

PUMPS HIT THEIR PRIME

OEMs continue to improve technologies for moving and dispensing liquids and other sensitive products, but manufacturers often fail to do due diligence in selecting the right technology.

By Paul Thomas, Senior Editor

IF YOU'VE got product, you've got to move it along. Particularly as shear-sensitive liquid biopharmaceuticals have proliferated, the industry has paid more attention to pump technology, from filtration and fluid transfer, to formulation, dispensing and fill/finish. While traditional pumps—of the centrifugal or piston variety, for example—have all shown steady improvement in design, materials and finishes, more sensitive and easy-to-clean peristaltic, lobe, and diaphragm pumps have captured significant market share of late.

The challenge is choosing the right pump for each application. “There are probably 50 pump technologies that overlap to some degree,” says Mike Matton, technical sales engineer for process equipment supplier **New England Sales, Inc.** (Pembroke, Mass.). Got a process with a high flow rate and volume? A good centrifugal pump is probably best, Matton says. High viscosity, like a cream or lotion? Try a lobe pump. High pressure, low flow? Mechanically activated diaphragm pumps. Low-shear, low-pressure? Probably a peristaltic tube or hose pump.

Those are merely rules of thumb. In each case, “There’s probably a few different right answers,” Matton says. And a lot of manufacturers get pump selection wrong, and end up with excessive maintenance or downtime.

Matton urges manufacturers to understand their own needs and processes, and to provide pump suppliers with as much information as possible regarding: flow rate and pressure; fluid pH, viscosity, specific gravity, and shear sensitivity; line size, pumping distance, and inlet/outlet conditions.

And it takes more than just one person to find the right fit. “You need a team,” says Matton, including process engineers, maintenance personnel, and line operators.

Several trends are shaping pump technologies for life sciences, says Wallace Wittkoff, global hygienic director for the **Pump Solutions Group** (PSG), which makes and markets the biopharmaceutical Wilden, Mouvex, and Almatec brands. These trends include the increase in continuous processing and the move towards high containment, control, purity, and cleanability.

For Wittkoff, these trends point towards products such as the Almatec Biocor series (photo), what he calls a “fully contained” diaphragm pump designed for “out of the box” pharma use—including a full validation documentation package. This air-operated pump features a design to match diaphragm valves which are already common in these processes and achieve high purity/cleanability goals. The

pumping diaphragms are made of USP Class VI PTFE that isolates the inner/outer environments without use of mechanical seals, reducing the risk of contamination, he says.



What about shear? Like the human heart with no rotating or tight clearance components, the diaphragm pump gently massages product through transfer tubing, says Wittkoff. This is why, for example, diaphragm pumps can be used to pump blood components and other cellular structures at high capacities.

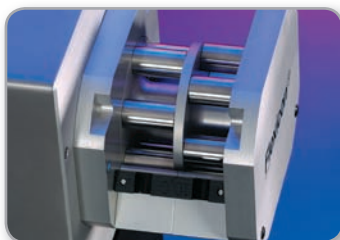
PSG’s Almatec brand also features the UA series pump, which are machined entirely from solid USP Class VI PTFE and are primarily used in permanent high purity applications that are biologically sterile or are discarded after single use.

Lewa, Inc. (Leonberg, Germany) offers a different design of process diaphragm pumps for high pressure processes, which can handle critical or toxic fluids, as well as those with

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extremely low viscosity or abrasive suspensions. The diaphragms come in durable metal or PTFE with their own monitoring systems.

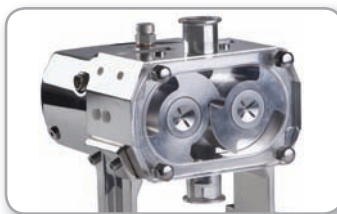
Peristaltic pumps are broadening their applications, says Peter Lambert, national sales manager for the biopharmaceutical division of **Watson-Marlow, Inc.** (Wilmington, Mass.), which markets Flexicon peristaltics. “The benefit of the peristaltic pump is that it doesn’t have seals or mechanical parts, so product is only in contact with the tubing,” Lambert says. The industry trends toward risk-mitigation and single-use technologies have encouraged a shift toward peristaltic pumps, he says.



The knock on these pumps has been that they’re not suitable for high-volume applications such as dispensing. Lambert says that Flexicon has been improving its pump head (photo) and tubing technologies to allow for accurate, high-volume dispensing or filling down to 0.1 mL fill volumes. An example is the PD12 peristaltic dispenser.

“An engineer will say, ‘You can’t beat the piston for reliability,’” says Lambert. “Yes, but things are changing.”

Waukesha Cherry-Burrell has been promoting its Johnson Pump Topwing (photo) of late, a new addition to its product mix in the U.S. It’s an external circumferential piston (ECP) pump with a strong documentation package, says Scott Dillner, director of marketing for WCB parent SPX Flow Technology (Delavan, Wis.).



WCB also offers the Universal II positive displacement pump for biopharma applications: 316 stainless steel rotors and contact surfaces, with 316L stainless or electropolish of contact surfaces optional.

SciLog (Middleton, Wis.) designs pump skids for a variety of applications, each with its own software, user definable alarms and input-output capabilities. The skids can be tailored to filtration, ultrafiltration, chromatography, purification, dispensing and filling, metering, reactor feed and more. The newest large-scale system is the Scipure GMP, used for ultrafiltration.

The SciPro Smart Bioprocessing System is a customizable skid for the above purposes. Users choose their own pump head, whether peristaltic (Watson Marlow, Tandem, Cole-Parmer), rotary lobe (ITT Jabsco), or magnetic gear (Micropump).

Fristam’s (Hamburg, Germany) new stainless steel models include the FKL 205 PD, meant to reduce deflection and wear for long life and low maintenance. The FZX 2350 self-priming pump is for CIP and other entrained air applications.

The **Grundfos** (Bjerringbro, Denmark) CRN MAGdrive pumps (photo) eliminate the need for shaft seals by way of, as the name implies, a magnetic-drive system where the power from the motor is transmitted to the pump by a magnetic field. The liquid end is hermetically sealed,



making the pump leak-free—and a good solution for aggressive or volatile media. The CRN’s hygienic aspects include very low surface roughness, electro-polished parts and Tri-Clamp connections.

Goulds Pumps, a subsidiary of ITT Corp. (Seneca Falls, N.Y.), has developed a new ANSI magnetic drive process pump to handle difficult pharma fluids. The Model 3296 EZMAG (photo) is specifically designed to reduce the risk of leaking toxic or ultra-pure liquids. Applications include product transfer, circulation, and tank car loading.



The 3296 EZMAG features silicon carbide bearings for dry run protection. The pump can handle flows up to 750 GPM (170m³/hr) and operating temperatures from -40°F to 535°F.

Alfa Laval (Lund, Sweden) offers a range of pumps for gentle, precision pumping in hygienic applications. This includes centrifugal and positive displacement pumps, as well as liquid ring pumps for liquids containing air or gas.

Swagelok (Solon, Ohio) offers sanitary centrifugal and positive displacement pumps for a broad range of pharma applications. Wetted parts, such as back plates, and impellers, are electropolished 316L grade stainless steel, offer CIP without disassembly and are also 3-A sanitary compliant.

Centrifugal models offer discharge rates to 750 gal/min (2835 L/min) and head pressures to 315 feet (94 m), 136 psig (9.5 bar). Swagelok pumps feature internal mounted, single mechanical carbon/carbide silicone seals. 