

Shifting Your Perception of AODD Pumps

REVOLUTIONARY NEW AIR DISTRIBUTION SYSTEM ENABLES AIR-OPERATED DOUBLE-DIAPHRAGM (AODD) PUMPS TO SET NEW STANDARD IN ENERGY-EFFICIENCY, AS WELL AS OPTIMIZED PRODUCTION

By Carl Glauber



The innovative Air Distribution System (ADS) in the new Pro-Flo® SHIFT AODD Pump from Wilden® gives facility managers unmatched control of their pumping system's air consumption, resulting in increased energy efficiency, lower operating costs and improved environmental sensitivity, all without adversely affecting production rates.

Introduction

Concerns regarding the amount of energy that is consumed – and potentially wasted – by industrial facilities in the United States officially reached the highest levels of the federal government on Aug. 30, 2012, when Pres. Barack Obama signed an Executive Order titled “Accelerating Investment in Industrial Energy Efficiency.” Noting that “the industrial sector accounts for (more than) 30 percent of all energy consumed in the United States,” the Executive Order describes ways that increased industrial energy efficiency can provide benefits to manufacturers, utilities and consumers while, at the same time, improving the nation’s energy system, along with American manufacturing competitiveness and job creation.

The Executive Order acknowledges what the operators and managers of industrial manufacturing facilities have known for more than a decade: the modern-day definition of a successful industrial manufacturing operation is not one that only satisfactorily meets production quotas. Indeed, as utility costs have steadily risen and increasing

environmental consciousness has moved front of mind, a successful industrial operation is now one that delivers the required production rates in the most cost- and energy-efficient, as well as environmentally friendly manner.

Pumps, which are the second-most widely used machines in the world, play a critical role in industrial operations around the globe and across a wide array of industries – from chemical production and mining to water/wastewater treatment and hygienic applications. In fact, according to the U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy (EERE), pumping systems account for anywhere between 27% and 33% of the total electricity used and consumed in the industrial sector.

Recognizing the importance of pumping systems in industrial applications, The Hydraulic Institute has commissioned the writing of *Optimizing Pumping Systems: A Guide for Improved Energy Efficiency, Reliability & Profitability*, which provides instruction on how facility

operators can recognize inefficient energy usage in their operations and the steps they can take to remove these inefficiencies. Facility operators must be fully aware that the initial purchase and installation cost of a new pumping system is generally only a small part of the total cost to operate it over its lifespan. In fact, over the 15 to 20 years that a typical pumping system is in operation it is the routine costs of energy, maintenance and other recurring expenses that are the primary components in total lifetime cost. Therefore, maximizing efficiency when designing and operating a pumping system is in the best interest of the facility and its customers, as well as the environment.

Pump manufacturers realize the importance their products play in industry and have taken great pains to design and develop pumping equipment that satisfies the increased need for energy efficiency and reduced operating costs. This white paper will illustrate how a revolutionary new air-distribution technology can help minimize air consumption and improve overall efficiency of reciprocating positive displacement air-operated double-diaphragm (AODD) pump technology that is used in many of the world's industrial liquid-handling applications.

The Challenge

Invented in 1955, AODD pumps were specifically designed for use in a wide variety of utilitarian liquid-handling and transfer operations. In the ensuing six decades, AODD pump technology has gained a well-earned reputation for outperforming other positive displacement pump styles – such as lobe, gear and progressive cavity – in the most demanding liquid-transfer applications. That's because the design characteristics of AODD pumps enable them to run dry, maintain a suction lift up to 30 feet (9 meters), withstand deadhead conditions without damage, operate while completely submerged and pass solids up to 1-3/8 inches (35 mm) in size, all while meeting most flow requirements and requiring little maintenance.

