ACHIEVING FULL CONTAINMENT WITH DANGEROUS CHEMICALS

There is an old adage, usually credited to the first chancellor of Germany, Otto Von Bismarck, that 'Laws are like sausages, it is better not to see them being made'. The implication is that reaching the consensus required to create a new law can often be unpleasant and it may be best not to know what the actual 'ingredients' are and how that consensus was reached.

The same can said for a number of industrial processes, whether it be the refining of petroleum products, manufacture of pharmaceuticals or the treatment of wastewater. In many cases, these processes require the use of many dangerous chemicals. Among them can be strong acids and caustics like hydrogen chloride (HCl), hydrogen fluoride (HF), nitric acid (HNO_3), sulfuric acid (H_2SO_4), potassium hydroxide (KOH) and sodium hydroxide (NaOH). There are also dangerous solvents like toluene, a colorless, water-insoluble liquid that can cause a series of severe reactions in the body when exposed to humans, and xylene, a slightly greasy, colorless flammable liquid with some level of acute toxicity.

These substances are also invaluable in the manufacture of consumer products. The challenge for manufacturers and users of these dangerous chemicals is to construct, handle and transfer them in a way that eliminates any chance for their release into the atmosphere where they can harm humans or the environment.

01
The plastic solid-body construction of Almatec® E-Series AODD Pumps eliminates the small crevices or cavities that can be found in injection-molded models

02
The need to use hazardous or dangerous chemicals in the manufacture of numerous products or the completion of a wide array of industrial processes is a fact of life

THE CHALLENGE

The risk from handling dangerous chemicals includes severe health consequences if they are released but also that these chemicals are often very expensive and any loss has a direct effect on the manufacturer's bottom line.

Since many chemicals can be highly corrosive, the pumping equipment used to transfer them is prone to chemical attack if the materials of construction are not compatible with the acid, caustic or solvent. Another area to focus on is the actual design features of the pump. For example, if the design incorporates mechanical seals or packing, they may be prone to leaking.

Attempts have been made to circumvent the shortcomings of pumps that feature mechanical seals through the implementation of magnetic couplings or double barrier seals. While these methods of containment do outperform mechanical seals, there are shortcomings that limit their effectiveness. The viscosity range of liquids that are transferred by pumps with magnetic couplings is limited by the amount of transferable torque that can be created. The use of pumps with double seals or barrier liquids can be impractical due to their high cost and the elevated level of maintenance required.

Some common pump styles that have traditionally been used to handle dangerous chemicals include lobe, gear and centrifugal models. While they may be constructed of chemical-compatible materials, their design features mechanical seals, the performance of which can be compromised over time, raising the possibility that leaks will occur.

In terms of actual performance, these competitive pump styles also have shortcomings when it comes to the reliable, energy-efficient transfer of dangerous chemicals. Gear pumps, for instance, move liquids through the meshing of gears. Over time, however, as the gears wear, the pump's volumetric consistency is adversely affected, resulting in unreliable flow rates and increased energy usage. The operation of both gear and centrifugal pumps can create turbulence in the pumped liquid, which can lead to shearing that can damage or alter the liquid's chemical properties. Since they are not true PD pumps, lobe models can be subject to product slippage, which can make attaining a consistent flow problematic and

result in compromised production rates.

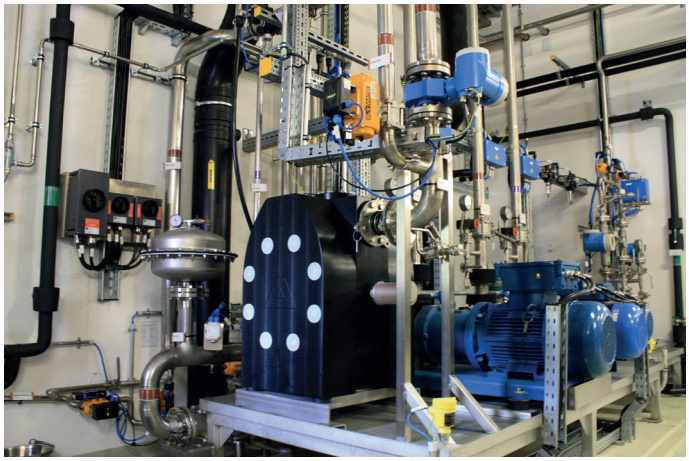
THE SOLUTION

Plastic solid-body AODD pumps are the preferred choice over their injection-molded cousins. In general, solid-body AODD pumps are stronger and have a longer life cycle with less required maintenance. Injection-molded plastic pumps can have small cavities or crevices in the body where liquids can accumulate and potential leak paths can be created. During their operation, injection-molded pumps can also bounce more than solid-body models, which can loosen pipework and increase the chances for a product leak.

Plastic AODD pumps can also be constructed of materials compatible with the chemicals being handled, which eliminates corrosion and leak concerns. The overall design and operation of AODD pumps gives them dry-run capability and good controllability, while they are seal-less. Their compressible drive medium permits gentle delivery with attenuated pressure peaks. Start-up is simple and the space required is considerably less than in the case of piston-actuated diaphragm pumps or eccentric screw pumps.

E-Series pumps from Almatec® are CNC-machined from solid blocks of polyethylene (PE) or polytetrafluoroethylene (PTFE) and feature a unique stainless-steel containment ring and ring-tightening structure to help create consistent high-torque compression. The PERSWING P is a lube-free valve with only two moving parts that allows the E-Series pump to achieve superior flow-rate efficiency and air consumption.

The E-Series pump's housing can be constructed of PE, PTFE, PE conductive or PTFE conductive. Additional versatility in regards to material compatibility is realised through the availability of EPDM, PTFE/EPDM and NBR diaphragms; EPDM, PTFE, NBR and stainless-steel ball valves; and PTFE cylinder valves. E-Series pumps constructed of PE/PTFE meet the requirements of the ATEX 94/9/EG directive.



CONCLUSION

While we may not want to know what types of dangerous chemicals, solvents, caustics or acids are being used to make paints, detergents, paper and fertiliser, we also know that we can't live without them and that we don't want them to be released to the atmosphere or environment.

Full containment of these hazardous, flammable or explosive substances is a front-of-mind concern for plant operators. Those concerns can be alleviated, however, through the use of pumping equipment that has been designed to achieve full containment of dangerous chemicals.

FOR MORE INFORMATION:

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