

The Case for AODD Pumps In Filter-Press Systems

AH SERIES AODD PUMPS FROM ALMATEC® OFFER THE RELIABILITY AND PRODUCT-CONTAINMENT CAPABILITIES NECESSARY FOR SLURRY-HANDLING AND SEPARATION IN WATER/WASTEWATER OPERATIONS

By Peter Schüten



Filter presses take a slurry that contains both solids and liquids and uses a series of filters to “dewater” the mixture so that slurry “cakes” are formed while the remaining liquids are filtered out. AH Series AODD Pumps from Almatec® are a popular choice in filter-press systems because they offer reliable high-pressure operation and product containment while being compatible with the many abrasive or corrosive fluids and chemicals that are a staple of the process.

Introduction

The first filter presses were invented in the 1850s in Great Britain and were tasked for use in the process of separating seed oils. It wasn’t until the 1950s, however, that the technology fully matured and became a viable and reliable choice in a number of industries. One that has welcomed the filter press as a key component in its various operations is the water/wastewater industry.

The filter press is ideal for water/wastewater applications because of the large amount of separation of solids and liquids that are required to take place. In general, a slurry that combines both solid and liquid components must be separated. As the slurry is introduced to the filter press, two chambers are filled with the resulting formation of thick slurry “cakes.” As the chambers fill, the pressure inside the filter-press system increases and when the chambers reach capacity, the liquid is filtered out with the aid of streams of compressed air or water in a process known as “dewatering,” leaving behind solid slurry or sludge cakes for disposal. One of

the major advantages of this process is that instead of having to dispose of large amounts of wet slurry, the user ends up with a flow of neutralized water and a comparatively small amount of filter cake, which noticeably reduces disposal costs.

A key piece of equipment in the filter-press process is the pump that sends the particulate-laden slurry into the filter press. For many years, positive displacement pump technologies like the piston diaphragm pump, hose piston pump and progressive cavity pump were used for slurry transfer. However, this article will illustrate that there is another type of positive displacement pump technology—air-operated double-diaphragm, or AODD—that has been proven to outperform competitive technologies in water/wastewater filter-press applications.

The Challenge

Because of their method of operation—high-pressure injection of slurries into chambers that form cakes while the remaining

liquid drips through filter clothes—filter presses require good filtration and pressure-producing and -handling capabilities. The pressure in the system must be constant, so that the flakes that form the slurry cakes are not destroyed. This means that anywhere between 8 and 15 bar (116 and 218 psi) of pressure are generally necessary.

This level of pressure can be generated in different ways, most commonly through the use of a positive displacement (PD) pump. One common PD pump technology used in filter-press applications is the piston diaphragm pump. The pump's operation, however, has some inefficiencies in filter-press applications. Mainly, they can be very expensive as they are typically electrically actuated, while their membranes are hydraulically actuated. So, they will always require the presence of an air-pressure vessel, which is needed to ensure that the slurry's flow rate is equalized, and the use of a maximum pressure switch.

A second popular PD-technology choice is the progressive cavity pump. Again, progressive cavity pumps require electronically controlled engines, or a cyclic system in which an air-pressure vessel is used to “load” the pump. Progressive cavity pumps perform well where there are very large quantities of sludge, but in small to medium-size systems, they are limited due to their high sensitivity to abrasion and dry-running.

To some extent, hose piston pumps, which operate similarly to piston diaphragm pumps, are used, but instead of membranes, the slurry flows through hoses. Hose piston pumps are also electrically actuated and require high amounts of maintenance due to the frequent need for hose replacement. Their operation also creates high amounts of pulsation within the pumped fluid.

The types of ancillary liquids that need to be pumped, for example, as a way to neutralize the sludges, during a filter-press operation must also be considered. In many cases, these liquids—which can include milk of lime, which can be very abrasive, and various types of alkalines—cannot be released into the environment, which necessitates the need for a reliably leak-free pumping technology.

The Solution

While other PD-pump technologies have shortcomings when used in filter-press applications, the AODD pump does not come with such concerns. The design of the AODD pump does not require electricity, with its operation carried out through the use of standard compressed air.

Air-operated diaphragm pumps have a number of characteristic advantages for filter-press feeding. Conventional positive displacement pumps with electric drive and control elements do not have these properties, which are



High-pressure, high-volume operations are a constant in filter-press systems, resulting in the need for a pump, such as the Almatec® AH Series AODD model, that can reliably meet the demanding operational parameters.

specific to the design of AODD pumps, and which include run-dry capability, good controllability and a gasket-less mechanical design, to mention a few. Operating against closed discharge is also possible. There are no drives, no rotating parts and no rotary shaft seals. The 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.

Specifically, Almatec®, Kamp-Lintfort, Germany, offers its plastic AH Series AODD Pumps for use in high-pressure charging of filter presses with wastes and sludges in water/wastewater applications. AH Series pumps are able to build up a delivery pressure of 15 bar (218 psi). They are compatible with the wide array of chemical formulations used in water/wastewater treatment because of their high-density polyethylene (PE) construction, which is seven times more resistant to abrasion than polypropylene (PP), and more resistant to wear than iron, aluminum and steel.

Almatec, which is a member of the Dover Corporation's Pump Solutions Group (PSG®), Oakbrook Terrace, IL, USA, offers the AH Series pumps in three sizes (AH 15, AH 25 and AH 40) with flow rates of 4 m³/h (67 L/min/18 gpm) 10 m³/h (167 L/min/44 gpm) and 20 m³/h (333 L/min/88 gpm).

Almatec's high-pressure AH Series diaphragm pumps can be ideally combined with filter presses, as their automatic pressure/volume adjustment clearly indicates. At the beginning of the filtering process, the low filter resistance causes delivery of a large volume, so that the empty filter press is rapidly filled. The rising fill level causes the volume to reduce automatically until the required standstill is reached (where it equals volume 0) at the maximum permitted pressure without any control elements or safety elements protecting against dry-running and excessive pressure or speed control. Unlike mechanically driven diaphragm pumps, at this stage the AH Series pumps stop and do not consume any further energy. This built-in control feature permits operation over the complete range of delivery volumes without any risk of excess pressure developing.



Almatec® AH 15 Model Plastic High-Pressure AODD Pump

The construction of the AH Series, with 12 housing bolts as the sole fastening elements, forms a solid basic unit with the fewest possible seals and joints. Recessed housing bolts covered with PE caps and spring washers on large stainless-steel discs reduce the surface pressure. The suction and discharge ports are of a solid design and equipped with flanges that are manufactured to DIN or ANSI standards. The position of the flanges can also be varied, depending on the application in question, thus permitting both horizontal and vertical connection.

Almatec high-pressure AH Series diaphragm pumps are equipped with specially developed heavy-duty diaphragms with an integrated metal core for long service life. The service life is extended even further by a supporting disc that is positioned on the pump's air side. The diaphragms are constructed of either EPDM, NBR or a PTFE/EPDM compound. The easily interchangeable ball valves and ball retainers have been specially designed to make them particularly suitable for high-pressure pumping applications, while they are also insensitive to solids. The ball valves are available in EPDM, NBR and PTFE materials of construction.



Almatec® AH Series Plastic AODD Pumps

Conclusion

The water/wastewater industry is a global one that affects the lives and well-being of the world's residents on a daily basis. The filter press has been a great friend to the industry as it provides the best way to separate solid-laden liquids during the dewatering process. But a filter press only operates at its best when the components used to deliver the slurry are the most efficient and reliable. While other pumping technologies have been tried, the clear winner in optimizing filter-press applications is the AODD pump, and the AODD pump that best delivers the efficiencies and reliability that the water/wastewater industry requires is the AH Series AODD Pump from Almatec.

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