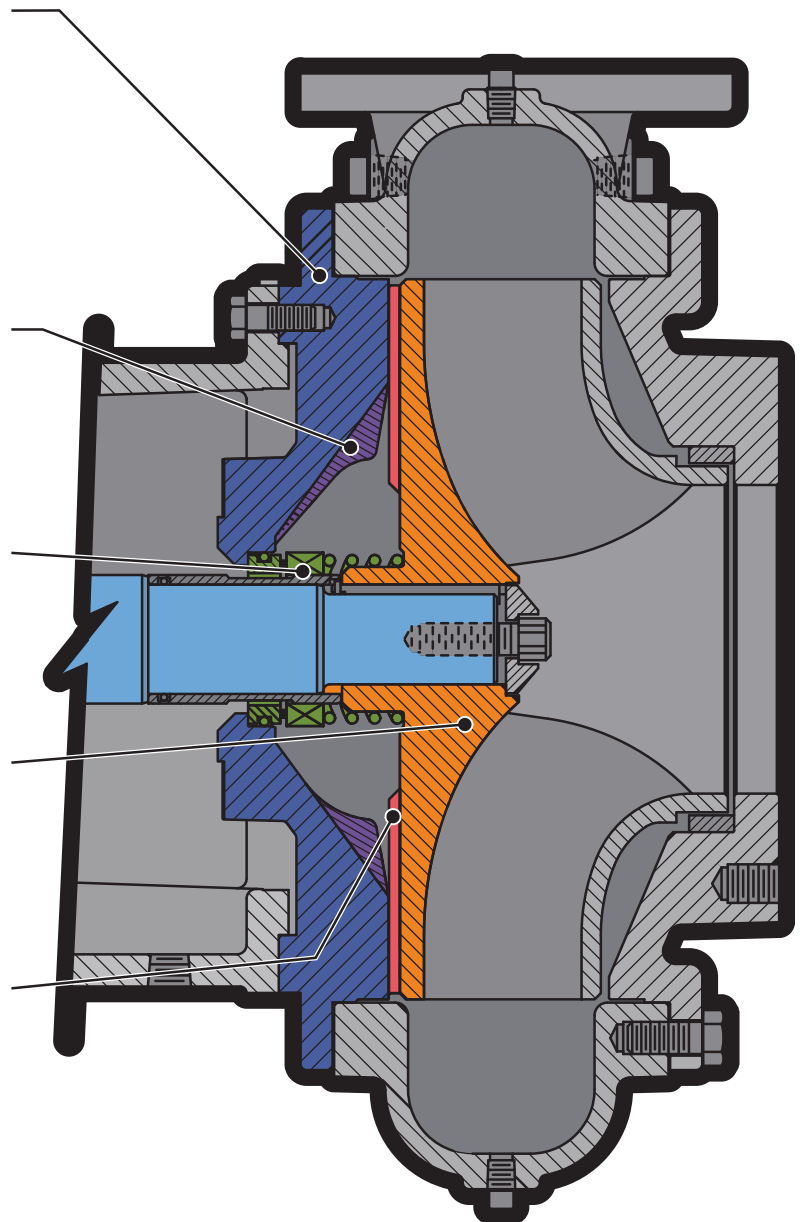
The seal is replaceable with a quality Type I or II mechanical seal.

SPECIFICALLY-CALIBRATED IMPELLER

Balanced to precise tolerances, Cornell impellers provide the kinetic energy needed to whisk away the particulates from the seal faces.

IMPELLER BACK VANES*

In solids handling applications the impeller back vanes work in conjunction with the stationary deflector vanes to redirect particles back into the pumpage stream, and away from the seal face.



*In clear liquid pumps the balance line serves a similar function by reducing pressure and improving hydraulic efficiency; increases the life of mechanical seals and bearings, and providing positive control of axial forces.

