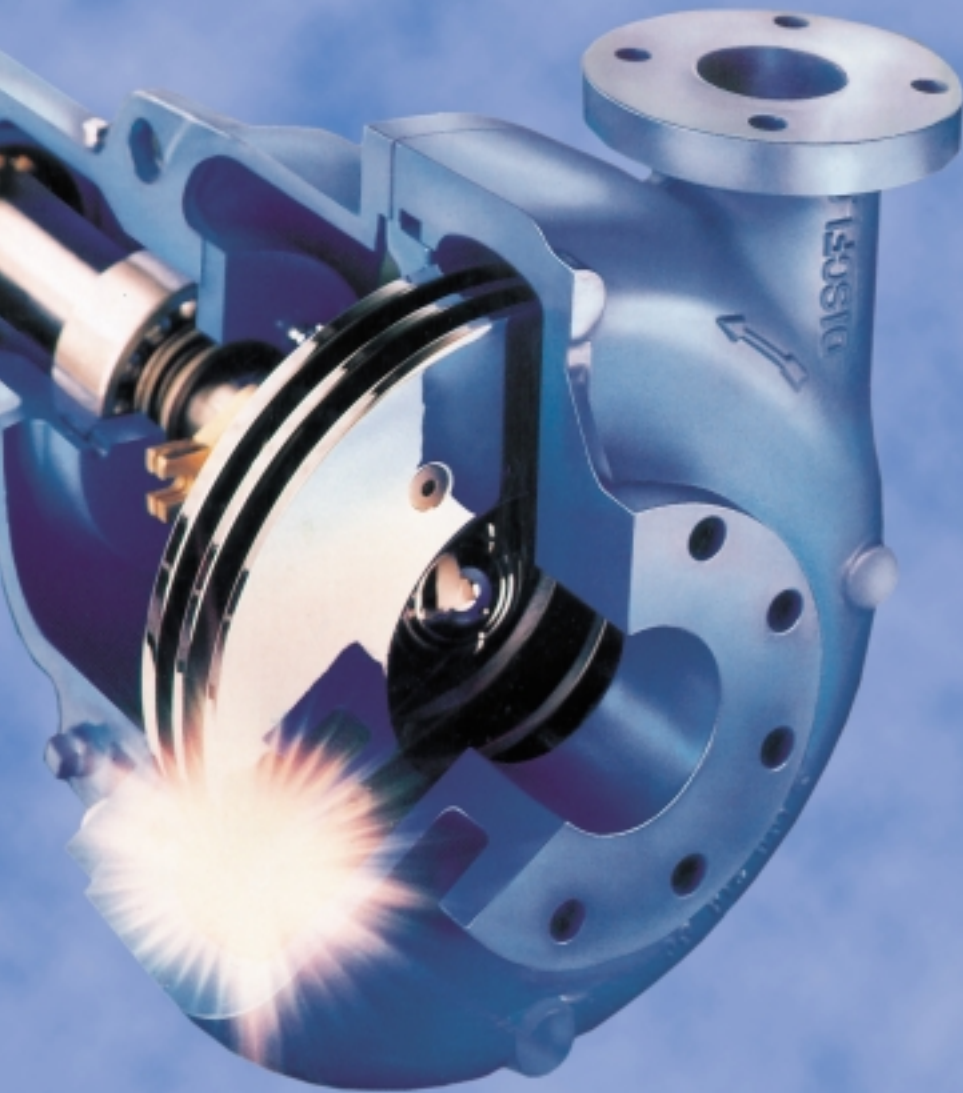


DISCFLO 

DISC PUMPS

For the Pulp and Paper Industry

THE FUTURE OF PUMP TECHNOLOGY



PUMPS

*up to 18%+ density
pulp & paper stock,
with no fiber damage,
no change in freeness*

