

AODD Pumps Improve Safety in Mining Operations

WILDEN® AIR-OPERATED DOUBLE-DIAPHRAGM (AODD) PUMPS MEET THE CHALLENGES FOUND IN TOUGH MINING CONDITIONS AND HELP MINIMIZE RISKS FOR PERSONNEL AND THE ENVIRONMENT



Wilden® AODD Pumps possess the ruggedness and reliability to overcome the harsh conditions found in many mining operations.

Introduction

In the early days of the mining industry, operations were pretty basic: identify the spot where the commodity might be buried, dig a hole and send people into the hole to retrieve the commodity. For generations, this was the way it was done, though this process had its inherent drawbacks; most notably, the extreme safety risks that the miners faced every second they were underground.

Today's mining operations barely resemble those of ancient times, with sophisticated equipment and systems making the identification of lodes – deposits of metalliferous ore that fill or are embedded in a fissure in a rock formation – more precise, and the retrieval of the commodity more effective. But perhaps the most important advance in mining operations is the increased determination to make the operation as safe as possible for the miner, the communities in which the mines operate and the environment as a whole.

Over the decades, targeted steps have been taken to improve the safety of mine personnel, as well as the people who live in the communities near the mining operation. That dedication has paid off, for example, in the United States, where, in early 2019, the Mine Safety and Health Administration (MSHA)

reported that the fatality rate in U.S. mines was the second-lowest ever in 2018, based on the number of man-hours that were worked during the year. Additionally, the MSHA reported that actual work-related fatalities in mines totaled 27 for the year, out of the approximately 330,000 miners who work in the nation's more than 13,000 metal/nonmetal and coal mines.

Mining safety is most precarious in underground mines, but advances in the ways that mines are dug and the shafts are shored up have helped mitigate much of the potential for cave-ins, collapses and explosions. Ensuring the safety of the mine infrastructure is just one part of the equation, however. Within those mines, many different types of equipment are used during the exploration and extraction processes. One of the most common is the industrial pump, which is utilized for any number of applications within a mining operation.

This white paper will demonstrate how air-operated double-diaphragm (AODD) pumps from Wilden® Pump & Engineering Company, LLC, Grand Terrace, CA, USA, feature not only the operational reliability that is paramount to the success of a mining operation, but also the safety in operation that helps prevent mining disasters.

The Challenge

There's no question that pumps are pushed to their limit when used in a mining operation. Nearly all mining takes place in extremely harsh conditions, with the pumps tasked to handle a wide range of solids, abrasives and particulate-laden liquids. AODD pumps are often the choice for these unforgiving tasks because their design enables them to outperform other pump styles in many mining applications.

Within the universe of AODD pumps, however, not all are created equal. Excessive downtime can limit a mining operation to the point where production delays can have an adverse effect on the mine's cost-effectiveness. This requires an AODD pump that can reliably meet the needs of demanding mining operations.

Too often, manufacturers of AODD pumps don't take the time to create a pump that can stand up to the rigors of the mining site. This can result in complete failure when used in an unsuitable application. This not only delays production, but also puts mine-site personnel at risk of injury or death. Pumps that are less durable are also likely to require more basic maintenance, which will also result in increased downtime and added ancillary costs for the mining company.

Many AODD pump models struggle to deliver the discharge pressures and flow rates that are required for severe-duty pumping in a mining operation, hampering production rates and increasing the risk of pump breakdown, as well as the potential for a catastrophic failure that can lead to increased safety risks.

The Solution



Photo courtesy of
Dowdens Pumping & Water Treatment

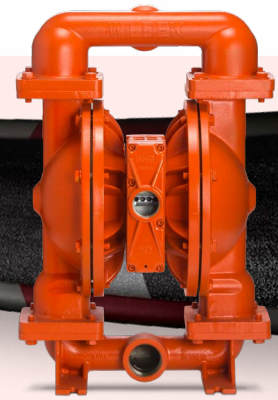
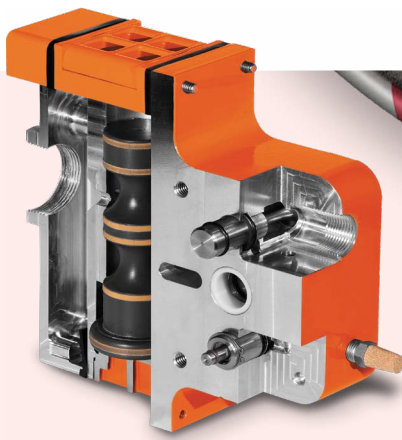
As mining operations and systems have increased their level of sophistication over the years, Wilden AODD pumps have played a huge role in enhancing their performance and overall safety.