CYCLOSEAL® SEALING SYSTEM

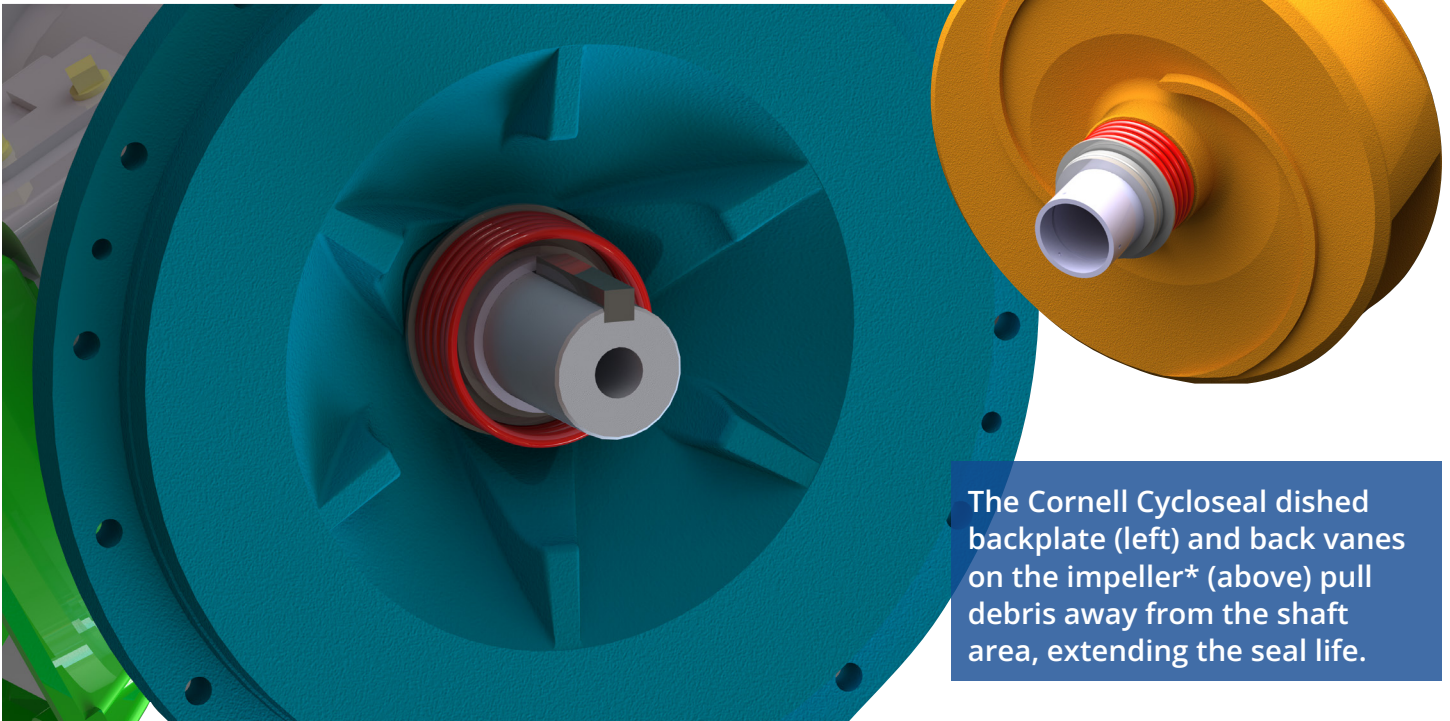
SEAL COMPARISON

FOUR MAIN TYPES OF SEALS USED IN CENTRIFUGAL PUMPS ARE COMPARED USING RELATIVE COST, DURABILITY, AND LEAKAGE.

	Packing	CYCLOSEAL® SYSTEM	Double Mechanical Seal	Cartridge Seals
Cost	Low cost	Low cost	Medium cost	High cost
Leak Propensity	Profuse leaks	No/ Negligible leaks	Negligible leaks	Small leaks
Flush	Flush optional	No flush required	Flush required	Flush required
Durability	Not durable	Very Durable	Somewhat durable	Very Durable

YOU WILL EXPERIENCE THESE BENEFITS BY EMPLOYING CORNELL'S CYCLOSEAL® PATENTED LONG LASTING, LEAK-FREE SEALING SYSTEM:

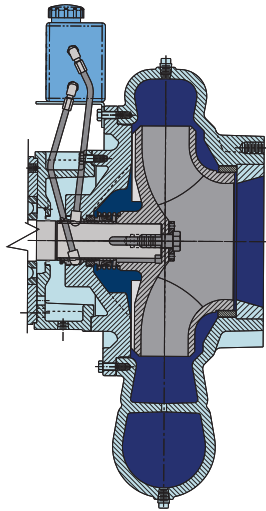
- ✓ No Flush Water or Packing
- ✓ No Gauging or Instrumentation
- ✓ Extended Seal Life
- ✓ Run-Dry Option
- ✓ System Savings
- ✓ Better for Abrasive Applications
- ✓ Greater Reliability
- ✓ Maintenance Savings



ADDITIONAL OPTIONS

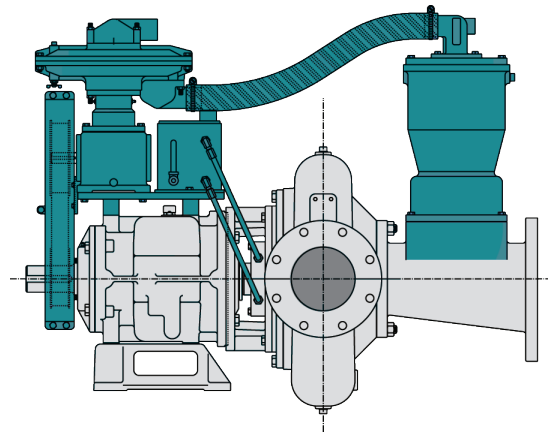
RUN DRY™ AND REDI-PRIME® OPTIONS

All pumps equipped with Cornell's Cycloseal® sealing system have an optional Run-Dry™ system designed to lubricate the seal faces even when no liquid is in the pump casing. Nearly all Cycloseal-ready pumps can also employ Cornell Redi-Prime technology, a mechanically-driven, low-maintenance, high-volume vacuum pump system for rapid priming and repriming.



RUN-DRY™

Cornell's Run-Dry system provides an effective solution for applications where the pump may operate in a dry condition. The system comprises an auxiliary gland and oil reservoir that ensures lubrication of the seal faces, preventing damage to the seal faces during priming, re-priming, or standby operation. The lubricant reservoir is connected to the Run-Dry gland via inlet and outlet lines, facilitating continuous circulation and cooling of the lubricant and seal faces as the shaft rotates. With the Run-Dry system, the mechanical seal can withstand dry running for hours without sustaining damage.



REDI-PRIME®

Cornell's Redi-Prime pumps are engineered with larger suction lines to offer greater flow, lower friction losses, and increased suction lift. The priming mechanism is environmentally friendly, using a diaphragm vacuum pump and a positive sealing float box to prevent water carry-over and environmental contamination. The Redi-Prime system can be easily integrated into most Cornell pumps, allowing for suction lifts of up to 28 feet, heads of up to 800 feet, and flow rates exceeding 20,000 GPM.

CORNELL'S CYCLOSEAL® SYSTEM IS USABLE IN ALL THESE MARKETS:



AGRICULTURE



FOOD PROCESS



INDUSTRIAL



REFRIGERATION



MINING



MUNICIPAL



OIL & GAS



RENTAL

SLURRY IN THE TEST LAB

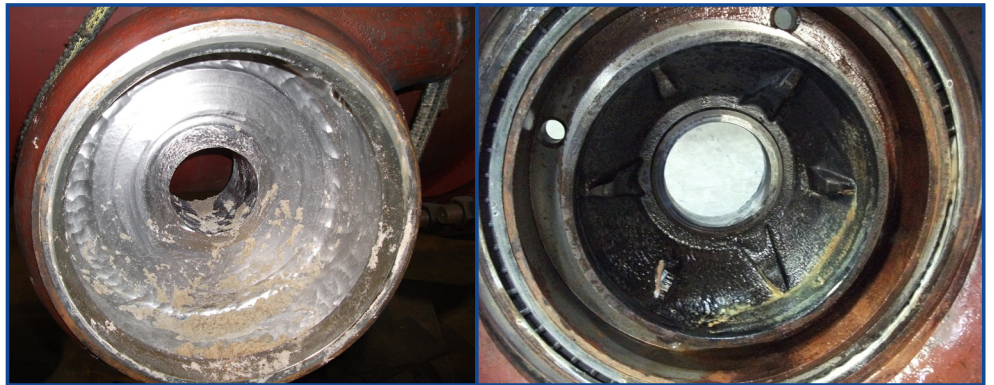
VOLUTE SCoured—BUT CYCLOSEAL® BACK PLATE/MECHANICAL SEAL STILL HAS PRIMER ON IT!

