

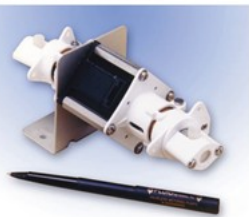


DUPLEX PUMPS SUIT PRECISION MIXING, DILUTING AND PROPORTIONAL METERING

STH and STQ Ratio:Matic® Duplex pumps are ideal for precision mixing, diluting, and proportional metering for OEM medical, analytical, and industrial instrumentation. The pumps consist of two FM1 valveless pump heads direct coupled to a single variable speed drive, a 23 frame stepper motor is standard although other drive types can be used. The displacement of each pump head is independently adjustable, and a variety of pump head sizes can be used in combinations to achieve dispensing ratios from 1:1 up to 500:1. Typically, each pump head is calibrated at the factory, locked in place, and will not require recalibration in the field, even after millions of cycles. Models are also available that can be adjusted in the field for applications that require frequent changes in mixing ratios or dispense volumes. Duplex Ratio:Matic® OEM Pumps feature FM1's CeramPump® valveless piston pump technology utilizing one moving part, a rotating and reciprocating ceramic piston to accomplish both pumping and valving functions without valves. The piston and mated liner are made of dimensionally stable, sapphire-hard ceramics which ensure long term, drift-free accuracy of 1% or better for millions of maintenance-free cycles. For more information contact pumps@fmipump.com

Fluid Metering

Circle 30 on Reader Service Card



HIGH-DEFINITION VIDEOSCOPE INSPECTION CAMERAS ARE RUGGED, WATERPROOF

The new Extech HDV600 High Definition VideoScope Inspection Cameras are rugged, waterproof and drop-proof industrial videoscopes which can deliver images and video with sharpness and clarity regardless of jobsite conditions. The HDV600 main display unit's large 5.7 in. (145mm) LCD monitor with 640x480 resolution is easy to view in outdoor sites, poorly lit industrial spaces, or aircraft maintenance facilities. SD memory capacity includes 15,000 image/4 hr. video capacity and audio annotations help eliminate manual note-taking. Both macro and long depth of field camera tips are available in diameters ranging from 4-6mm. Macro optics are ideal for up-close inspections while long depth of field optics are suited for viewing larger or longer concealed areas. 10m and 30m long fiberglass cables feature 25mm optics. All HDV600 camera tips are equipped with adjustable LED lighting. Users can select from a number of semi-rigid, flexible, and long-length-fiberglass scopes that connect to the display unit. Scope handsets are also available with wired connections to the main unit and wireless models for inspections up to 10m away. Articulated controller handsets feature 320° articulated 6mm scopes and a large, glove-friendly, articulation control knob with adjustable resistance helping simplify inspections of detail-intensive equipment. Extech Videoscopes are tested waterproof to IP67 standards and drop-proof to 2 meters. For more information contact tracy.tumeinski@extech.com

Extex Instruments

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AUTOMATIC BACKPRESSURE VALVE PERFORMS MULTIPLE FUNCTIONS

The new, 1/2 in. lug-mounted Series RVDT automatic valve uses an adjustable non-wetted spring to control backpressure in a piping system. It performs multiple functions in a piping system, including pressure relief, backpressure control, pump bypass, and anti-siphon protection. The set-point is adjustable, and once the set pressure is reached, the valve begins to open. It will allow the rated full flow at approximately 40% over the set pressure. This operation enables the valve to provide a controlled obstruction in a piping system as needed, which is invaluable in providing backpressure on a pump, or backpressure to maintain flow to points of use. It can also be used to open and relieve dangerous pressure in a system. These same characteristics enable the valve to remain closed in the event of downstream vacuum, and prevent siphoning of hazardous chemicals. All wetted materials are thermoplastic and the metal spring is isolated from the process liquid by a PTFE diaphragm. The 1/2 in. lug-mounted RVDT is offered in body materials of Geon® PVC, Natural Polypropylene, Corzan® CPVC, and Kynar® PVDF. Pressure can be set infinitely from 5 to 150 PSI. The valves can be factory modified for special applications. The RVDT automatic valve has applications in water/wastewater pump control, backpressure control in ultrapure water & chemical distribution systems, pressure relief in any liquid piping system, and siphon prevention in potable water treatment. For more information contact info@plastomatic.com