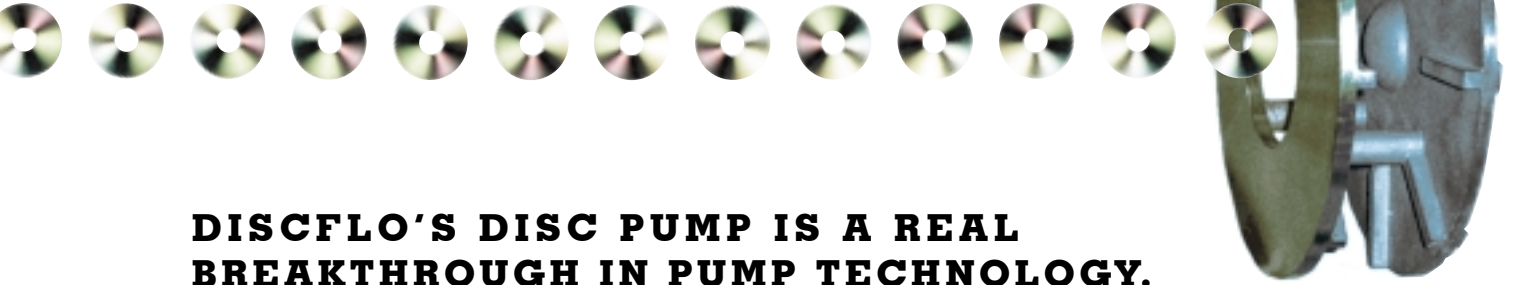
HANDLES

*abrasive, viscous
and/or high solids
fluids*

REDUCES

*maintenance
and downtime
in hard-to-pump
applications*

DISCFLO *and* *the* DISC PUMP



DISCFLO'S DISC PUMP IS A REAL BREAKTHROUGH IN PUMP TECHNOLOGY.

Using a totally unique operating system that differs from other pump designs on the market, it allows you to achieve an unheard-of level of productivity, versatility and exceptionally low Life Cycle Costs in all hard-to-pump applications in the pulp and paper manufacturing process.



- The disc pump has solved some of the toughest problems in the industry. It is able to handle paper stock up to 18%+ density, abrasive and viscous slurries from the chemical recovery process, shear sensitive chemicals such as paper coating slurries, sludge with a high solids content and slurries with high levels of entrained air or gas. The disc pump's superior performance is confirmed by comments by users in pulp and paper mills worldwide, all of whom have reaped significant benefits—both in higher product quality and in reduced wear, maintenance, operating and downtime problems—by moving over to the Discflo pumping system.

● The disc pump technology was developed in the late 1970s. The pumps are manufactured exclusively by Discflo Corporation, founded in 1982, at its international headquarters in southern California, USA.

DISCFLO'S MISSION

*is to become the number one
manufacturer of pumps for
the hard-to-pump
marketplace worldwide.*

*We plan to achieve this through
continuous innovation in pump
design and technology, attention
to quality in our manufacturing
process and dedication to
excellent customer service.*

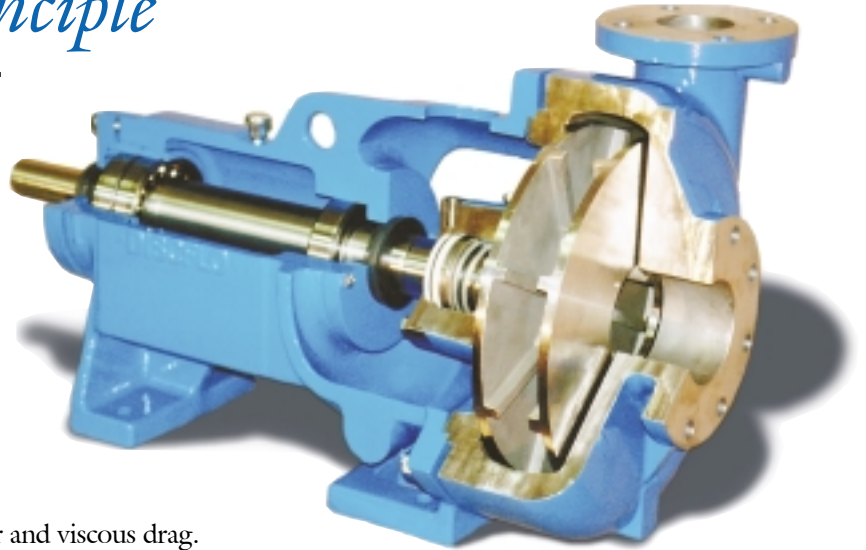
*In reaching our goal, we can help
you reach yours—to solve your pump
operating and maintenance problems
and produce a superior end-product.*

