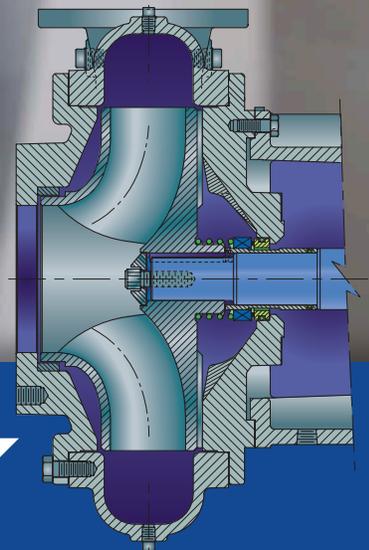
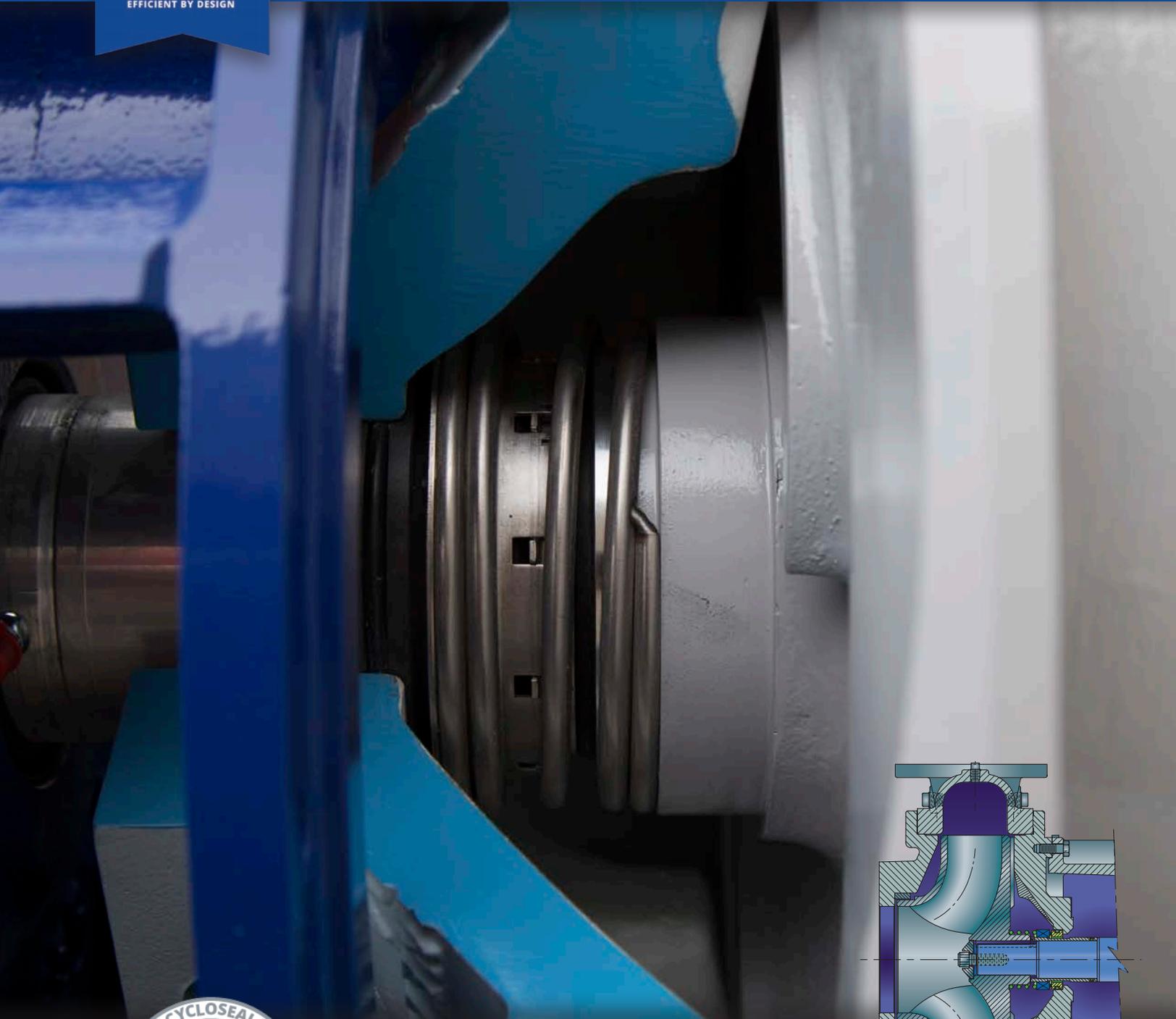