Plast-O-Matic Valves

Circle 32 on Reader Service Card



NON-CONTACTING TRANSIT TIME FLOWMETER MEASURES FROM OUTSIDE A PIPE

The TTFM 1.0 ultrasonic Transit Time Flow Meter measures flow from outside a pipe. Clamp-on sensors mount on the outside of plastic or metal pipes and ultrasonic signals are transmitted through the pipe between the two sensors. The TTFM 1.0 is designed for "clean" liquids such as water, oils and chemicals. Calibration and start-up is simple with the built-in 5-button keypad. Standard features include a large, backlit display and totalizer, isolated 4-20mA output and 2 control relays. Options include a built-in data logger and reporting system with USB output and Windows software. For more information contact info@greylines.com

Greylines Instruments

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Beyond Sealless: Leak-Free Pumps Come of Age

Twenty years ago, the managers of a wide range of manufacturing and liquid-storage facilities would not have been incorrect if they thought that the industry was about to enter "The Age of the Sealless Pump." With stricter federal emissions regulations set to be introduced in 1992, this would have been welcome news for those in the petroleum refining, petrochemical, gas processing and chemical industries where the use of hazardous/toxic materials or other pollutants was prevalent. Faced with tighter control guidelines for these types of emissions, plant and storage-facility operators needed a pump technology that could deliver the environmentally sensitive leak-free operation they demanded, while at the same time addressing maintenance and cost concerns.

Extensive documentation existed to support the thesis that sealless-pump technology was the answer in these applications. For example, in June 1990, Vista Strategies, Inc., a management-consulting firm, produced a report for a leading manufacturer of industrial gear drives, pumps and compressors that predicted, among other things, that:

- The Best Available Control Technology (BACT) for most refining, petrochemical and chemical plants will be sealless pumps.
- The chemical industry is moving to use sealless pumps at a faster rate than the petroleum industry.
- The sealless market will be served two-thirds by magnetic-drive units and one-third by canned-motor units.
- The long-term answer to the new federal regulations will be sealless pumps.
- And, perhaps most significantly:
- Sealless pumps will take an increased percentage of the market – probably 25% by 1995 and 50% by 2000.

A year earlier, a report titled "An Overview of BACT Guidelines for Centrifugal Pumps" prepared by the South Coast (California) Air Quality Management District opined that the No. 1 BACT in terms of efficiency in controlling emissions in liquid-handling applications was sealless-pump technology, which was "becoming increasingly important, especially in the handling of toxic and hazardous fluids."

Looking back, we know now that 1990 did not signal the beginning of the golden age of sealless pumps. The simple fact was that the technology – as it was designed and constructed at the time – wasn't reli-

able enough, with too many instances of failures brought about by bearing and load deficiencies that led to seal and leakage issues. Just as important, these deficiencies created an operational stigma that many manufacturers of sealless pumps are still attempting to overcome today.

But, after all that time, there now exists an innovative sealless pump technology available that eliminates the bearing and load concerns that were affecting the performance of traditional sealless designs. This technology has the capability to create a new category of sealless gear pump that not only eliminates leakage concerns that can compromise safety for both plant personnel and the environment, but also allows the operator to move all types of liquids, from the thin to the extremely viscous, and the hazardous to the benign.

The challenge

As mentioned, any pump design that is deemed to be "sealless" needs to overcome the stigma that has been attached to the technology for more than two decades. In fact, while the reports cited above were trumpeting the use of sealless pumps, efforts began almost immediately to discredit the technology's effectiveness and reliability when handling hazardous or toxic materials.

A report entitled "Meeting Emission Regulations with Mechanical Seals" released in April 1990 by the Seals Technical Committee of the Society of Tribologists and Lubrication Engineers (STLE) stated, "eliminating seals in pumps is not the solution to emission controls." The standards committee included seven leading seal manufacturing companies working in conjunction with chemical company clients. The report went on to say "sealless pumps seem like the perfect solution but rely on bearings being lubricated by the product being pumped. Thus, bearing problems result from converting to sealless pumps." The seal manufacturers effectively removed themselves as the weak link and focused on the perceived, and sometime real, bearing issues.

The report listed a number of perceived problems that were present when rely-



ing on the product being pumped for lubrication, including: poor lubricity of the pumped product; high instances of costly downtime for in-shop repairs; and the elevated chance that leaks will still occur, which exposes plant personnel and the environment to the pumpage. As pump manufacturers rushed their sealless offerings to market, an overzealous sales force misapplied or over applied their product. Initial failures, most common among high-speed centrifugal manufacturers lent credibility to the seal manufacturers' warnings. End users became cautious; those burned would hesitate to consider sealless technology again.

Then, most damningly, the report concluded: "Obviously, there is questionable, if any, benefit (of using sealless pumps) to the end-user who is genuinely concerned with the environment and his personnel."

