

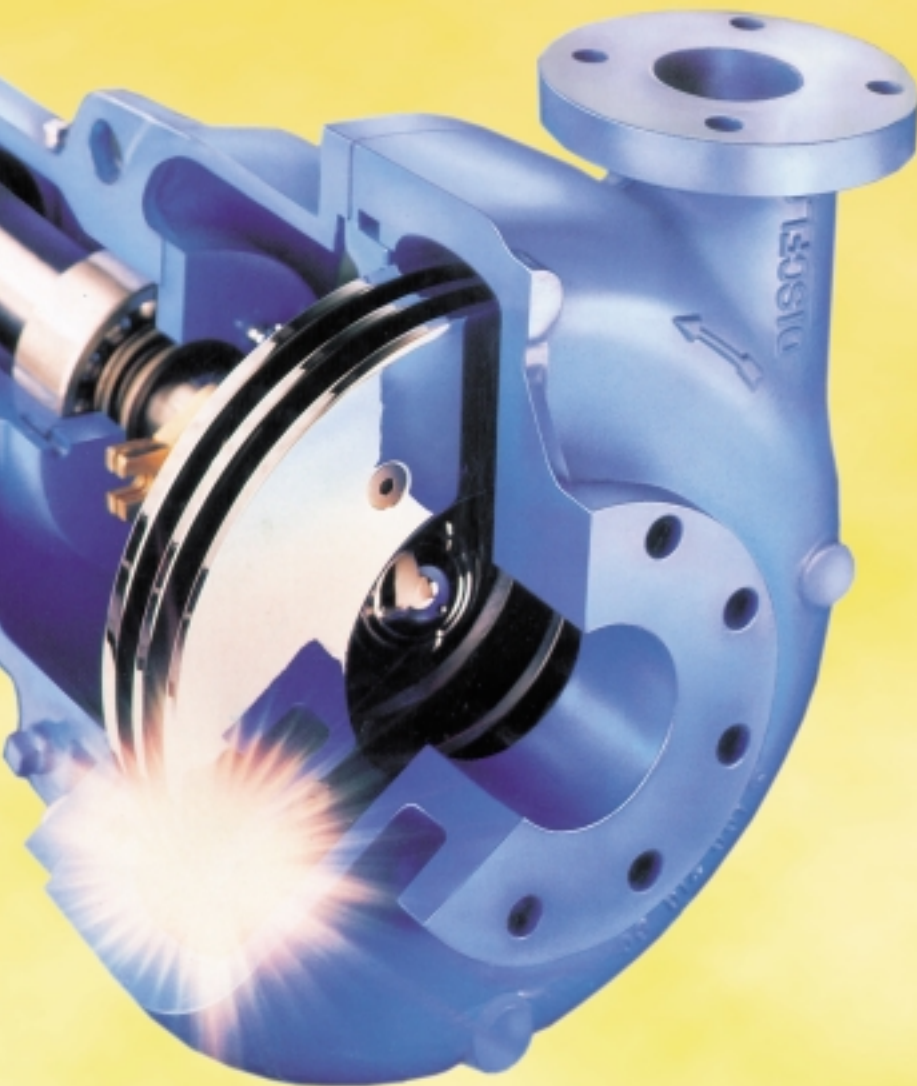
DISCFLO



DISC PUMPS

*For Chemical and
Petroleum Processing*

THE FUTURE OF PUMP TECHNOLOGY



PUMPS

*highly abrasive, high
solids, large or stringy
solids and viscous
slurries and sludge*

HANDLES

*shear sensitive
chemicals and
emulsions with
no damage*

SLASHES

*high operating,
maintenance, and
spare parts costs
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 chemical, petrochemical, petroleum and oil processing industries.



- The disc pump has solved some of the toughest problems in these industries. It is able to pump all types of highly viscous, high solids and abrasive slurries, as well as shear sensitive and delicate fluids. In fact, the ability to handle shear sensitive materials without damage has led to the disc pump becoming 'pump-of-choice' for many of the world's largest chemical companies – one application for pumping crystals, another pumping latex emulsions. The disc pump can also handle fluids containing high levels of entrained air or gas, such as chemical froths and crude oil with gases. The disc pump's superior performance is confirmed by users from chemical and petroleum processing plants worldwide, all of whom have reaped significant benefits—both in higher product quality and in reduced wear, maintenance, operating and downtime problems—by switching to the Discflo technology.