**The Discflo pump allows
you to achieve an unheard-of
level of productivity, versatility
and exceptionally low
Life Cycle Costs.**

The Disc Pump Principle

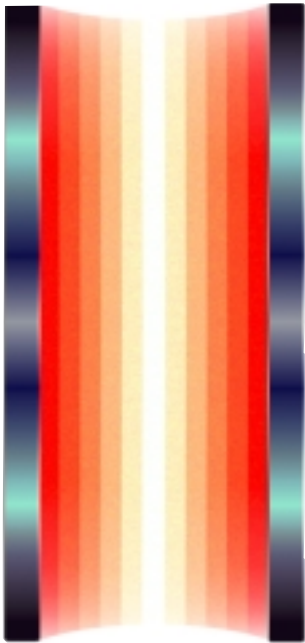
THE DISC PUMP IS A HIGHLY INNOVATIVE PUMP.

From the outside, it has the appearance of a centrifugal unit, but it performs the work not only of centrifugals, but also progressive cavity pumps, lobe and gear type pumps, and in some cases has replaced chopper pumps. The disc pump achieves flow rates from 2 to 10,000 GPM [2250 m³/h] and heads up to 1000 ft [300m].



- Disc pumps use the principles of boundary layer and viscous drag.

The application of these principles is new in the world of pumps but widely used in other areas of fluid engineering, such as causing friction loss through a piping system. Under laminar flow conditions, streams of liquid travel at different velocities through a pipe. Fluid in the layer closest to the pipe is stationary due to drag forces, forming a boundary layer between the pipe and the rest of the fluid, while successive fluid layers flow faster towards the center of the pipe.



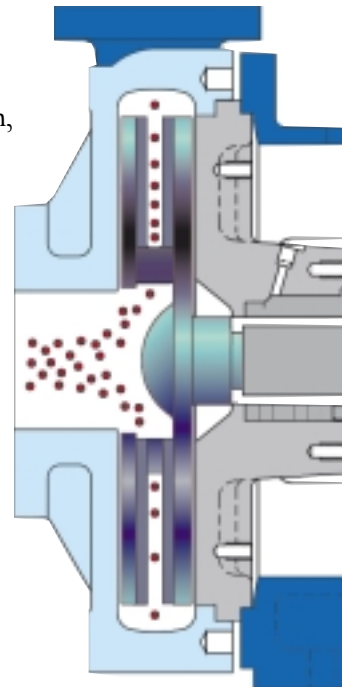
Disc pumps employ the principles of boundary-layer adhesion and viscous drag, which produce pulsation-free, laminar flow.

- Similarly, when a fluid enters the disc pump, its molecules adhere to the surfaces of the Discpac, a series of parallel discs which are the heart of the disc pump. This creates a boundary layer. As the discs rotate, energy is transferred to successive layers of molecules in the fluid between the discs through viscous drag, generating velocity and pressure gradients across the width of the Discpac. This combination of boundary layer and viscous drag causes a powerful dynamic force field that “pulls” the product through the pump in a smooth, pulsation-free flow.

Disc pumps have a non-impingement pumping action, with minimal contact between pump and fluid.

- The fluid being pumped moves parallel to the discs, and the boundary layer creates a molecular buffer between the disc surfaces and the fluid. Consequently there is no impingement of the fluid on the moving parts of the pump. It is this which distinguishes the Discflo pump from other pump systems on the market, all of which use some kind of impingement device—such as a vane, impeller, lobe, hose or screw—to “push” product through the pump.

By minimizing contact between the pump and the material being pumped, wear on the disc pump components is greatly reduced, pump breakdown is almost unknown and, in the case of delicate and shear sensitive materials, damage to the product by the pumping system is virtually eliminated. The disc pump’s problem-solving ability in hard-to-pump applications is unparalleled in the world of pumps... making the disc pump truly the future of pump technology.