It's true that the sealless-pump technology available at that time did rely on the pumped product to lubricate the pump's bearings, with some of that product – which could contain hazardous or toxic materials, or volatile organic compounds (VOCs) – being introduced to the atmosphere, but that amount was so small (generally less than 500 ppm) that it is not considered a safety hazard. To combat this leakage, a secondary seal system could be used, but the secondary containment fluids required for this type of system could contaminate the product being pumped. Plus, the secondary fluids would need to be disposed of at some point, which creates another headache for the plant operator.

So, with secondary containment an unacceptable solution to solving product leakage, no matter how minuscule, the ultimate challenge in creating a reliably operating sealless gear pump is in its overall design, especially the interior components.

Traditionally, sealless gear pumps are designed with a cantilevered load where a large rotor gear is attached to the end of the pump shaft. As hydraulic force is applied to the rotor during pump operation extra pressure is put on the shaft and bearings. This pressure can lead to shaft deflection and increased bearing wear, which in turn results in more rotor-to-casing or rotor-to-

head contact wear. The operational result is reduced pressure and flow rate.

The leakage that occurs in traditional sealless pumps results in two types of prohibitive costs for plant operators: maintenance and environmental.

According to The Hydraulic Institute, as much as 40% to 50% of the cost of owning a pump is spent after the pump is bought, due to maintenance issues. The leading causes of high maintenance in sealless pumps is mechanical and packing wear that can damage the pump shaft by scoring it and making it more difficult to seal, and the premature wear of the bushings and close-fitting metal parts due to insufficient support of the pumping elements. There is also an environmental cost of leakage in terms of cleanup and potential local, state or federal fines that may need to be paid in extreme cases – as well as the often-incalculable cost that bad press can result in.

The main point is that leaks cost money. It costs money to replace the raw materials that are lost. It costs money to replace the finished goods that are damaged. It costs money to pay a firm to clean up the spill. It costs money to dispose of the cleanup. It costs money in potential slip-and-fall hazards. It costs money to pay environmental-compliance fines and fees. And it costs money in lowered worker morale, or the need to replace workers who may choose to seek employment elsewhere.

Secondly, traditional sealless gear pumps feature two fluid chambers – a hydraulic chamber where the gears work and a second chamber for the mag-drive coupling unit – joined together by a bracket, which also serves as a barrier between the two chambers. This complicated design requires that a portion of the material being pumped through the hydraulic chamber must be used to cool the magnets in the other chamber. This results in a long, complicated pump with elongated, narrow flow paths and the need for more parts – making the pump more expensive and difficult to maintain, while limiting the viscosity of the liquids that can be pumped, as well as the types of solids that can be handled.

The solution

The approach to finding an ultimate solution to the sealless-pump quandary had to remove the word "sealless" from the development process. When Henry Ford was going about inventing the car as we know it today, he did not start with a vision of how it should look. He just knew that he possessed the technology, know-how and components to create a motor vehicle and his task was to piece them together in a way that best utilized their benefits and features. The result was the Model T, which was the first affordable automobile and one that opened travel for middle-class Americans, and set the standard for generations of automobiles to come.

So, when looking to create a gear pump that is affordable, controls leaks, and reduces maintenance costs and environmental concerns, the first step is to identify the areas where sealless pumps fall short and look to improve on them. As mentioned, the main area where traditional sealless-pump operation is compromised is the bearings and how they interact with, and are affected by, the pump's cantilever load. The second step is to find a superior replacement for the two-fluid-chamber design that complicated the pump's operation and limited its fluid-handling range.

Taking these concerns into account, and approaching the design process with an open mind, resulted in the EnviroGear pump. The EnviroGear pump line is sealless, not because the designers and engineers felt that it needed to be, but because its design enhancements led them to the



Two steps to better protection.

The worker swings the hinged derail onto the rail and then steps over and swings the lightweight flange of SideKick onto its rail. Now both rails have derailing capability. **NEVER use a SideKick alone.** It should always be used in conjunction with an Aldon hinged derail. (The photo shows our Hinged Derail with Pop-Up Sign Holder. The pop-up feature assures that the derail sign will always be upright when the derail is activated.)

SIDEKICK Derail Booster

SideKick works with a derail so that car or locomotive wheels on **both** rails are guided off and into the ballast.

SideKick is especially useful in curved track if, due to space limitations, a derail has to be installed on the inner curved rail. A derail thus placed is less likely to derail without help.

SideKick is installed opposite a hinged derail on the same two ties. Like a hinged derail, SideKick folds down between the rails when not needed.

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by: Dale Evers

conclusion that it would operate most effectively as a sealless pump.