- 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.*

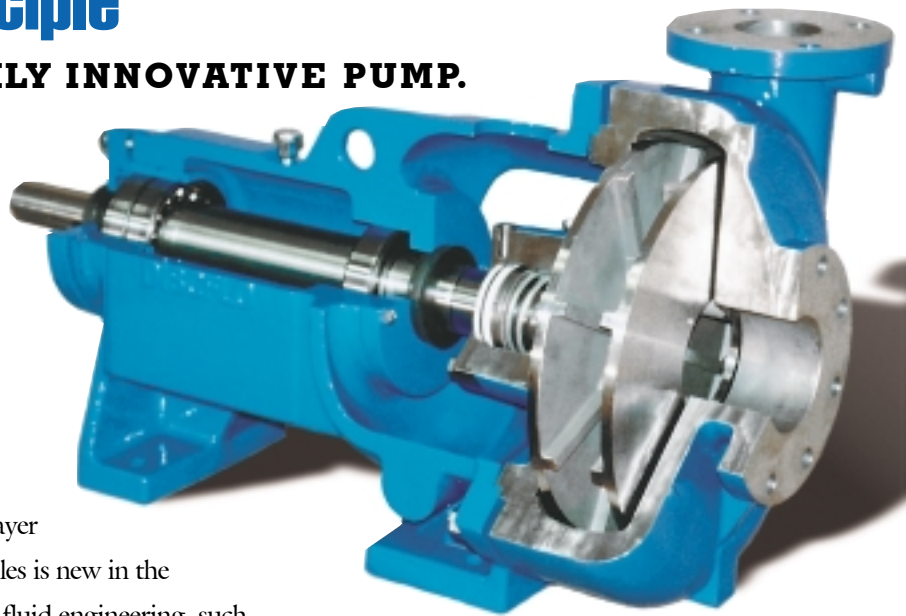
*In reaching our goal, we can help
you reach yours—to solve your pump
operating and maintenance problems
and produce a superior end-product.*

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

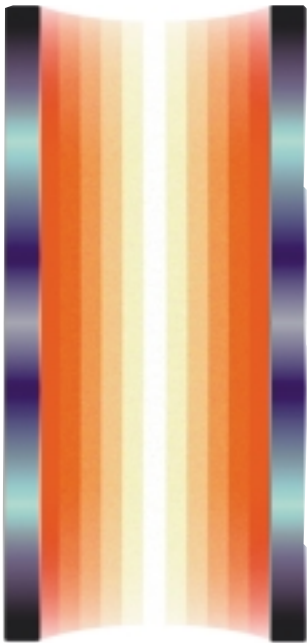
The Disc Pump Principle

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, forming a boundary layer between the pipe and the rest of the fluid. Successive fluid layers flow faster towards the center of the pipe.



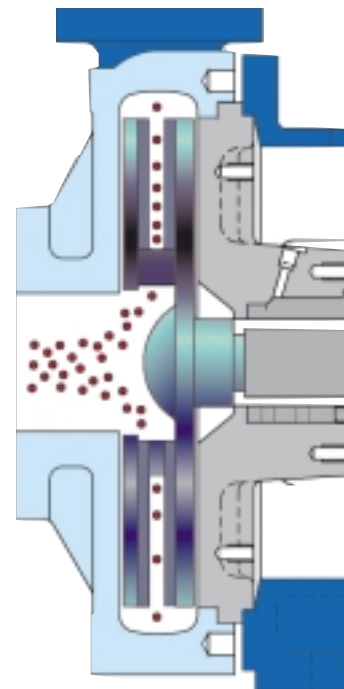
Disc pumps employ the principles of boundary-layer adhesion and viscous drag, to produce pulsation-free, laminar flow.

- 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.

- 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.