Before launching the SP Series of slurry pumps, Cornell conducted a rigorous 1,500-hour test of the 3SP pump in their test lab, using a 30 percent sand mixture. The slurry mixture was changed every 50 hours to maintain sharp edges on the sand. Despite the harsh conditions, the pump performed flawlessly, with the volute, impeller, and expeller all scouring without issue. The volute displayed slight indentation, while the sand polished the inside of the casing to a near-mirror finish. The impeller bore signs of wear, with jagged edges appearing on the outer vanes.

Thanks to Cornell's patented Cycloseal® mechanical seal system, the abrasives were kept away from the seal so well that the factory primer was still visible on the part. The Cycloseal® system utilizes unique deflector vanes with the expeller to generate a cyclo-action, removing solids and abrasive materials from the seal area while purging air and gas pockets. This not only prolongs seal life by up to three times that of a standard seal but also eliminates the need for venting, water flush, filters, grease cups, piping, or instrumentation usually associated with packing or double mechanical seals.



Impeller scoured by the sand mixture



ON LEFT: Volute shows signs of severe wear.

ON RIGHT: Cycloseal® backplate still has primer on it.

The longer seal life and elimination of associated components translate to reduced pump downtime and lower maintenance costs, making the SP Slurry Series more cost-effective and valuable for users in remote areas or other locations where replacing the seal may be difficult.

For more application stories, visit our website at www.cornellpump.com

CORNELL PUMP COMPANY MARKET & PRODUCT LINE



AGRICULTURE



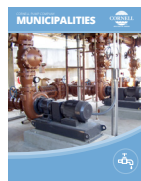
FOOD PROCESS



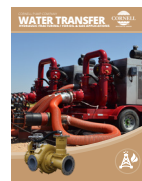
INDUSTRIAL



MINING



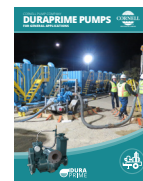
MUNICIPAL



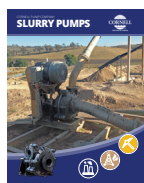
WATER
TRANSFER



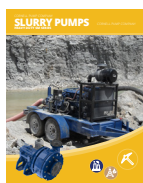
REFRIGERATION



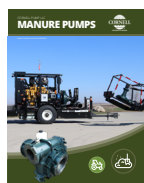
CONSTRUCTION



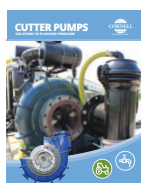
SLURRY



SLURRY SM



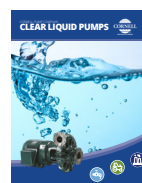
MANURE



CUTTERS



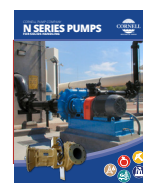
SELF PRIMING



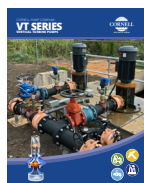
CLEAR LIQUIDS



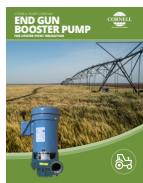
MX SERIES



N SERIES



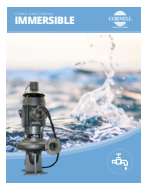
CYCLONE™



EDGE™



HYDRAULIC
SUBS



IMMERSIBLE



CD4MCU



RUN-DRY™



PRIMING
SYSTEMS



CYCLOSEAL®

Cyclo Seal® and Redi-Prime® are Registered Trademarks of Cornell Pump Company.

Cornell pumps and products are the subject of one or more of the following U.S.
and foreign patents:

6,074,554; 6,036,434; 6,079,958; 6,309,169; 6,104,949.

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