Features of the Disc Pump

APPLICATIONS

PULPING OPERATIONS

White liquor (extremely caustic)
Stock and black liquor mixture
Washed stock
Cleaned stock, up to 18%+ density

CHEMICAL RECOVERY

Heavy black liquor, 100,000s cP
Weak black liquor
Weak liquor (abrasive, alkaline)
Green liquor with dregs
(very abrasive, high temperature)
Green liquor (abrasive)
White liquor and mud
(caustic, alkaline and abrasive)
White liquor (hot, caustic and abrasive)
Lime slurry (abrasive, high solids)

POWER HOUSE OPERATION

Ash slurries
Scrubber solutions, lime slurries

BLEACHING PROCESS

Paper stock, to 18%+ density
Sodium hydroxide, high solution
Chlorine dioxide

PAPER MANUFACTURING

Slush pulp
Beater room pulp
Coating & filler clay slurries (very abrasive)
White water, 0.5% consistency or less
(can contain abrasive pigments and clays)
Paper treating chemicals: alum, latex,
rosin, wet strength resins, starch

PAPER CONVERTING

Clay slurries, clay slips
Emulsions: PVDC, PVA, latex, silicone
Starch, raw and cooked
Casein or soy protein, raw and cooked
Wax, paraffin and microcrystalline
Inks, solvent and water-based

EFFLUENT TREATMENT

Sodium hydroxide solutions
Lime slurries
Polymers, coagulant aids
Sludge
Knotter rejects

OPERATING BENEFITS

● Pulsation-free Laminar Flow

Pulsation-free laminar flow ensures no degradation of delicate products or damage to shear sensitive fluids, no dampening required later in the process, and less wear on the surrounding pipework.

● No Close Tolerances

Allows the disc pump to handle large and stringy solids, as well as fluctuations in solids size and volume, without clogging.

● Low NPSH Requirement

The disc pump's NPSH requirement is about one half to a third that of a standard centrifugal pump in the same service conditions due to the smooth laminar flow within the disc pump.

● Ability to Run Bone Dry

The disc pump is able to run dry indefinitely because there is no direct metal-to-metal contact in the pump. *Note: the mechanical seal must still be protected under these conditions.*

● Deadheading Discharge/Starving the Suction

It is possible to deadhead the discharge and/or starve the suction for extended periods of time at normal operating speeds, without damaging the pump. *Note: seal flushing must be continued under these conditions.*

● No Radial Loads

In-house testing at Discflo proves that there are no radial loads on the disc pump shaft during operation, ensuring longer seal, bearing and shaft life.

● Highly Versatile Design

Handles a wide variety of difficult fluids efficiently and effectively, without breaking down in service. The same system can handle fluctuations in temperature, pressure, solids content and even product, without breakdown.

● Long Life for Pump Components

Very few spare parts needed for the Discflo pump over its lifetime. The pump uses a heavy duty shaft which has close-to-zero axial loading and no radial loads, increasing bearing and seal life.

● Low Life Cycle Costs

Proven reduction in maintenance needs, repairs and downtime in hard-to-pump applications, compared to all other pump designs. Savings up to 90% have been reported.

● No De-Watering

Paper stock is gently processed without impingement through the pump—in effect *pulled* rather than pushed through it—as a homogeneous liquid, ensures that de-watering does not occur.

● Maximum Paper Freeness

Independent tests have confirmed that there is no measurable loss of freeness to paper fiber when processed through a properly-sized Discflo pump due to its non-impingement design.

FLUIDS PUMPED



- **Highly Viscous Fluids**

Because the disc pump uses friction, the higher the viscosity, the *more* efficiently it pumps. Fluids—including black liquors, high density stock, and effluent—up to several 100,000 cPs can be pumped.

- **Slurries with a High Solids Content**

Handles slurries containing up to 80%+ solids without clogging, wearing excessively or coming to a standstill. Examples include pumping clarifier sludge, various types of effluent and pigment slurries.

- **Severely Abrasive Fluids**

Pumps the most severely abrasive fluids with no problems and minimal wear, including green liquor dregs, lime slurries, titanium dioxide, and fly ash.