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



APPLICATIONS

SPECIALTY APPLICATIONS

- Specialty chemicals
- Batch chemicals
- Reactor feed
- Hydrocarbon condensate
- Column bottom and reflux
- Heavy oil and hot oil

NON-CLOGGING SOLIDS

- Filter press feed
- Latexes
- Polystyrene beads
- Crystal suspensions
- Screen rejects
- Sodium chlorate slurry
- Dye liquor

CORROSIVE CHEMICALS

- Hydrochloric/hydrofluoric acids
- Sulphuric acid
- Sodium sulphite
- Sulphate liquors
- Plating solution/plating acid
- Sea water/brine
- Chlorinated hydrocarbons
- Sodium hydrochlorite

PRIMING CHAMBER PROCESSES

- Industrial sump
- Mine dewatering
- Chemical transfer
- Bilge water removal
- Coal pile drainage
- Tank car unloading
- Filter systems
- Petroleum transfer
- Column bottom and reflux

IN-LINE PROCESSES

- Caustic fluid and acid transfer
- Monomer & polymer transfer
- Waste acid recovery
- Liquor circulation
- Filter feed
- Hydrocarbon condensate return

ZERO LEAKAGE SLURRIES

- Explosive slurries
- Hazardous slurries

CHEMICAL PROCESS SLURRIES

- Sodium hypochlorite (bleach)
- Sodium hydroxide
- Sulphuric acid
- Rail car or tank unloading

Features of the Disc Pump

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 pump model 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 Maintenance/Spare Parts Requirements

Disc pumps suffer little-to-no wear even in severely abrasive service due to their non-impingement operation and laminar flow. Less than 5% of Discflo's business comes from spare parts purchased for repair.

● High Uptime and Reliability

The most reliable pump on the market for hard-to-pump applications. The disc pump has no close tolerances, pulsation-free flow and is based on a non-contact pumping action. All these factors contribute to high uptime by preventing solids from clogging.

● Higher Yields and Improved Quality

When pumping delicate and shear sensitive (e.g. dilatant or thixotropic) products, disc pumps can increase productivity and reduce product losses due to the non-contact pumping mechanism and laminar flow. Savings can be phenomenal – in one application, up to \$10 million/year has been saved.

FLUIDS PUMPED



- **Highly Viscous Fluids**

Because the disc pump uses friction, the higher the viscosity, the *more* efficiently it pumps. Fluids – including tank bottoms, clarifier sludge, tar with coke fines and asphalt – 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 oil and sand slurries, titanium dioxide slurries and drilling muds.

- **Severely Abrasive Fluids**

Pumps the most severely abrasive fluids with no problems and minimal wear, including lime slurries, borax, drilling muds with grit and rocks, and ash.

- **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, and crystal slurries.

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

Handles fluids containing high levels of air/gas without vapor-locking or causing pump cavitation, including DAF sludge, crude oil and chemical froths.

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

Discs in the Discflo pump can be spaced several inches apart to handle large solids. Solids entering the pump move to the area of highest velocity – the midway point between the discs – and pass through without clogging.

- **Corrosive Fluids and Hazardous Materials**

Pumps are available in a wide range of metallic and non-metallic materials to handle all types of corrosive/hazardous fluids, including toxic slurries, nuclear waste and hot acids/alkalis.

- **High Temperature and High Pressure Processes**

Disc pumps can be manufactured to API-610, 8th Edition, standard, making it suitable for high temperature and high pressure processes.

API-610, 8th Edition, build Discflo disc pumps for high temperature and high pressure processes

PUMP CONFIGURATIONS



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. Disc pumps are available in direct-coupled, frame-mounted, close-coupled, sump, submersible, vertical sump, dry pit and cantilever models, with Discpac diameters from 8-inch [203mm] to 20-inch [508mm].

Models		Models	
US (in)	Metric (mm)	US (in)	Metric (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	806-17	200 × 150 × 432
403-12	100 × 80 × 305	1008-17	250 × 200 × 432
604-12	150 × 100 × 305	603-20	150 × 80 × 508
402-14	100 × 50 × 305	804-20	200 × 100 × 508
403-14	100 × 80 × 305	806-20	200 × 150 × 508
604-14	150 × 100 × 305	1006-20	250 × 150 × 508
806-14	200 × 100 × 432	1008-20	250 × 200 × 508

PUMP MATERIALS



METALLURGIES: stainless steel, ductile iron, CD4, hastalloy, maxalloy, carbon steel, titanium

