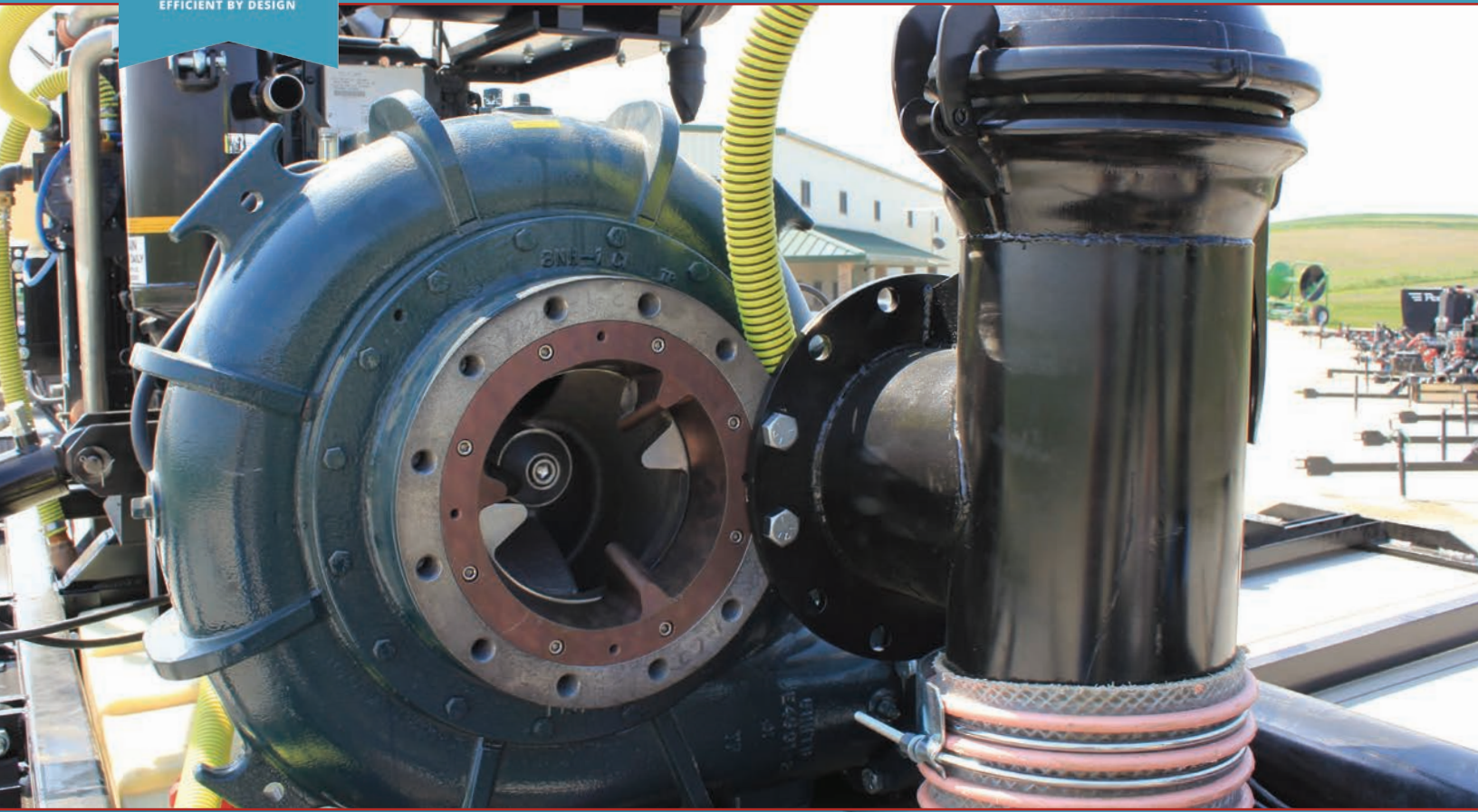




CORNELL PUMP COMPANY

CUTTER PUMPS

SOLUTIONS TO PLUGGING PROBLEMS



EFFICIENT BY DESIGN





CUTTER PUMPS



Cornell Pump was founded in 1946 by five friends who set out to design a more reliable, durable and efficient pump. Over the years, Cornell engineers have contributed significantly to industry advances in centrifugal pump design with pump features like Cornell Redi-Prime®, Run-Dry™, and Cycloseal® systems.

CORNELL: WHAT SETS OUR COMPANY APART

Cornell Pump has been producing robust, highly efficient pumps for the Industrial market since 1946 and our innovative pump concepts have provided unmatched value. Cornell clear liquid, solids handling, and grit/slurry pumps provide the reliability and inter-changeability demanded in municipal, industrial and agricultural applications. Cornell offers a wide range of pump models and configurations to fit into existing installations. We'll also work with you to create a custom system to satisfy your needs.

Our technical and engineering staff is the best in the business at providing quality solutions.

A WIDE VARIETY OF SIZES AND CONFIGURATIONS

Models range in size from 1" to 30" and a range of configuration options are available for each model – including frame and engine mount options and Cornell features like Run-Dry™ and Redi-Prime®.

PUMPS DESIGNED FOR SPECIFIC JOBS

Our team of expert engineers design pumps to meet the varying demands of industry applications, such as solids handling, slurry, and head requirements.

OUTSTANDING EFFICIENCIES

We put our experience and knowledge to work to produce tested designs with some of the highest efficiencies of any pumps on the market.

ROBUST CONSTRUCTION

Cornell pumps are built using superior materials selected for their suitability to each pump's intended application. Heavier casting walls, thicker shafts, and fully-machined impellers are part of what make Cornell pumps more rugged and durable than other pumps.

WASTEWATER RAGGING AND FOULING



More than six billion flushable toilet wipes, plus over one billion floor and counter cleaning wipes mingle with countless paper towels, baby wipes, feminine hygiene products, grease and other coagulants in sewers worldwide EVERY YEAR!

A problem that didn't exist a decade ago has 'wiped-out' many water utilities maintenance and repair budgets. Instead of building infrastructure, waste water engineers have been cleaning out pump stations up to three times a day, auguring out force mains, and picking away at so-called 'fatbergs' the size of buses, just to keep systems running.

It's a problem—a big problem, and one that must be addressed to keep sanitation functioning around the world.

TWO CORNELL PUMP SOLUTIONS

In creating the cutter option to deal with wastewater ragging and fouling, an important concern was to keep efficiency as high as possible. Two designs worked well—the blade cutter and auger cutter. With a range of cutter solutions, users can choose the Cornell cutter which will best suit their needs. Both provide Cornell's renowned quality and reliability. Here are the features, benefits, and differences of them both.

MINIMAL INCREASE TO COST OF OPERATIONS

LABOR SAVINGS BY REDUCING CLEAN OUT EVENTS

TWO-YEAR WARRANTY

IMPROVE EFFICIENCY BY REDUCING DOWN-TIME AND PERIODS OF LOW FLOW



BLADE CUTTER

Consists of a rotating and stationary cutter, utilizing a standard impeller.

- Minimal energy consumption (4% or less) for solution
- Designed to break up clogs/ragging
- Hardened cutter material
- Adjustable clearances
- Minimal flow restrictions
- Does not change external pump dimensions
- Retrofittable



AUGER CUTTER

The more aggressive solution, featuring scythe-like edges from the impeller eye, sweeping all the area where the suction pipe meets the volute.

- Handles most aggressive and troublesome clogs and ragging
- Limited energy consumption (around 8%) for solution
- Hardened cutter material
- Insignificant flow restrictions
- Does not change external pump dimensions
- Retrofittable

HOW ARE CUTTERS AND CHOPPERS DIFFERENT?

Cornell also makes a chopper pump series in addition to the cutter pumps. While choppers can dice up even more aggressive clogs than cutters, they sacrifice flow, efficiency and head to operate.

USE A CUTTER FOR:

- ✓ Clogs and ragging
- ✓ To save energy costs
- ✓ When you need a wide range of heads and flows
- ✓ If you want to retrofit
- ✓ If you are passing along to a main trunk or pipeline

USE A CHOPPER FOR:

- ✓ Severe plugging
- ✓ When energy efficiency is a minimal concern
- ✓ If the application will work with a narrow flow range
- ✓ If you don't need to work with existing equipment
- ✓ If you are unconcerned that material will plug further in process



SUCCESSFUL APPLICATIONS

Since its introduction in July 2011, Cornell cutter pumps have improved operations at treatment plants experiencing ragging and saved users thousands of dollars in maintenance costs.

CUTTER BLADES SAVE THOUSANDS IN SOUTHERN CALIFORNIA

The following is a testimonial from a Southern California water district's experience with Cornell's Cutter pumps.

"The water district replaced another manufacturer's pump with a Cornell 8NHTA cutter pump in February 2012. After the installation of this new pump, the Maintenance Superintendent went to the station to give it a real test by cleaning the wet well. He indicated that this wet well was very dirty, with a large blanket of rags and trash in which he intends to run through this pump for this test, and to confirm that the pump can be used to clean the wet well on a routine basis. He had the Collections Crew stand by with wash water to wash down the wet well as he pumped this debris through the pump. According to his staff, there were even items such as large plastic sports drink bottles that were running through the pump.

According to the superintendent, the pump never choked, or made any indication of exertion. After the wet well was fully cleaned, his staff opened a volute inspection port to inspect the pump. It was clean and had no debris whatsoever in the impeller or volute.

Needless to say, he was very happy with this progress. So happy they are considering installing new or modifying existing pumps to have at least one cutter pump per station."

~Cornell Distributor



CLOGGING PUMP STATION NEEDS INNOVATIVE APPROACH

A Southwest Washington water district started a waste water management system to address the needs of 77,500 residents. The system has a pump station with 18.4 mgd capacity at 200' TDH.

Shortly after being placed in service in December of 2008, the station experienced daily ragging that caused capacity to degrade from approximately 3,750 GPM to around 2,900 GPM. The decrease in flow reduced the daily output by 1.2 million gallons, effectively increasing the station's operating costs. The system operator tried fixes such as operating at different speeds and different operating levels. They changed the pump order, and instituted a self-cleaning cycle. None of the fixes stopped the ragging. The station was taken offline in April 2009, and operated seasonally. In that capacity it had to be de-ragged twice a day, seven days a week; at a cost of four hours of staff time per day.

Cornell's cutter was placed in the system in 2012. While the cutter reduced some of the issues and increased the flow rate, the eye of the impeller was still getting clogged more frequently than the system operator wanted.

Cornell got to work creating more than half a dozen prototypes designs for new cutters to deal with the plugging of the impeller eye. The final

solution used the stationary cutter from the original cutter system, and added a cutter-auger that extended impeller vanes all the way to the center to cut the ragging material.

The cutter-auger design reduced capacity somewhat, but kept a consistent flow rate throughout the day.

Ragging events were reduced more than ninety percent. The municipal water district is looking at retrofitting other pump stations where ragging is also a problem.

WHAT COULD YOU SAVE WITH CUTTERS?

The Southern California district estimated they saved about \$31,000 per year with the cutters, while the Southern Washington District figured between personnel and electric they were saving more than \$41,000 per year. Most installations save thousands of dollars a year in staff time.

Cost Savings Example:

Average time per event (two workers for three hours)	6 hours
Cost per man hour	\$50
Total direct cost per event	\$300
Events per week:	2
Total annual direct expense	\$31,200
Total man hours saved that can be used maintaining other items	624 annually

WATCH A VIDEO

Use your smart phones QR reader to see a short video about the auger cutter solution for the SW Washington water district, or visit our website at <http://www.cornellpump.com/support/videos.html>



CUTTER PUMP APPLICATIONS



SINGLE TOOTH WEAR PLATE

Useful with very high hay, water foliage and other stringy material content. Tooth holds the material without plugging eye of impeller. Sweeping motion of the cutter blade cuts up the material to pass through the pump.



CUTTER BLADES FOR MANURE

USED ON MANURE BOATS AND FOR STATIONARY LAGOON PUMPING

The trusted source for reliable and dependable pumps to the manure pump industry, Cornell has been a leader in transferring, removing, and pumping for injection for more than 30 years. The cutter allows us to:

- Break up clogs and rough cut
- Work from a boat or stationary location
- Works well with a priming system
- Reduce maintenance, labor, and downtime costs



RENTAL CUTTER APPLICATIONS

Cutters are useful in Rental applications where a temporary installation will best meet the end-user's needs.

Sewer By-Pass: in cases where reconstruction, emergency, or growth call for system that can handle ragging and plugging.

Dewatering: If debris in the dewatering stream could foul an impeller or sheet up and plug a pump, a cutter blade or auger could address the issue.

Hydraulic Transfer: if pulling from less than clean water sources which necessitate cutting debris such as leaves before pumping out of a pond.



INDUSTRIAL CUTTER APPLICATIONS

Food Processing: Dealing with items like chicken feathers or potato peels that can plug standard pumps, are within the cutters capabilities.

Plant Waste Water: if scum or wash down material could plug a standard pump, the cutter is a good option to keep the plant running.

- Poultry/meat processing
- Wood chip clogging in Pulp & Paper
- Stringy material
- Laundry service



CUTTER BLADE DESIGN AWARD 2012 PRODUCT INNOVATION OF THE YEAR, BY PUMPS & SYSTEMS MAGAZINE

The fourth annual Product Innovation of the Year was judged by Pumps & Systems magazine. Dozens of innovative products vied for the distinction of being Product Innovation of the Year, and Clackamas-based Cornell Pump Company's Cutter Pump was judged to be best of the worldwide entries—the previous three contests were won by companies based in Denmark, Ohio, and Germany. The winners, finalists and honorable mentions were chosen by the magazine's editorial advisory board.

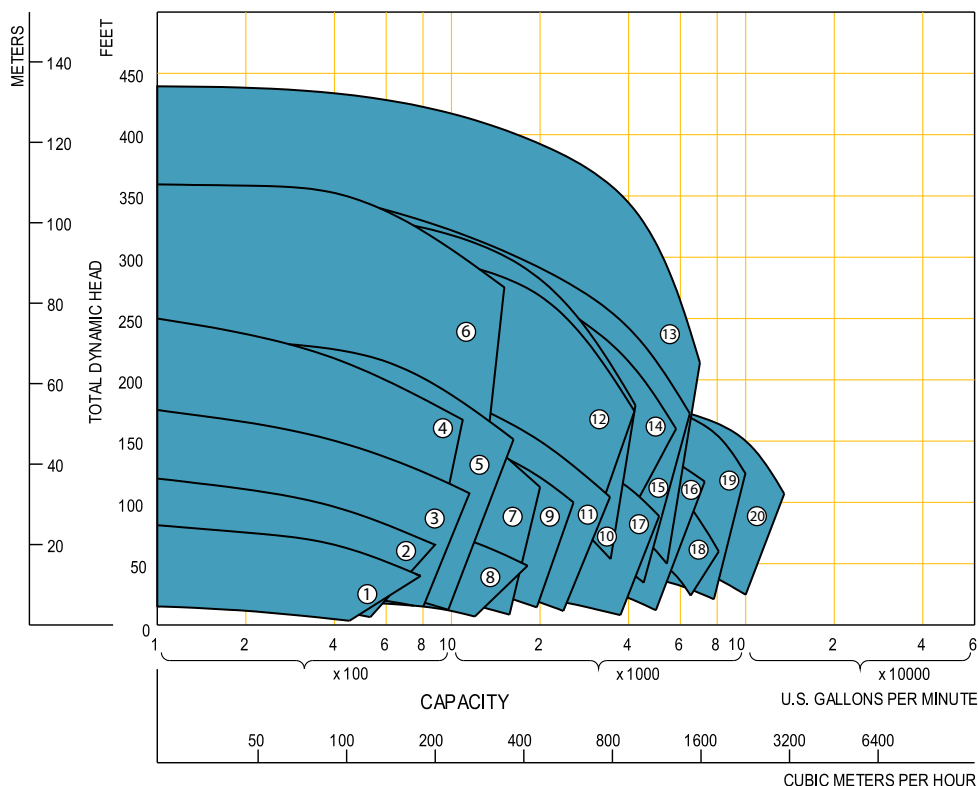
Cornell's Cutter Pump was awarded the prize because of the innovative design that took minimal energy consumption. The review group was also impressed at how effectively the cutters worked at breaking up the clogs. The flexibility of the system was also a key element in the award selection; cutter rings can be added to existing installations, allowing municipalities the benefit of cutters without having to buy all new pumps.

You can read the article on our website, under the application sheet tab: <http://www.cornellpump.com/applications.html>



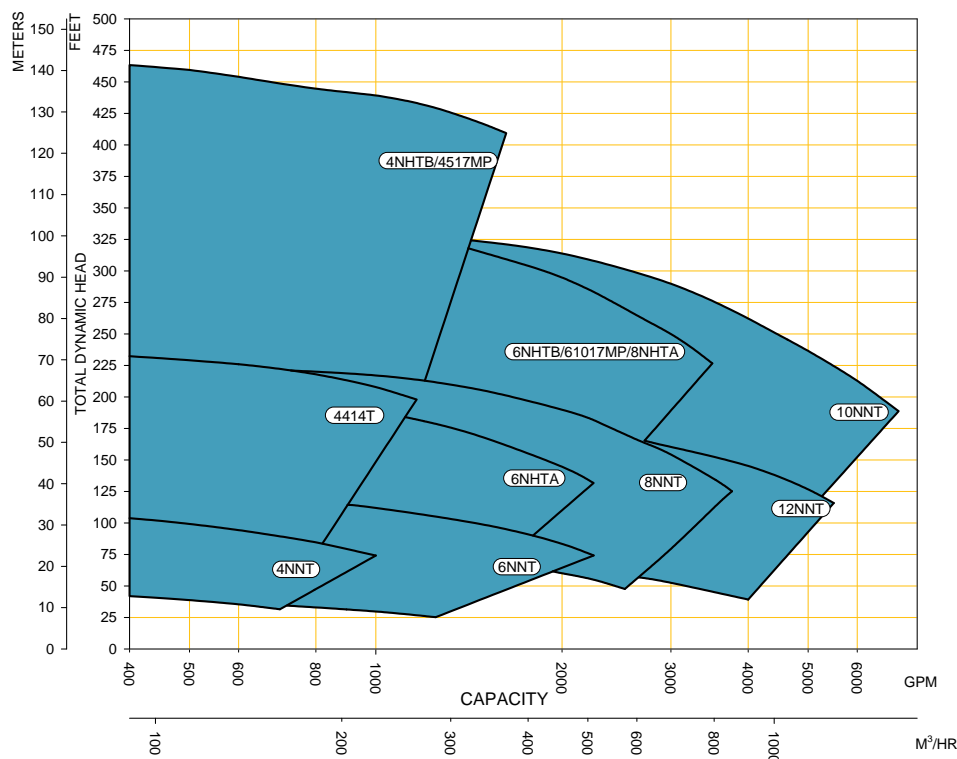
CUTTER CURVES

CUTTER PUMP CURVES

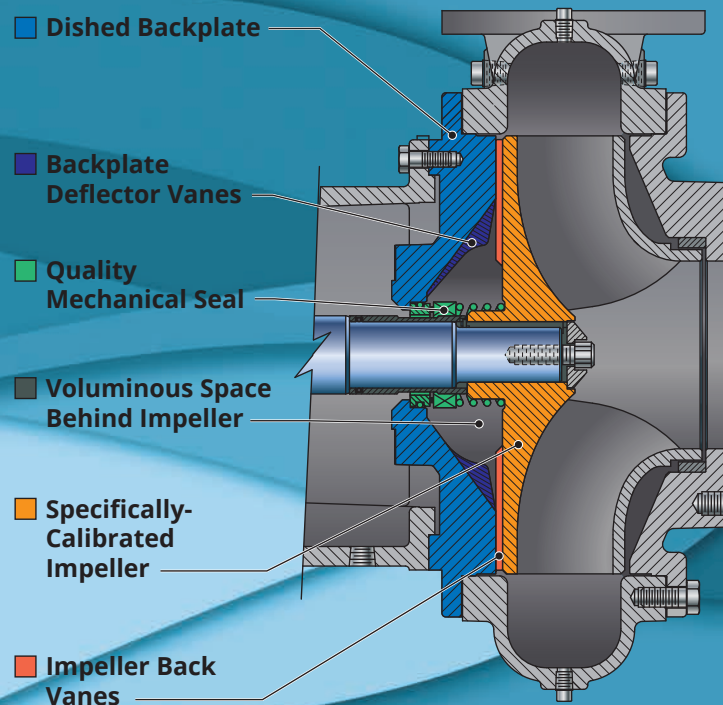


1. 4NNTL
2. 4NNT
3. 4NHTA
4. 4414T
5. 4514T
6. 4NHTB
7. 6NHTA
8. 6NNT
9. 6NHTH
10. 6NHTB
11. 8NNT
12. 8NHTA
13. 8NHTH
14. 8NHTR
15. 10NNT
16. 12NNF
17. 12NNT
18. 12NHTR
19. 14NHG
20. 16NHG22

WASTE WARRIOR CUTTER PUMP CURVES



MINIMUM 20,000 HOURS BEARING LIFE • PATENTED CYCLOSEAL® DESIGN • LOWER OPERATING COST



CYCLOSEAL® —THE SEALING SYSTEM INTEGRAL TO CORNELL PUMPS

The Cutter Blade or Waste Warrior cutter pumps from Cornell feature our patent Cycloseal sealing system, which 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.

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, 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.

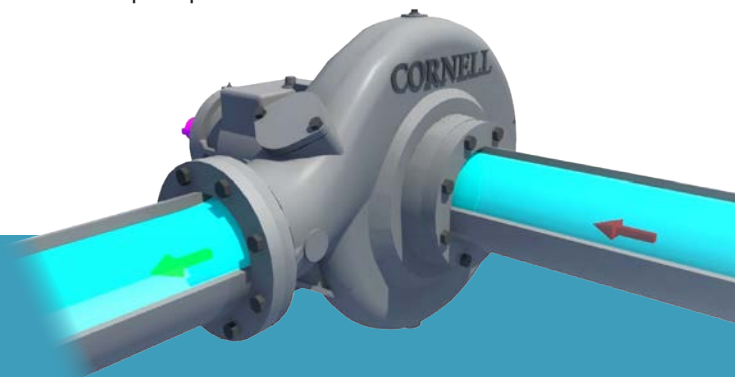
Better for Abrasive Applications: More resilient than packing and standard mechanical seals bathed in grit and other materials, Cycloseal keeps solids away from the seal area for reduced seal wear.

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.

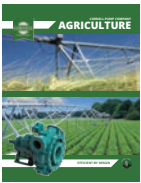
**Watch the Cycloseal video
online to see it in action:**

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





MARKET AND PRODUCT LINE



AGRICULTURAL



FOOD PROCESS



INDUSTRIAL



MINE DEWATERING



MUNICIPAL



REFRIGERATION



OIL & GAS



CYCLOSEAL®



CHOPPER



CUTTER



EDGE™



HYDRAULIC SUBS



HYDRO TURBINE



IMMERSIBLE



MANURE



MP SERIES



MX SERIES



MX MINING



REDI-PRIME®



SELF PRIMING



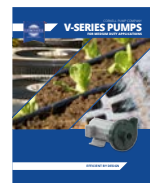
SLURRY



SUBMERSIBLE



WATER TRANSFER



V SERIES

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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