EnviroGear's major design enhancements which overcome the long-time challenges of excessive bearing wear and a fluid-chamber design that complicates operation while at the same time limiting product range set a standard in safe, cost-effective and environmentally friendly sealless-pump design and operation. They are:

- **Between-the-Bearing Support System:** As opposed to the performance-robbing, one-sided support found in cantilevered-load design that exists in traditional sealless-pumps, the EnviroGear pump supports the rotor and idler gears at three locations through the creation and incorporation of:

- A patented Eccentric Spindle supported in the head, the crescent location and the back of the containment canister, eliminating much of the effects of cantilever load. In tests where 200 psi of pressure was applied to the rotor, there was only 0.005 in. of shaft deflection in the EnviroGear pump, compared to 0.056 in. of shaft deflection in a traditional sealless pump.

- Larger diameter materials that provide more rigid support for less shaft deflection and bearing wear. For example, a traditional 3-in. sealless pump will have a shaft that is 1-7/16 in. in diameter; the diameter of the EnviroGear eccentric spindle is 2 in.
 - Large, long radial bushings that support the entire length of the rotating element, which spreads out the hydraulic forces and allows the bushings to last longer. The EnviroGear bushings are also made of premium-grade carbon graphite that will last up to eight times longer than more common bushing materials.

- **One-Fluid-Chamber Design:** As noted earlier, traditional sealless-pump design features two fluid chambers that are separated by a bracket; this design creates operational difficulties while limiting the types of fluids that can be handled. The EnviroGear design has only one fluid chamber with the pump's magnets placed on the back of the rotor and close-coupled, or "piggy-backed," on the rotor gear. This gives the pump a much shorter, simpler flow path. It also allows the pump to easily handle viscosities in the 20,000 to 30,000 cps range, and as high as 50,000 cps, while still maintaining the ability to run thin liquids like caustics and various solvents. These redesigned pumps can also pump liquids and slurries that contain solids.

EnviroGear also offers dimensional interchangeability. The pumps have been designed to be interchangeable with 95% of other gear pumps currently available in the market. So a plant can be running a traditional sealed pump in the morning, have it pulled out in the afternoon and drop an EnviroGear pump into the footprint while reusing the same piping, gear box, motor and base plate, all while receiving the same hydraulic performance as what the previous pump was providing.

While the EnviroGear pump is designed to eliminate all of the operational concerns found in old-style sealless gear pumps, its simple design – which consists of only seven primary parts – a magnet housing, containment canister, casing, rotor magnet assembly, idler gear, eccentric spindle and head – greatly reduces maintenance and environmental costs.

For more information contact Dale Evers@PumpSG.com

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Dover Corporation,
Pump Solutions Group

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CAST IRON THREE-PHASE PREMIUM EFFICIENCY MOTORS



The IronHorse™ general purpose AC motor line now includes cast iron three-phase premium efficiency motors available in horsepower ranges from 1 to 200 hp. Motors are available in speeds of 1200, 1800, and 3600 RPM and are electrically reversible. The three-phase industrial duty T-frame and TC-frame TEFC motors feature ribbed cast iron frames to ensure maximum cooling. They are equipped with solid full frame-length cast iron mounting feet, cast iron junction box with rubber gasket and rubber dust cover. Motor sizes 10 hp and lower are equipped with maintenance-free bearings. Larger motors feature NSK/NTN/SKF brand premium quality ball or roller bearings. These premium efficiency motors are CSA, CE, ISO9001 certified. IronHorse premium efficiency motors are ideal for applications such as pumps, material handling, metal and textile processing, and test stands. Accessories include C-flange kits, which can be used for C-face mounting of the MTCP T-frame motors. For more information contact tgable@automationdirect.com

AutomationDirect

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EXPANDED SERIES OF HEAT TRANSFER OIL SYSTEMS CONTROL PROCESS TEMPERATURES

The expanded line of HTF 350 Series heat transfer fluid systems offers both heating and combined heating/cooling units with capacities ranging from 3 to 24 kW. The HTF 350 Series offers customers a wide range of heating capacities for controlling process temperatures up to 350°F. The HTF 350 features a small footprint, ideal for process applications where space is limited and continuous temperature control is required. Three system configurations are available, each with 5 and 10 GPM flow rates; Heating only – providing up to 24 kW of heating capacity and heating the process automatically upon demand; Cooling only – including a heat exchanger that matches the amount of heat to be systematically removed from the process; and Heating & Cooling – combining both heating and cooling for total temperature control of a process. Standard features include a high-efficiency gear pump; insulated, energy-efficient heater manifold; microprocessor-based controller; NEMA-rated electrical enclosure with safety door disconnect switch; expansion/fill tank; UL 508A labeled electrical sub-panel; and NFPA 79 electrical safety standards. For more information contact rd.kennerly@mokon.com