NON-METALLIC MATERIALS: PVDF, Teflon, ceramic-lined, rubber-lined

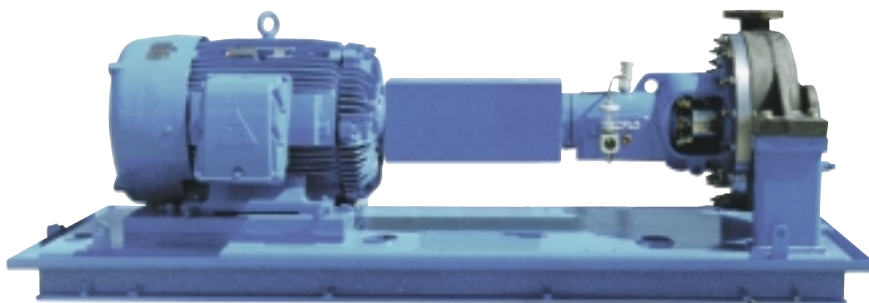
Other specialist materials available on request.

OPERATING RANGE

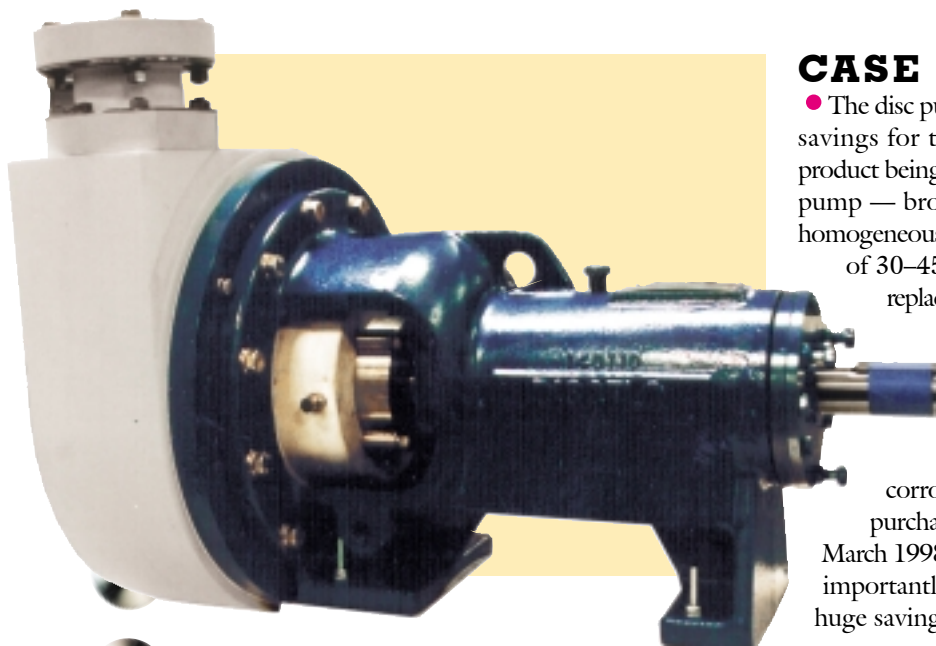


Operating range for standard disc pumps:

- **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



CASE STUDIES: CHEMICAL AND PETROLEUM PLANTS



CASE HISTORY N° 1

• The disc pump's no-shear operation has led to significant cost savings for this chemical company in the Netherlands. The product being pumped is one of the toughest applications for any pump — bromide slurry. The slurry is highly corrosive, non-homogeneous and shear sensitive and has a crystal solids content of 30–45% and a specific gravity of 3.0. The Discflo unit replaced a recessed impeller pump, which suffered excessive corrosion problems. In addition, this type of pump can destroy anywhere from 30% to 60% of the crystals by reducing them to a sand-like consistency. After searching for a pump that would reduce shear to a minimum and cope with the corrosive, high solids nature of the slurry, the company purchased the Discflo pump. The system was started up in March 1998 and since then has been performing very well. Most importantly, crystal losses are now less than 1%, leading to huge savings in raw materials and production costs.