- **Fluids with High Volumes of Entrained Air/Gas**

Handles fluids with very high levels of air/gas entrainment without vapor-locking or causing pump cavitation, including DAF sludge, and paper stock.

- **Fluids Containing Large and/or Stringy Solids**

Discs in the Discflo pump can be spaced as far as 20 inches apart to handle large solids, including effluent, knotter rejects and lime sludge, because solids entering the pump move to the area of highest velocity—the midway point between the discs—and pass through the pump without clogging.

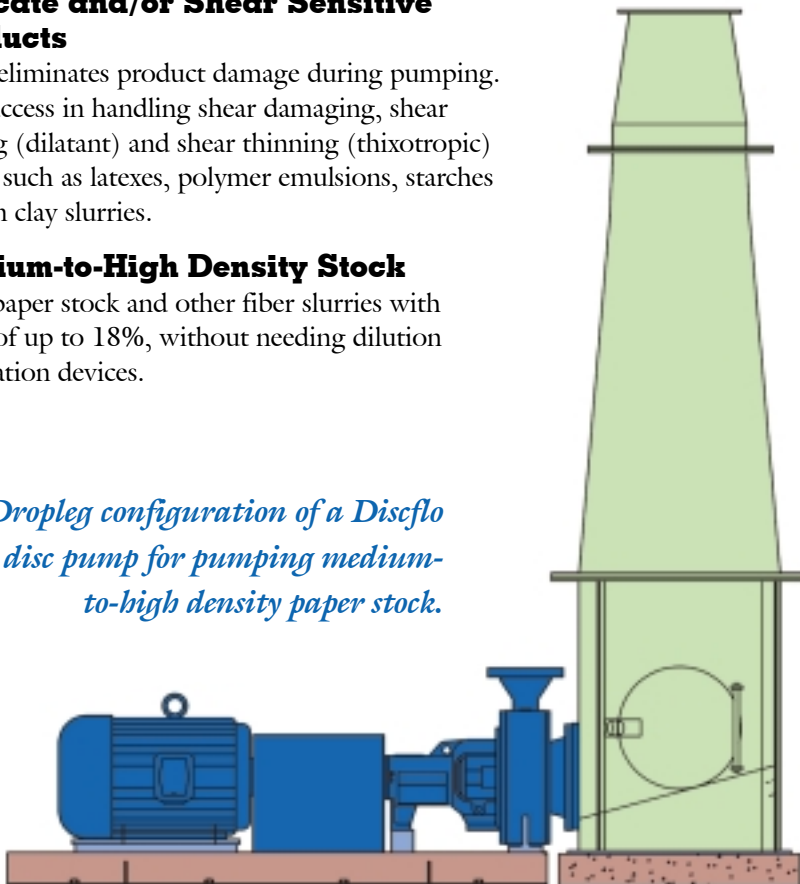
- **Delicate and/or Shear Sensitive Products**

Virtually eliminates product damage during pumping. Proven success in handling shear damaging, shear thickening (dilatant) and shear thinning (thixotropic) products, such as latexes, polymer emulsions, starches and kaolin clay slurries.

- **Medium-to-High Density Stock**

Handles paper stock and other fiber slurries with densities of up to 18%, without needing dilution or fluidization devices.

Dropleg configuration of a Discflo disc pump for pumping medium-to-high density paper stock.



PUMP CONFIGURATIONS & OPERATING RANGE



Discflo's disc pumps are an engineered product, configured to meet the user's needs by varying the number, size and spacing of discs in the Discpac. The table below lists the standard pump configurations. Disc pumps are available in direct-coupled, frame-mounted, close-coupled, submersible, vertical sump, dry pit and cantilever models, with Discpac diameters from 8-inch [203mm] to 20-inch [508mm] and containing from two to twenty discs.