Wilden's AODD pump technology, which was invented in 1955 by Jim Wilden, has been proven over the ensuing years to excel when used in severe-duty mining applications. The list is long when naming the applications where mine operators are utilizing Wilden AODD pumps, including:

- Froth flotation for particulate separation in slurries
- Leaching of commodity by-products
- Transfer and treatment of mine "tailings"
- Wash bays for large-scale machinery and vehicles
- Above and below-ground dewatering
- Bulk liquid chemical transfer
- Raw material transfer
- Water recirculation
- Water/land reclamation
- Explosive atmospheres
- Oil-separation processes
- On-site bulk fuel transfer
- Soap dispensing through on-site bath houses

Mining professionals trust their operations and safety to Wilden's Clamped Series and Bolted Series Metal AODD Pumps. Wilden Clamped and Bolted Series pumps are ideal for mining applications in terms of safety, reliability and cost-effective performance. More specifically, Wilden offers the Stallion® clamped metal AODD pump, which incorporates many design enhancements that make it the first choice for mine operators. Chief among these are a shock-absorbing polyurethane screen base that absorbs the impact from constant assault by solid particles and increased internal clearances to prevent aggregate entrapment, resulting in maximized durability. Stallion pumps also feature an integrated suction strainer, with the option of plumbed suction, if needed.

Stallion pumps can be outfitted with Wilden's patented Pro-Flo® SHIFT Air Distribution System (ADS). The design of the Pro-Flo SHIFT ADS features an air control spool that reduces air consumption by up to 60% (See Sidebar, Page 3). Wilden's Stallion pumps are available in three sizes: PS4, 38 mm (1-1/2"); PS8, 51 mm (2") and PS15, 76 mm (3"). All are available in either aluminum



A Game-Changing Innovation in AODD Pump Operation

Since the company's founding in 1955, Wilden has prided itself on maintaining a commitment to consistent innovation in the operation of its air-operated double-diaphragm (AODD) pumps. One area of the AODD pump's operation that has received constant attention is the best way to maximize air usage and eliminate wasted air while simultaneously maintaining the pumping operation's required flow rate.

Wilden has been at the leading edge of air distribution system (ADS) design and innovation, and its latest offering is an innovation that has revolutionized the way pneumatic pumps operate. It's called the Pro-Flo® SHIFT Air Distribution System and it represents a significant breakthrough in the level of an AODD pump's energy efficiency, which is critical as industrial plants work to reduce air consumption and energy usage, as well as their carbon footprints.

While the operation of an AODD pump has basically remained constant for the past 65 years, improvements have been made in the pump's ADS that address its rate of air consumption in relation to the product flow rate and how much air can be wasted during the pumping cycle. The gremlin in traditional ADS operation has been the "overfilling" of the air chamber at the end of each pump stroke without any corresponding displacement of fluid, an action that is similar to a car spinning its wheels on ice but not moving forward.

While attempts have been made to eliminate this overfilling, the new Pro-Flo SHIFT is a true game-changer in ADS operation. To combat AODD pump overfilling, the Pro-Flo SHIFT restricts the air flow into the air chamber near the end of each pump stroke so that only enough air is introduced to keep the pumping process going. This is accomplished through the incorporation of an air control spool that automatically meters the air to prevent overfilling with no reduction in product yield.

The Pro-Flo SHIFT ADS is available on Wilden's Clamped and Bolted Series AODD pumps in 13 mm (1/2"), 25 mm (1"), 38 mm (1-1/2"), 51 mm (2") and 76 mm (3") sizes, with independent side-by-side tests with competitive models showing that the Pro-Flo SHIFT:

- Achieves up to a 60% savings in air consumption (SCFM)
- Delivers more yield per SCFM versus competitive pumps
- Costs 50% less than electronically actuated pumps