CORNELL PUMP COMPANY
CYCLOSEAL®
PATENTED, LONG LASTING, FLUSHLESS SEALING SYSTEM



EFFICIENT BY DESIGN



25 YEARS OF EXCEPTIONAL SEAL TECHNOLOGY

Cycloseal grew out of a need to address municipal seal failure. In 1994, the idea that you could have a mechanical seal that didn't require a water flush, and wouldn't leak, was revolutionary. Twenty-five years later, that idea still resonates with customers — the ease of care and reliability have seen Cycloseal installed on more than 100,000 pumps in dozens of countries around the world.

CYCLOSEAL® DESIGN: The patented, premium mechanical seal system that distinguishes Cornell Pumps from all others.

One of the main reasons Cornell Pumps have a service advantage compared to competitors is our patented Cycloseal design that removes solids and abrasive material from the seal area, while purging air and gas pockets. This innovative cyclonic action extends seal life and eliminates the need for venting or flush water.

These benefits come from the Cycloseal system's unique deflector vanes, which work with the impeller backvanes to create the cyclo-action. The Cycloseal design is available in all Cornell solids handling pumps, as well as many of our clear liquids and food handling pumps.

CYCLOSEAL® SAVES YOUR FROM FLUSHING AWAY MONEY!

Each pump with flush water can be \$6,000 or more in water costs.

A typical 6" pump uses 3 gallons a minute in flush water. Doesn't seem like much...but that's over 1.57M gallons/5,950 m³ per year. An 8" pumps uses more, and big 16" to 24" pumps use much more — 8 million gallons/30,300 m³ or more per year!

And that's one pump...multiple by several pumps per location, and the possibility of several locations per organization and the water used 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 \$6,000 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
\$0.004	1	1,440	525,600	\$2,102
\$0.004	3	4,320	1,576,800	\$6,307
\$0.004	5	7,200	2,628,000	\$10,512
\$0.004	8	11,520	4,204,800	\$16,819

Table is illustrative—and costs per gallon are what is what is typically paid by a waste water treatment plant for their own water. Some location can be as high as \$.022 per gallon; so that same 6" pump costs nearly \$35,000 in flush water.



CYCLOSEAL® SEALING SYSTEM

CYCLOSEAL® BENEFITS

No Flush Water or Packing: Through the backplate and sweeping vanes, Cycloseal requires no flush water or packing, saving expense, service time, and messy drips.

Extended Seal Life: Cornell's Cycloseal design has proven itself in the toughest applications, from manure, slurry, starch recovery, municipal waste water, and clear water, to food processing and self-priming applications – in some cases more than tripling the normally-expected seal life.

Run-Dry™ Option: All pumps with Cornell's Cycloseal system can be equipped with an optional Run-Dry feature, which serves to lubricate the seal faces even when there is no liquid in the pump casing. In situations where the pump must run dry for several hours, or where the pump may suddenly lose prime without being shut off, the Run-Dry feature is a must.

System Savings: The Cycloseal system requires no external water flush, filters, grease cups, or piping normally associated with packing or mechanical seals in other pumps.

Better for Abrasive Applications: More resilient than packing and standard mechanical seals bathed in grit and other materials, Cycloseal keeps solids away from the seal area for reduced seal wear.

Greater Reliability: Through positive seating, end users can tell when the seal is perfectly fitted. With greater ability to withstand to grit, the Cycloseal system results in longer intervals between service.

Maintenance Savings: The end result of a longer-lasting seal is less down-time and lower maintenance costs over the life of the pump.