Models	Metric Sizes (mm)	Models	Metric Sizes (mm)
2015-8	50 × 40 × 203	603-17	150 × 80 × 432
302-10	80 × 50 × 254	604-17	150 × 100 × 432
402-12	100 × 50 × 305	804-17	200 × 100 × 432
403-12	100 × 80 × 305	806-17	200 × 150 × 432
604-12	150 × 100 × 305	1008-17	250 × 200 × 432
402-14	100 × 50 × 305	603-20	150 × 80 × 508
403-14	100 × 80 × 305	804-20	200 × 100 × 508
604-14	150 × 100 × 305	806-20	200 × 150 × 508
806-14	200 × 100 × 432	1006-20	250 × 150 × 508
403-17	100 × 80 × 432	1208-20	300 × 200 × 508

The operating service range for standard disc pump models:

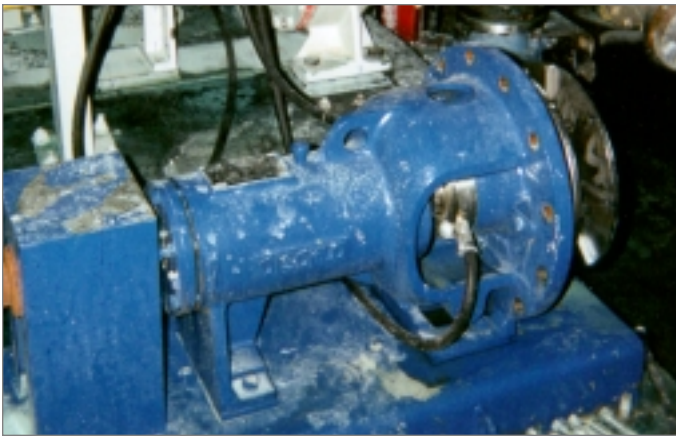
- **Hydraulic flow capacities:** 2–10,000 GPM [0.5–2250 m³/h]
- **Discharge pressures:** up to 1000+ ft TDH [300+ m]
- **Suction pressures:** low NPSHr
- **Working pressures:** up to 1400 psi [95 atm].
- **Operating temperatures:** to 1000°F [523°C]
- **Viscosities:** up to 300,000 cPs
- **Pump speeds:** up to 3600 rpm
- **Solids size (max):** 10 inches [250 mm]
- **Drivers:** electric, diesel, hydraulic, air
- **Metallurgies:** stainless steel, ductile iron, CD4, hastalloy, maxalloy, carbon steel, titanium, various non-metallic materials

Case Studies: Pulp & Paper Mills



CASE HISTORY N° 1

● The UK paper industry's first Discflo pump has reduced downtime in pumping paper stock to almost zero and has cut machine downtime by 12 hours a month, which yields savings of approximately £96,000 [\$150,000] a year. The paper stock, which includes recycled de-inked stock, is around 4% consistency and contains 5–7% entrained air. The pump feeds stock to the paper machine and if it fails, the entire paper machine goes down. The previous pump, a centrifugal type commonly used for stock pumping, suffered frequent breakdown and cavitation problems, due to the high level of entrained air. The mill engineering manager is delighted with the disc pump's performance: "Since start up, the Discflo pump has performed 100%."



CASE HISTORY N° 2

● The green liquor pump shown above has been running for over two years at a pulp mill in Finland. That is over 1½ years longer than any other pump used previously. The first Discflo pump has run 24 hours a day since start up without requiring any maintenance and at a recent inspection, showed no signs of wear. The mill manager is very pleased with the Discflo pump's performance and says: "This pump has really fulfilled its promises." The company subsequently placed an order for more Discflo pumps.