Mokon

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GAS TURBINE FLOW METER OFFERS ACCURACY AND RUGGEDNESS

Blancett Gas QuikSert Turbine Flow Meter provides accuracy and ruggedness in a unique wafer-style design that allows for quick installation between two flanges. It's constructed from stainless steel and tungsten carbide, ensuring an extended service life even in demanding oil and gas production environments. Explosion proof and intrinsically safe ratings allow QuikSert to be mounted in virtually all Class I Div 1 hazardous areas. With a lightweight rotor design that provides instantaneous response to changes in flow, and full compatibility with Blancett's B2800 Flow Monitors, K-Factor Scalers, Intelligent Converters, and the NEW B3000 series of flow monitors, the Gas QuikSert provides an ideal option for gas flow measurement up to 350 CFM [600 m³/H]. For more information contact billwagner@racinedf.com

Racine Fedated

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HIGHLY RELIABLE DC POWER SYSTEM FOR LIMITED SPACE



Eltek Valere Trilogy DC Power System is powered by the Flatpack2 line of power modules. With a maximum depth of 15 in., the system brings the Flatpack2 modules to applications where space is limited. It uses established components, including the Flatpack2 rectifier, the Smartpack controller, and flexible distribution. It mounts into standard 19 in. and 23 in. telecommunication racks. It meets Agency Standards – NEBS Level 3 (GR-63-CORE, GR-1089-CORE) IEC60950-1, UL 60950-01, EN 55022 (CISPR 22), EN 61000-3-2, EN 61000-3-3-20, EN 61000-4-2, 4-3, 4-4, 4-5, 4-6, 4-8, 4-9, and 4-11. For more information contact sales@psui.com

Power Sources Unlimited

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ROTATING TANK CLEANING NOZZLES PROVIDE EFFECTIVE RINSING

Powered by the flow of cleaning liquid, Tankjet 9 tank cleaning nozzles provide reliable, effective rinsing. The flat spray nozzles mounted in a rotating spray head operate effectively in any position – vertical or horizontal. Tankjet 9 is suitable for clean-in-place and sanitary applications and can also be used for chemical distribution and passivation. The unit is ideal for cleaning brewery tanks, chemical containers, drums/kegs, food processing tanks, pharmaceutical tanks and



wine barrels/vats. Three versions are available. Tankjet 9-A produces two flat side sprays for 2 x 175" coverage for use in tanks up to 6 ft. (1.8 m) in dia.; Tankjet 9-B produces six flat sprays for 360° coverage for use with tanks up to 12 ft. (3.6 m) in dia. and Tankjet 9-C produces six flat sprays for 360° coverage for use with tanks up to 16 ft. (4.8 m) in dia. For more information contact Jon.barber@spray.com

Spraying Systems

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AFP™

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CHROMATOGRAPHIC ANALYTICAL VALVES

- Three main GC valve product lines
- Direct replacement of commercial grade GC valves
- Higher performance grade GC valves (diaphragm and rotary)
- Unique design sample stream selection valves now available with electrical actuation (EDV-Series)

GC ROTARY ACTUATOR

- Pneumatic rotary actuator that can be used directly in an oven up to 300°C
- Electrical rotary actuator that eliminates side loading on the rotor seal

A WORLD PREMIERE

- Our analytical and sample stream selection valves are now available for the NeSS™ platform, as per ANSI/ISA-76.00.02-2002 standard

IS-System

- **PURGE CONICAL ROTARY VALVE** for industrial and instrumentation applications

- Common features:
 - Purge groove design
 - Purge design, eliminating the need for stem packing
 - No fugitive emission or inboard/outboard contamination
 - Self-washing upon rotation reduces wear, increases lifetime

EDV-Series

INTELLIGENT ELECTRICALLY DRIVEN DIAPHRAGM VALVE

- Common features:
 - Servolop torque controlled, compensating for long term wear; maintaining sealing level over the time
 - Green Power: Consumes power only during actuation
 - Sleep mode between actuation

Applications:

- Analyzer auto-calibration systems.
- Electrically controlled sample stream selection system.
- Syringe Pump / Dispenser / Diluter system
- Liquid autosampler

NISA

HIGH TEMPERATURE STACKABLE ACTUATOR

- Common features:
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 - User configurable actuating force with the help of independent stackable cartridge
 - Ideal for atomic layer deposition valves



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