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®)

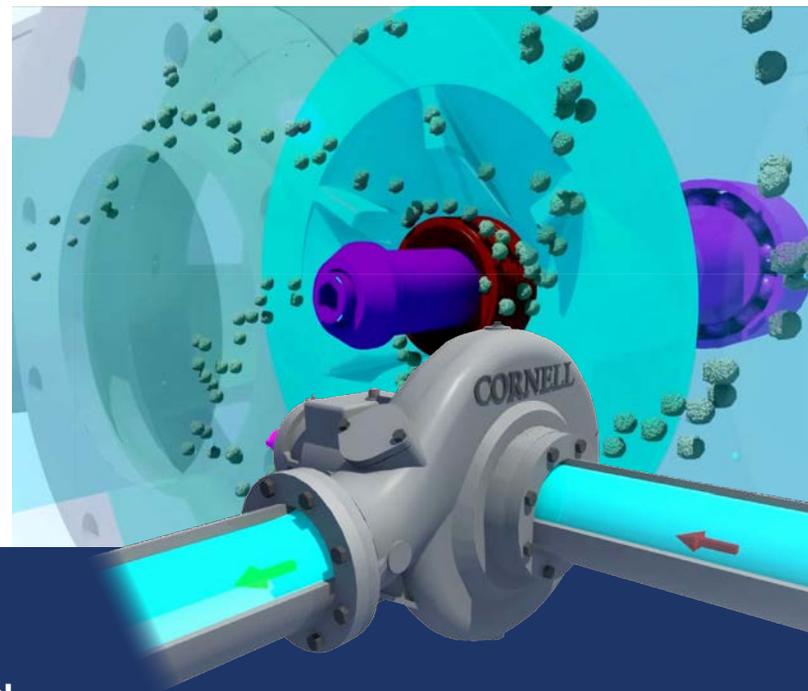
Seal Faces: Tungsten carbide vs. silicon carbide or carbon vs. ceramic (other material options available.)

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

Hardware: Stainless or plated steel.



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**Watch the Cycloseal video
online to see it in action:**

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

CYCLOSEAL® SEALING SYSTEM



HOW CYCLOSEAL® WORKS

Cycloseal isn't just a seal, but rather a sealing system. Designed by Cornell engineers in the 1990's, and refined over the years, the elegance of the system is that it utilizes a traditional Type I or II Mechanical Seal in such a way that the Cycloseal system provides much longer life than the seal would normally experience.

Through a pressure gradient, the Cycloseal system pulls grit and material away from the seal face, leaving it in an environment with fewer particulates than a standard seal.

Cycloseal creates this environment with these 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

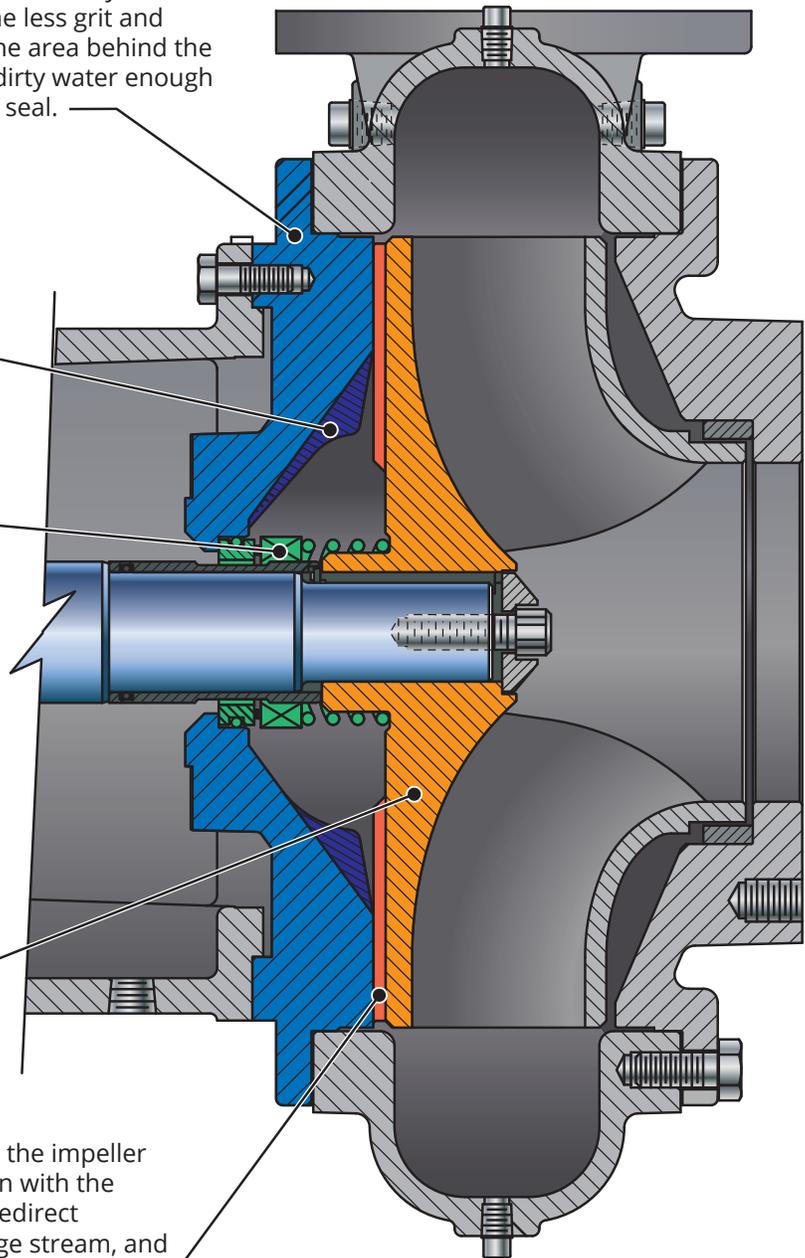
The seal is replaceable with a quality Type I or II mechanical seal.

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

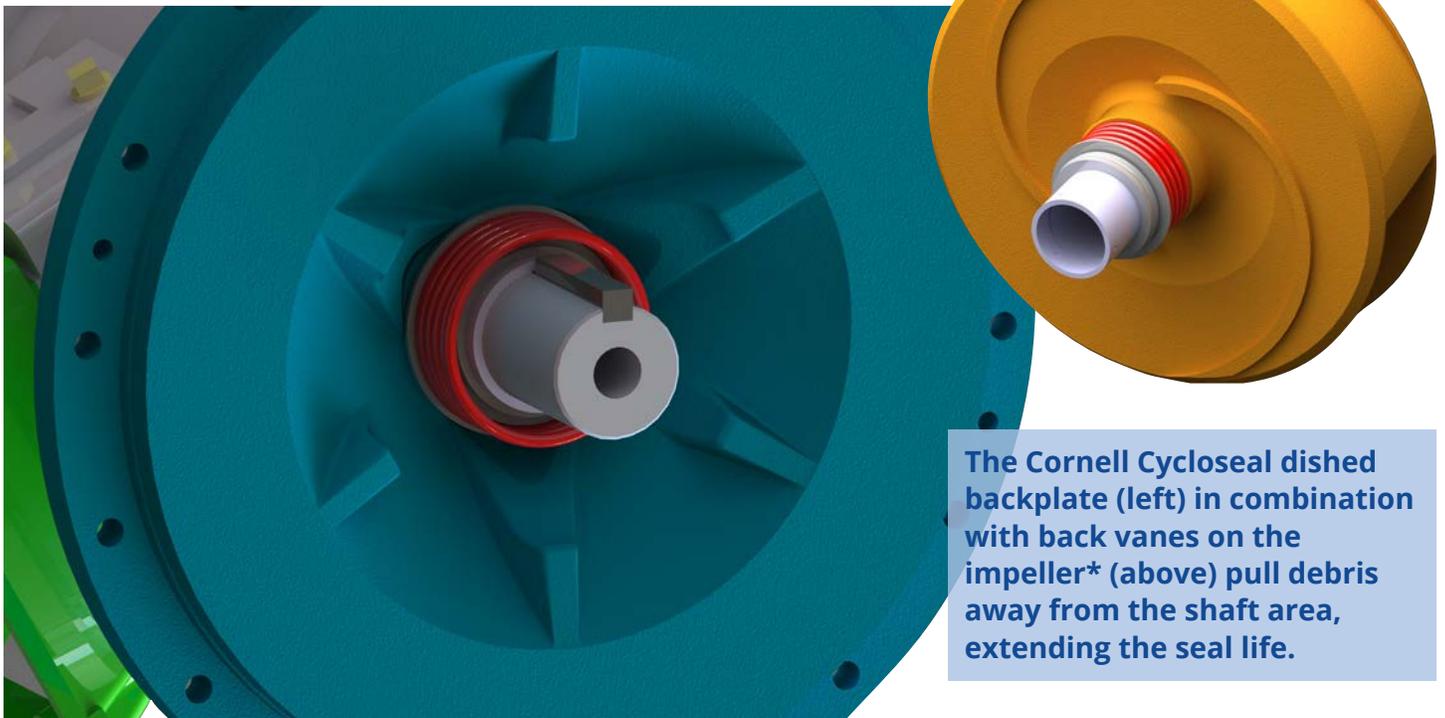
SEAL COMPARISON

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 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**



The Cornell Cycloseal dished backplate (left) in combination with back vanes on the impeller* (above) pull debris away from the shaft area, extending the seal life.

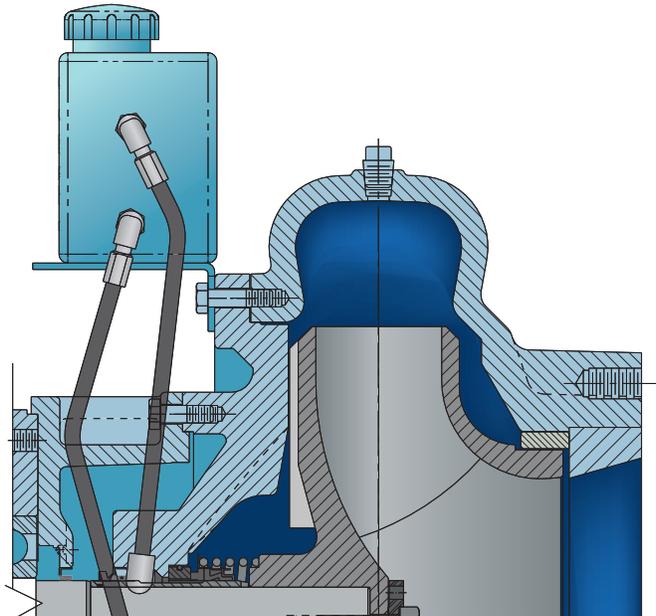
RUN DRY™ AND REDI-PRIME® OPTIONS

All pumps equipped with Cornell's Cycloseal® sealing system have an optional Run-Dry™ system, designed to lubricate the seal faces even when there is no liquid in the pump casing. Nearly all of the 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™

The Cornell Run-Dry system is a unique, state-of-the-art solution for providing continual lubrication to mechanical seals. Run-Dry provides a gland on the back side of mechanical seal through which lubricant can circulate, providing cooling to the precision hardened seals faces of the mechanical seal. The result is exceptional seal life, regardless of the operating conditions, from full-flow to no-flow—Run-Dry!

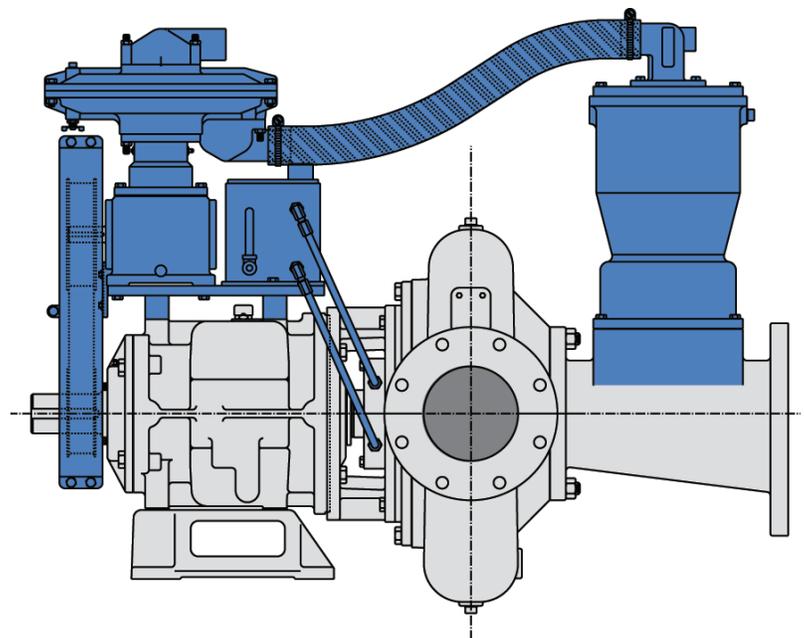
In situations where pump must run dry for several hours, or where the pump may suddenly lose prime without being shut off, the Run-Dry feature is a must.



REDI-PRIME®

Cornell's patented priming and repriming system allows your pumps to work properly, unattended. Redi-Prime pumps are designed with oversized suction to provide more flow, reduce suction friction losses, and handle air liquid mixtures with ease. The widest range of dry repriming pumps in the industry, Redi-Prime is available on virtually all of Cornell's Solids Handling and Clear Liquids pumps, from 1.25" to 30" discharge. Valued by customers around the world, Redi-Prime provides a distinct advantage to your application.

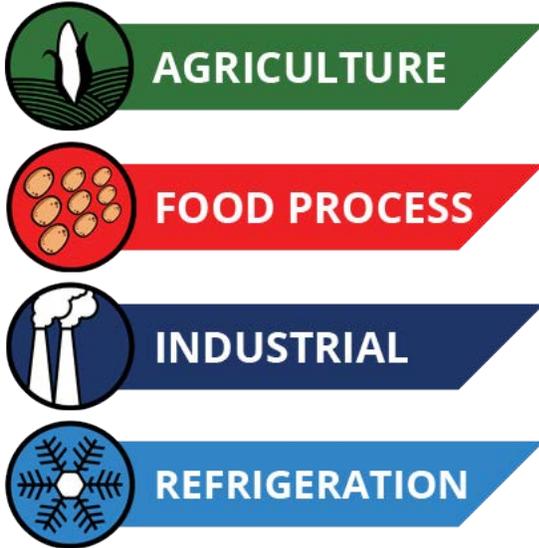
Redi-Prime is fully automatic and doesn't require a manual shut-off valve to ensure there is no water "carry-over" to the diaphragm vacuum pump.





CYCLOSEAL® APPLICATIONS

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



SLURRY IN THE TEST LAB

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

In preparing to launch the SP Series of slurry pumps, Cornell conducted tests of a 3SP pump in our test lab. The 3" pump was subjected to over 1,500 hours of testing, with a 30 percent sand mixture. The slurry mixture was switched every 50 hours to maintain sharp edges on the sand.

The pump functioned flawlessly. The volute, impeller, and expeller were all scoured by the mixture. The volute shows signs of indentation, and the sand polished up the inside of the casing almost to a mirror-like shine. The impeller shows definite signs of wear—with jagged edges appearing on the outer vanes.

The Cycloseal® mechanical seal system worked so well at keeping abrasives from damaging the seal, that the factory primer can still be seen on the part. Cycloseal® is Cornell's patented design, featuring unique deflector vanes that works with the expeller to create a cyclo-action. This action removes solids and abrasive material from the seal area while purging air and gas pockets – extending seal life and eliminating any need for venting or water flush.

Cycloseal® lasts typically three times longer than a standard seal—making the SP, SM, and MP Slurry Series more cost effective and useful to users in remote locations, or other areas where replacing the seal would be difficult. The longer seal life also translates into less pump down time and lower maintenance costs. The Cycloseal® system requires no external water flush, filters, grease cups, piping or instrumentation normally associated with packing or double mechanical seals.



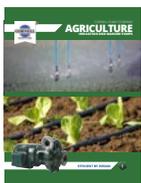
Impeller scoured by the sand mixture



ON LEFT: Volute shows signs of severe wear. ON RIGHT: Cycloseal® backplate still has primer on it.



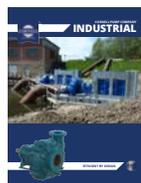
MARKET AND PRODUCT LINE



AGRICULTURE



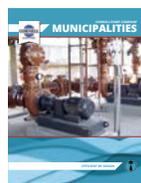
FOOD PROCESS



INDUSTRIAL



MINING



MUNICIPAL



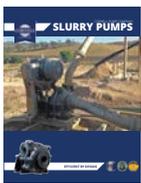
WATER TRANSFER



REFRIGERATION



CONSTRUCTION



SLURRY



SLURRY SM



MANURE



CUTTERS



SELF PRIMING



HIGH FLOW



MX SERIES



N SERIES



CYCLONE™



EDGE™



HYDRAULIC SUBS



IMMERSIBLE



CD4MCU



RUN-DRY™



PRIMING SYSTEMS



CYCLOSEAL®

Cycloseal® 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: 3,207,485; 3,282,226; 3,295,456; 3,301,191; 3,630,637; 3,663,117; 3,743,437; 4,335,886; 4,523,900; 5,489,187; 5,591,001; 6,074,554; 6,036,434; 6,079,958; 6,309,169; 2,320,742; 96/8140; 319,837; 918,534; 1,224,969; 2,232,735; 701,979 and are the subject of pending U.S. and foreign patent applications.

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