

A Pump Built For Chemical Compatibility

PERISTALTIC (HOSE) PUMP TECHNOLOGY, EPITOMIZED BY THE ABAQUE™ SERIES FROM PUMP SOLUTIONS GROUP (PSG®), PROVES ITS WORTH IN CRITICAL CHEMICAL PRODUCTION AND HANDLING OPERATIONS

By Johannes Meijer



The sheer volume of chemicals that need to be produced to satisfy global demand in many industries requires the use of reliable, efficient and safe pumping technology, such as that offered by Abaque™ Peristaltic (Hose) Pumps (inset).

It's far from hyperbole to say that chemicals help make the world go round. In fact, the chemical industry enables the conversion of a wide array of raw materials into more than 70,000 different products, many of which people around the world use on a daily basis. This reliance on chemicals and the products that they help produce has made the chemical-processing industry a €2.4 trillion (\$3 trillion) behemoth, which accounts for nearly 10% of all global trade. With a compound annual growth rate of nearly 8%, it's also safe to say that chemicals will continue to be a fulcrum in the global economy well into the future.

Thanks to its sheer size, the chemical industry features a number of sub-sets, each of which holds its own unique manufacturing, transferring, transporting and handling challenges. Among the most critical chemical applications are the ones that involve the use of dangerous chemicals, those that – if mishandled – can pose a palpable threat to production-facility personnel and the environment.

Therefore, dangerous chemicals, which are classified as being highly corrosive, toxic or potentially explosive, require cautious and vigilant handling.

In addition to cautious handling, the sheer volume of chemicals that need to be produced in order to meet global demand also requires a production process that can reliably and consistently meet production quotas. This means identifying and incorporating a pumping technology that not only is compatible with the myriad types of chemicals, dangerous or not, that are being manufactured and used at one time, but also one that can meet the unwavering demands of product flow and volumetric consistency.

This white paper will highlight why one type of pumping technology – positive displacement peristaltic (hose) pumps – can rise to the challenges inherent in the manufacture, transfer, transport and containment of many of the world's unique chemical configurations.



The Challenge

The design and operational characteristics of peristaltic (hose) pump technology, which was patented in 1925 in France, make it a wise choice in a wide range of chemical-handling applications – from moving viscous and/or abrasive slurries to the transfer of water-thin, non-lubricating fluids and shear-sensitive materials. These characteristics make peristaltic (hose) pumps ideal for the full array of diverse operations within the chemical-processing industry.

Peristaltic (hose) pumps satisfy the requirements of such a wide range of chemical applications because their operation is based on the alternating contraction and relaxation of the hose, forcing the contents to move through the pump and into the discharge piping. A smooth-wall, flexible hose is fitted in the pump casing and is squeezed between shoes on the rotor and the inside of the pump casing. This rotating action moves the product through the hose at a constant rate of displacement. The hose restitution after the squeeze produces an almost full vacuum that draws the product into the hose from the intake piping. The pump casing is lubricated to cool the pump and lengthen the service life of the shoes and hose. Since the product only contacts the hose and not the internal pump components, this pumping technology is very suitable for abrasive and corrosive applications.

This pump style also maintains excellent volumetric consistency, making it ideal for the strict dosing applications that can be found in chemical processing. The pump's seal-free design makes it dry-run, self-priming

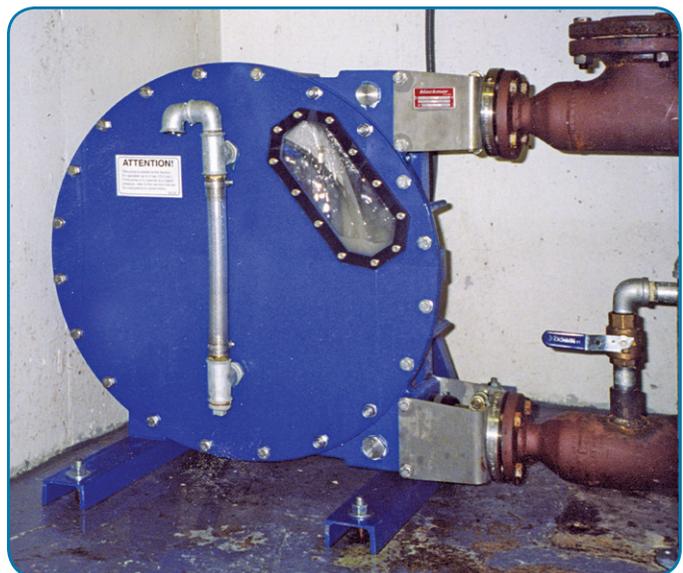
and low-slip capable, and eliminates any potential leak or contamination points while simultaneously providing superior suction lift. Finally, peristaltic (hose) pumps are easy to operate and easy to maintain. The pump's reversible operation also allows for pumping in both directions.