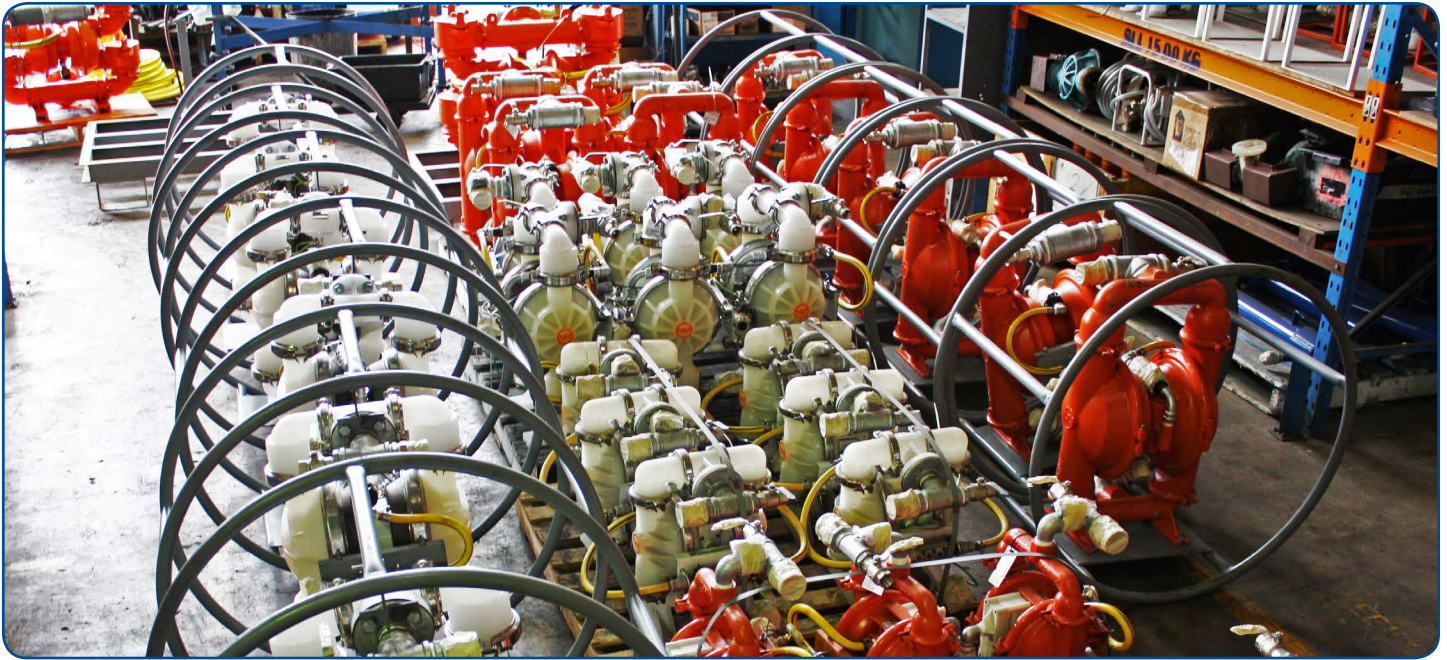
The design of the Pro-Flo SHIFT also features fewer operating parts, resulting in less downtime and simplified maintenance, while it is available with a single-point-exhaust option (for submersible applications) and offers plug-and-play operation.

All of these capabilities make the Pro-Flo SHIFT the preferred ADS choice in a variety of industrial applications where AODD pumps reign supreme, including the global mining industry.

or ductile-iron materials of construction, are submersible, intrinsically safe, lube-free, can run dry, have superior anti-freezing properties and can handle pressures to 125 psi (8.6 bar). Depending on the model, flow rates range from 305 to 776 L/min (81 to 205 gpm).

Wilden has also long recognized the need for pumping equipment that can not only meet production and reliability requirements, but also do so in the safest manner possible, for site personnel and the environment. That's why Wilden's

various models of AODD pumps are manufactured under the tenets of an Integrated Management System (IMS) that encompasses the Quality Management System (ISO 9001), Environmental Management System (ISO 14001) and Occupational Health and Safety Advisory Services (OHSAS 18001) standards. Since 1999, Wilden has also met the criteria to put the "CE" mark on its pumps, which allows every pump manufactured by Wilden to bear the mark and enables them to be sold to mining operations around the world.



Conclusion

The operating conditions at most mines around the world are trying. Harsh operating environments, along with the ever-present threat of accidents, make attention to detail a front-of-mind concern on a daily basis. Helping to make mining conditions safer for site personnel and the environment are Wilden AODD pumps. With more than 60 years of experience in developing pumps for severe, utilitarian pumping applications, Wilden is wellpositioned to offer the mining industry the safest, most reliable AODD pumping technology. This not only allows mining companies to meet their production goals, but to do it in the safest, most employee-friendly manner possible.

About the Author:

Based in Grand Terrace, CA, USA, Wilden is a leader in air-operated double-diaphragm (AODD) pumps and a product brand of PSG®, a Dover company, Oakbrook Terrace, IL, USA. PSG is comprised of several leading pump companies, including Abaque™, Almatec®, All-Flo, Blackmer®, Ebsray®, EnviroGear®, Griswold®, Mouvex®, Neptune™, Quattroflow™ and Wilden®. You can find more information on Wilden at wildenpump.com and on PSG at psgdover.com.