CASE HISTORY N° 2

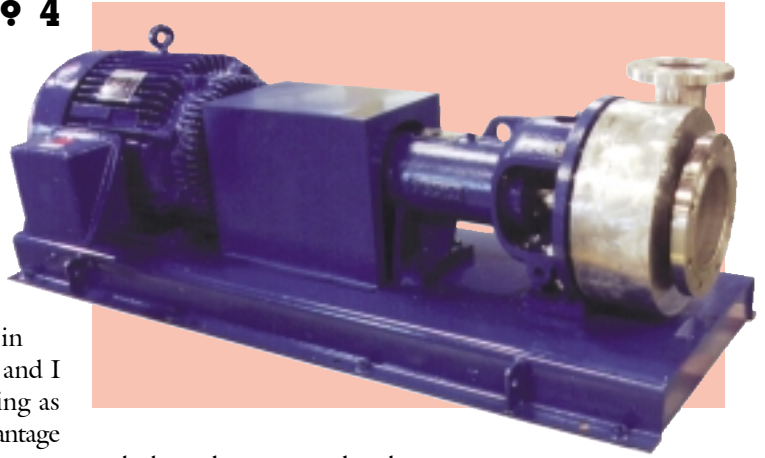
• Eka Nobel AB, one of the leading manufacturers of paper and bleaching chemicals worldwide, has successfully employed the Discflo disc pump technology at several of its plants in Sweden. The first pumps were installed at a meta silicate plant, where the existing centrifugal pumps suffered extreme wear problems and needed a change in packing once a week. The fluid had a sand content of 39–52%, mixed with 40% NaOH, making it abrasive and dense as well as alkaline. A second application at this plant is pumping water glass mixed with sand — a dense, alkaline, hot and abrasive fluid. The Discflo unit supplanted an external gear pump which required maintenance every second month. Eka Nobel has also purchased pumps for pumping perborate slurry, replacing a frequently failing progressive cavity pump. In all these applications, the disc pumps have solved the previous pumping problems.

CASE HISTORY N° 3

• The disc pump's versatility is the key to its success at a major refinery in Torrance, California. The first units were installed in 1993 to pump a viscous, abrasive, hot sludge used in the quenching phase of the coking process. The sludge consists of water, hydrocarbons and about 10–20% solids by weight of various sizes — anything collected from the tank bottoms. The sludge's viscosity varies a great deal from one batch to another; sometimes, it is as viscous as water and at other times 1000 cP. Previously, the refinery used multistage centrifugal pumps. These pumps would fail frequently in service due to the high solids content of the sludge and abrasive wear, running only two to three weeks before repair was required. The disc pumps have solved these problems. Since start up, they have performed exceptionally well and saved the refinery a considerable sum in maintenance and downtime.

CASE HISTORY Nº 4

• A South Carolina-based company was having great difficulty handling latex emulsions with its existing positive displacement pumps. The nature of these pumps caused the shear sensitive products to froth and so plug up the line downstream and eventually rupture the pump impellers. In addition, pressure was continually building up in the pumps, causing the latex emulsion to flow through the safety valves and blow them. "The pumping operation at that time was very maintenance intensive" says the plant process engineer. The answer was to install Discflo pumps in 1994. "We have had no more major maintenance problems and I don't have to worry any more about the safety valves blowing as there is no pressure build up in the Discflo pumps." The key advantage for the company though is the cut in product losses. "There are no more leaks and so our product losses are greatly reduced, giving us a productivity edge over our competitors. These pumps are such a significant step from what we had before ... it's like night and day!"



CASE HISTORY Nº 5

• The project co-ordinator for a leading chemical producer in Kentucky has given the non-metallic Discflo pump very high marks for an extremely tough application. He has tried all kinds of metallic pumps and coated pumps without success to handle the high grade silicon with 15% hydrochloric acid. The Discflo pump was commissioned in November 1997 and has been running non-stop since then. Another benefit has been an increase in the final product quality. "The lower the shear, the less acid in the product", comments the project co-ordinator. "Discflo's low shear technology has significantly reduced the acid content of our product, which in turn has reduced the subsequent processing required, saving time and money."



"Discflo's low shear technology has significantly reduced the acid content of our product . . . saving time and money."

—Product co-ordinator for a Kentucky-based chemical producer

Increasing productivity, reducing operating costs



CASE HISTORY Nº 6

• A disc pump was installed at a chemical plant in Pennsylvania to replace a centrifugal pump for pumping de-benzonized tar. The fluid is highly abrasive and contains coke fines. The centrifugal pump suffered from cavitation and erosion problems, so that the customer had to replace the impellers every 20 days. The disc pump, meanwhile, has performed exceptionally well and has had no unplanned downtime since start-up in 1992.

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 chemical and petroleum processing industry, contact Discflo Corporation direct at the address below, or visit our web-site www.discflo.com.



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

- Pulp and paper manufacture
- 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

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