However, while peristaltic (hose) pumps can be a workhorse in chemical-handling, concerns regarding the pump hose's chemical compatibility are ever-present. For example, these are just some of the diverse chemicals that a peristaltic (hose) pump may encounter during its operational life:

- Sodium hydroxide
- Sodium hypochlorite
- Cyanide solutions
- Calcium hydroxide
- Sulfuric acid
- Catalytic agents
- Plating solutions
- Solvents
- Resins

In order to successfully handle this gamut of fluids, the pump's hose – which, because of its seal-less design, is the only component to actually come in contact with the pumped medium – needs to achieve the highest level of chemical compatibility, while also being able to reliably deliver the millions of pumping cycles that are required during its lifetime.

Another consideration when selecting a hose material is its "fatigue resistance." This trait defines how resistant to failure the hose material is as it runs through its millions of pumping cycles. A hose material that is susceptible to developing cracks and holes relatively early in its



The design of peristaltic (hose) pumps allows them to handle a wide array of product-transfer applications within the production of chemical compounds.

operational life is not as desirable as a material that can reliably handle the demands of the repeated contraction and relaxation of the hose. The reinforcement construction of the Abaque hose and its use of rubber compositions that have been specially designed for the stresses within the peristaltic hose allow for the optimum life cycle and performance.

The Solution

While peristaltic (hose) pumps can be a reliable component in the optimization of chemical manufacturing and handling operations, one specific pump brand has risen above the competition to be a top choice among chemical processors – Abaque™ Series Peristaltic (Hose) Pumps from Dover Corporation’s Pump Solutions Group (PSG®). PSG was formed in 2008 and has grown to become a global corporation with world-class facilities in the United States, France, Germany, India and China.

Abaque Series pumps feature a seal-free design that eliminates leaks and product contamination, which enables them to handle the chemical industry’s toughest pumping applications, from abrasive and aggressive fluids to shear-sensitive and viscous materials. The pumps, which can run in either forward or reverse, are self-priming and offer suction-lift capabilities to 9 meters (25.5 feet), as well as the ability to run dry continuously without adversely affecting the pump’s performance. Ductile-iron and steel construction lets the pump produce discharge pressures as high as 16 bar (232 psi).

The Abaque pump’s hoses are available in three materials of construction, all of which have been chosen because of their high levels of chemical compatibility and fatigue resistance:

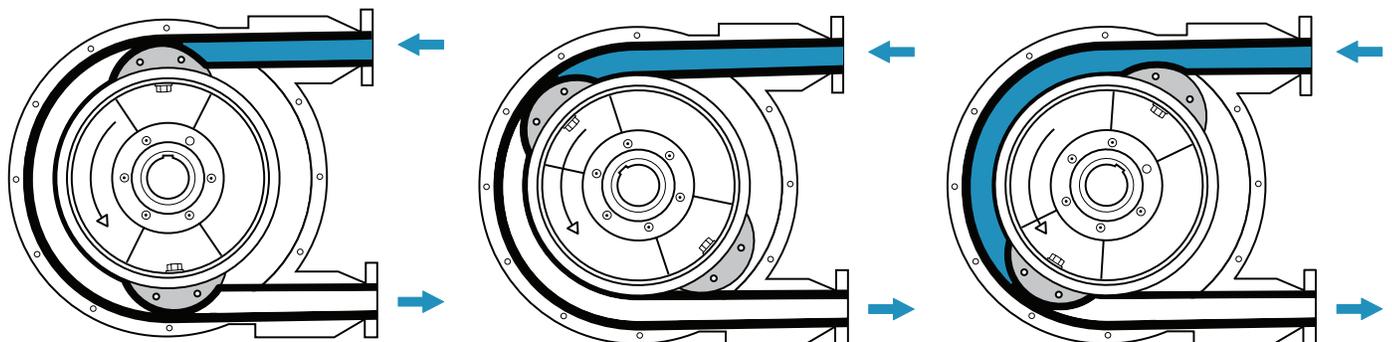
- **Natural rubber** – highly resilient with excellent abrasion resistance and strength; ideal for use with diluted acids and alcohols
- **EPDM** – high chemical resistance, especially when handling concentrated acids, and alcohols
- **Buna®-N** – highly wear resistant to oily products