CASE HISTORY N° 3

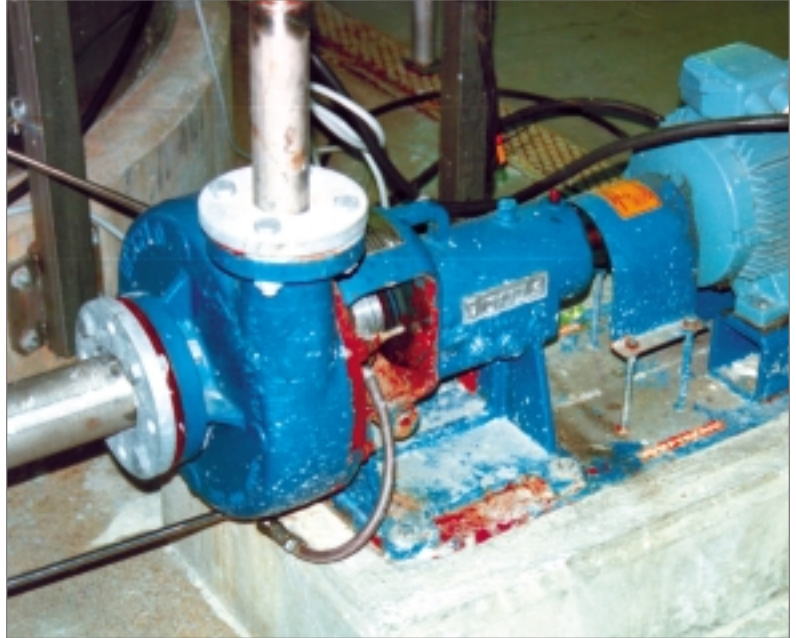
● The clarifier sludge being pumped at this paper mill in Arkansas is 70% sand mixed with water and salt brine. The company previously used two self-priming centrifugal pumps to move 450 GPM of sludge from the cooling tower. These pumps broke down on average once every six weeks and suffered badly from wear due to the highly abrasive nature of the sludge and the high solids content. The plant manager estimated he was spending around \$21,000 per year per pump on spare parts. The company then installed a disc pump to replace the two centrifugal pumps. Since start-up over two years ago, they have been operating with zero downtime.

"Since start up, the Discflo pump has performed 100%."

— Mill Engineering Manager in the UK, commenting on a paper stock disc pump application



*Increasing productivity,
reducing operating costs*



CASE HISTORY Nº 5

● Pumping the liquid ink sludge from the thickener plant was proving a difficult and costly task for this Quebec-based paper mill. The existing air-operated diaphragm pumps were continually breaking down and the maintenance bill was huge. Based on the success of another disc pump installation at the mill, pumping 4% density stock, a number of disc pumps were supplied to the de-inking plant in 1992. They are still successfully operating today. “All the problems we had with the diaphragm pumps and with high maintenance costs disappeared when we installed the Discflo pumps” comments the mill’s senior engineer. “Their performance has been astonishing.”

CASE HISTORY Nº 4

● One of the top paperboard manufacturers in Europe is using the disc pump system throughout its mill in northern Sweden. Applications include pumping lime slurry, black liquor soap, coating waste and lignin/white liquor. One of the toughest uses was pumping a very abrasive and shear sensitive bentonite solution. Since installation of the disc pumps, the plant manager has not purchased any spare parts for these pumps, and has reported no unplanned maintenance or downtime. The company estimates the savings amount to SEK 50,000 to SEK 100,000 [\$10,000–\$20,000] per pump per year, with a return on its investment of between six and ten months.

CASE HISTORY Nº 6

● Disc pumps are being used to pump a 4–7% tissue pulp directly out of the paper machines into production. Prior to installing Discflo units, the mill used two units to pump a 5% concentration with entrained air and encountered frequent downtime problems. Due to its unique boundary layer/viscous drag concept, the disc pumps can handle the variance in pulp concentration and entrained air without any difficulty. The problems experienced prior to installing Discflo disc pumps have been eliminated, and uptime is high.



DISC PUMPS...

The Future of Pump Technology

Disc pumps are available both from Discflo Corporation direct and through your local disc pump distributors. For information about your nearest distributor or the use of this innovative pump technology in the pulp and paper industry, contact Discflo Corporation direct at the address below, or visit our web-site www.discflo.com.



Disc pump have been successfully installed in a wide range of industries, including the following:

- Chemical and petrochemical industries
- Oil refining and drilling operations
- Metal, mining and mine de-watering industries
- Municipal wastewater and utility plants
- Food, beverage and agricultural industries
- Pharmaceutical and bio-medical processing

Disc pumps and the Discpac technology are covered by United States and foreign patents.

Find out what Discflo can do for you today!

DISCFL 

1817 John Towers Ave.
El Cajon, CA 92020, US
Phone: 619/596-3181
Fax: 619/449-1990
e-mail: discflo@cts.com
www.discflo.com

Distributed By: