

4 Reasons to Choose AODD Pumps for Chemical Processes

Recent improvements and low maintenance costs can give this technology an advantage.

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Since its invention in 1955 as a mining pump, the air operated double diaphragm (AODD) pump has established a well-earned reputation as a technology that is ideally suited for utilitarian, auxiliary or basic liquid-handling and transfer applications. AODD pumps excel in these types of applications because they have design characteristics that allow them to offer simple, sealless operation and enable them to self-prime, run dry, achieve suction lift up to 30 feet (9 meters or 14.7 pounds per square inch absolute [psia]), resist deadhead pumping conditions, operate while submerged and pass solids up to 3 inches (76 millimeters [mm]) in diameter.

It did not take long for companies to see why these operational characteristics would be highly desirable in many process applications and why AODD pumps are true “process” pumps capable of performing efficiently, reliably and safely in a wide range of critical fluid handling applications.

AODD pumps also hit the operational sweet spot in many of the fluid handling tasks that are prevalent in the chemical processing industry.

There are four key areas in which AODD pumps often outperform other technologies in terms of efficient, reliable and cost-effective operation. Chemical processors who are looking to optimize their operations would be wise to consider the advantages that AODD pumps can provide in these areas.

1 The Importance of Air

As the name states, the operation of AODD pumps relies on compressed air, which can be found in most chemical-processing plants around the world. Leveraging this readily available air can make the AODD pump a plug-and-play device that requires no infrastructure upgrades to incorporate. Additionally, the use of air to power the pump is the key source of one of its most sought-after capabilities: the ability to deadhead without damaging the pump, system or fluid. This makes AODDs easy and flexible pumps to operate.

Keeping air usage low is critical to maintaining a healthy environment and a healthy processing plant, and recent technological advances have taken significant steps toward realizing these goals. The advances have been focused around one shortcoming in AODD pump operation. At the end of every pump stroke, a small amount of air is consumed that does not contribute to the movement of the fluid. Imagine hitting the gas pedal in a vehicle that is on ice; the wheels spin, but the car does not move.



Image 1. While plastic pumps are typically a go-to pumping technology in chemical processing, there can be instances where metal pumps are a better choice for the operator. (Images courtesy of Wilden)

One redesigned air distribution system addresses this problem with an air control spool that reduces the amount of air allowed into the pump at the end of the stroke, which reduces the amount of wasted energy that had traditionally been lost to the atmosphere.

This allows the AODD pump to realize up to 60 percent savings in air consumption, improves the pump’s suction-lift capabilities and enables the pump to better handle high inlet pressures, all while delivering more yield per standard cubic feet per minute (scfm)

of air consumed than AODDs that feature traditional air distribution technology.

2 Low Maintenance Costs Through Proper Diaphragm Selection

Diaphragm pumps have a unique benefit when compared to many rotating-pump technologies in that they do not require any seals. Elimination of the need for packing or mechanical seals means that maintenance costs tend to be inexpensive and infrequent. Combined with the ease of operation, AODDs are a “set-and-forget” type of pump, provided the right diaphragms are selected for the application. Diaphragm material choice, shape and pump design all play a role.

Along with the advances in air distribution design and operation, the improvements made in diaphragm construction and function over the years have been meaningful. Chief among them is that long-life diaphragms that have been engineered for use in chemical-processing activities require less maintenance, which lowers repair costs for the operator.

One piston diaphragm pump has an outer piston that is completely encapsulated within the diaphragm’s thermoplastic elastomer (TPE) material, which provides several benefits.

First, the design removes the phenomenon known as outer piston abrasion, which is when the outer piston rubs against the diaphragm as it cycles and over time, like sandpaper, wears away the material. Removing the outer piston eliminates this failure mode, dramatically increasing diaphragm life. Secondly, it also removes a known leak point in traditional diaphragm designs around the outer piston, improving overall safety when handling dangerous chemicals. Finally, the design eliminates an area along the outer piston where pumped fluid can be trapped.

In the end, the downtime and maintenance that unplanned failures can incur are typically more expensive for the facility operator than the spare

parts required to keep the AODD pump operating. The use of these newer designs allows the pump to run longer before requiring diaphragm maintenance and will translate directly to a healthier bottom line.

3 Versatility & Compatibility

By definition, chemical processing requires the completion of some of the most intricate and complex industrial operations in the world.

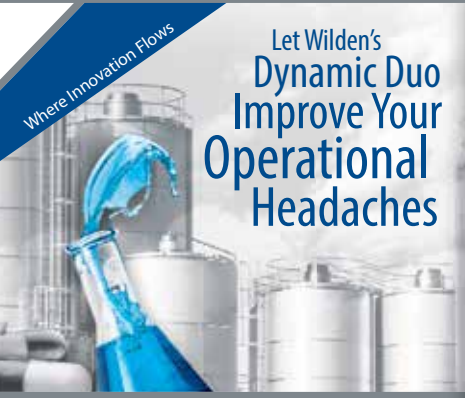
One of the most crucial operations is the transfer of liquids along the production chain.

Due to the importance of the many fluid transfer operations along the breadth of the chemical manufacturing chain, facility operators need to identify the best pumping technology for the job. The technology must possess the versatility to perform reliably and



Image 2. A newly developed air control spool eliminates costly air loss at the end of the pump stroke, resulting in up to 60 percent savings in air consumption when compared to competitive models.

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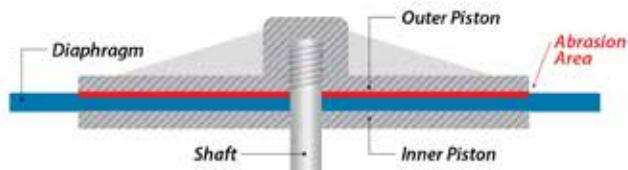
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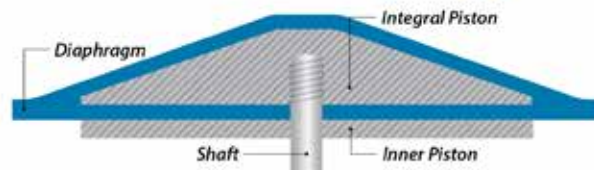


Image 3. One diaphragm is designed with a piston that is integrated into the diaphragm itself. The result is that unlike conventional diaphragms, this diaphragm has no outer piston abrasion, which is a key failure mode for conventional diaphragms and eliminates a potential leak point around the outer piston. This means improved diaphragm life and peace of mind when handling hazardous liquids.

efficiently at any number of points in the production hierarchy.

AODD pumps can offer a number of operational advantages:

- They are appropriate for use with high-viscosity fluids and can handle fluids that range from water-like to medium and very viscous liquids.
- They can run dry and strip discharge lines without getting damaged. If the pressures get to be too much, the pump will just stop running, but it will not break.
- They are simple devices and their control relies solely on solenoid operators, pump cycle counters and surge-dampener assemblies.
- Their operating costs can be lower when all of the maintenance, accessories and controllers are included, and in many cases their total cost of ownership is lower over their entire operational lifespan when compared to competitive pump styles.

Additionally, some of the AODD pump styles have been designed to be direct bolt-to-bolt and pipe-to-pipe drop-in replacements in existing pumping systems. This makes the AODD pump styles a cost-effective way to upgrade fluid transfer performance while simultaneously realizing the benefits inherent in the operation of an AODD pump that features an advanced air distribution system. These benefits include reduction in air consumption and expense, optimized product handling and containment, and scaled-back

maintenance and replacement costs.

Finally, the design and operation of AODD pumps allows them to transfer a wide range of liquids with varying handling characteristics. One of the most prominent is viscosity, or the thickness of the liquid that is being transferred. The operation of AODD pumps virtually eliminates product slip, regardless of the fluid's viscosity, since the pump's ball check valves control fluid transfer. Conversely, gear, screw and lobe pump technologies use fixed tolerances to control slip, which means they are less likely to adequately adjust to viscosity changes.

4 Pump Construction

Quality pump construction is key when handling dangerous chemicals, and using a pump designed with the right materials is important to the safety of a plant. To satisfy these demands, AODD pumps are available in a wide range of materials of construction in order to meet a variety of chemical handling needs. Common chemical pump materials include polypropylene, Kynar, stainless steel, ductile iron and Hastelloy, with some companies possessing the capability to offer special materials like super duplex when really unique materials are required to ensure uninterrupted production processes and the safety of plant personnel.

If metal pumps are required, one overlooked material in the chemical processing world is ductile iron, which works well in both acidic and basic pH application ranges of 4 to 10. Provided

that the chemical compatibility is correct, operators who use ductile-iron pumps can realize all of the benefits of stainless steel, but at a lower purchase cost.

A bolted design does not, as mentioned earlier, rely on packing or expensive mechanical seals to prevent leaks. In this case, the most important benefit of bolted pumps is their ability to offer one of the highest levels of product containment. This is critical for two main reasons: many raw or finished chemicals are high-value products and any loss through leakage can be detrimental to the operation's bottom line and, second, most chemicals can be harmful to humans and the environment.

Go-To Technology

Thanks to its simple yet innovative design, the AODD pump has proven to be able to consistently meet the demands of chemical processors while building a reputation as a go-to pumping technology where basic fluid transfer capabilities are required. The AODD pump, which possesses a stable of notable operational characteristics, has become a first-choice technology for chemical manufacturers who are searching for a pump that meshes cost-conscious air consumption with reliable production rates. ■

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