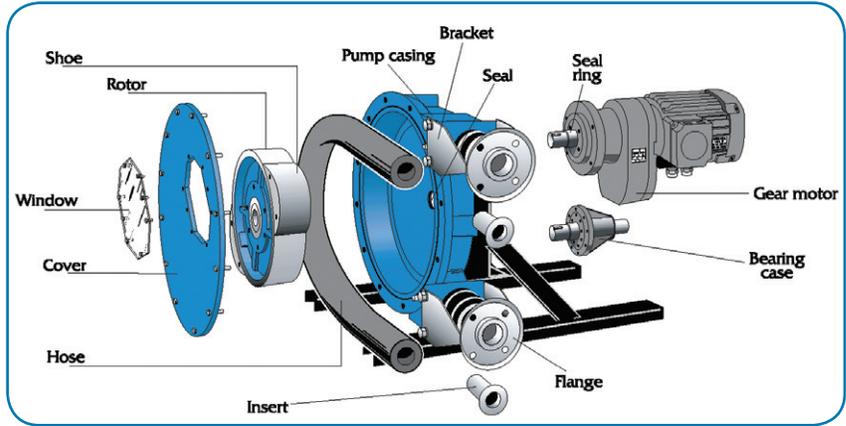
Abaque pumps are available in 10 different sizes and 19 total models with flow rates ranging from 1.7 to 1,249 L/min (0.46 to 330 gpm). They have been designed to handle products with water-like viscosities to those as high as 70,000 cSt (352,000 SSU), solid particle sizes from 1.5 mm to 18 mm (0.06 inches to 0.71 inches) and soft particle sizes from 1.5 mm to 31 mm (0.06 inches to 1.22 inches). All Abaque pumps can handle product temperatures ranging from 0°C to 80°C (32°F to 176°F) with models featuring an EPDM hose capable of handling maximum temperatures to 90°C (194°F). Optional equipment includes hose-failure detectors, vacuum kits and non-metallic inserts.



Maintaining strict dosing rates in chemical production is a constant concern and the operation of Abaque Peristaltic (Hose) Pumps delivers the volumetric consistency that is required.

Below: The Abaque pump’s hose restitution after the squeeze produces an almost full vacuum that draws the product into the hose from the intake piping.





The simple design of the Abaque Series Peristaltic (Hose) Pumps features a seal-free design that eliminates leaks and product contamination, which enables them to handle the chemical industry's toughest pumping applications.

Conclusion

The chemical universe is one of the most diverse in the global economy. This diversity means that the pumps used in their manufacture, transport, handling and containment must be nimble and versatile enough to cope with fluids with many different levels of viscosity, temperature, corrosiveness, toxicity and abrasiveness, to name a few. These varying product characteristics must also be successfully handled while adhering to strict production quotas. For more than 80 years, peristaltic (hose) pump technology, as epitomized by the standard-setting operation and reliability of the Abaque Series Peristaltic (Hose) Pump family from Pump Solutions Group (PSG), has been a leading choice for chemical producers and processors who know the value of highly reliable, environmentally friendly, maintenance-free pump operation.

ABOUT THE AUTHOR:

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