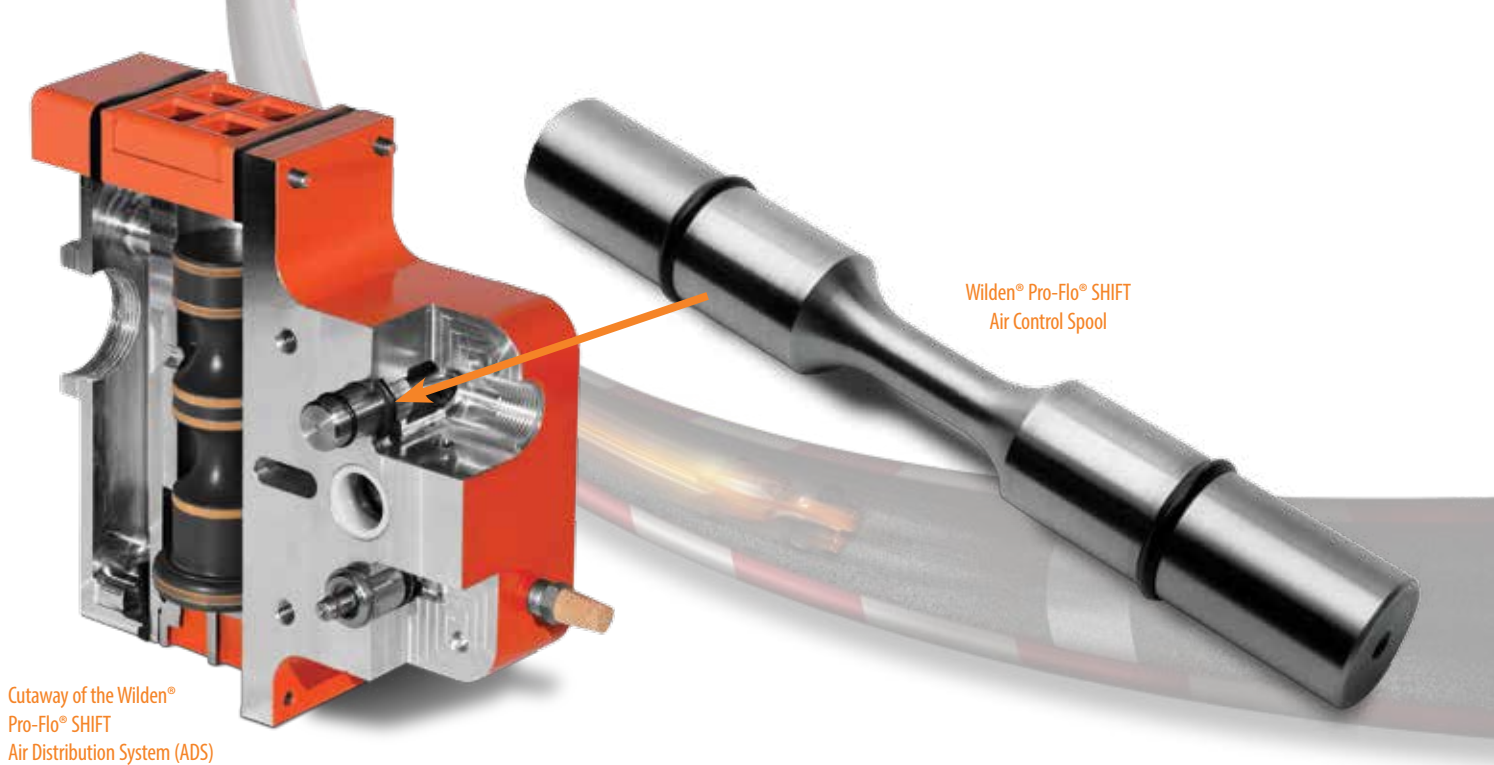
While the operation of an AODD pump has basically remained constant for the past 60 years, improvements have been made in the pump's air distribution system (ADS) that addresses its rate of air consumption in relation to the product flow rate and how much air can be wasted during the pumping cycle, with that wasted air resulting in an added cost for the plant operator. While these savings are important for the plant operator, they are actually modest when looking at the total volume of air that is used for these pumps.

There remains an opportunity for more significant savings. During the time period from the end of each stroke to the completed shift of the valve, the air is allowed to "overflow" the air chamber without any corresponding displacement of fluid. The rate of this "overflowing," which is defined as wasted compressed air, can be more adequately controlled. Attempts at improving the ADS in order to eliminate overflowing have included the incorporation of a control dial that "sets" the pump's operation at a point that optimizes both air consumption and flow rate. However, these control dials need to be manually adjusted by the operator after identifying the point where air usage and flow rate are both at their most efficient, which can be time-consuming and place an undue burden on the operator.

Most recently, a new generation of ADS has attempted to eliminate overflowing in AODD pump operation. This next-generation ADS technology claims to prevent overflowing by cutting off the air supply to the air chamber before the end of the pump stroke. There are two shortcomings, however, in this approach. First, this ADS technology is electronically monitored and controlled, rather than mechanically actuated, which raises an entirely different set of energy usage, maintenance and operational concerns. Second, this electronic ADS technology requires time to "learn," meaning that every time the pump is turned on, the electronic system needs a "learning period" of 30-40 seconds, where it monitors the operation of the pump before it can estimate when to cut off the air supply prior to the end of the stroke. This can result in erratic and inconsistent flow rates for up to 40 seconds and a corresponding waste of air, a drawback that is compounded in dosing operations that feature constant on-off cycles.



AODD Pumps have long been reliable performers in a wide range of industrial pumping applications. The new Pro-Flo® SHIFT from Wilden® takes that reliability to an all-new, cost-optimizing level.



Cutaway of the Wilden®
Pro-Flo® SHIFT
Air Distribution System (ADS)

Wilden® Pro-Flo® SHIFT
Air Control Spool

So, while AODD pump operation has come a long way in terms of air consumption, thanks in large part to the invention of the signaled ADS, test pumps fitted with data-acquisition equipment show that air is still being wasted due to overfilling and that there is the potential for additional energy-saving gains to be realized.

The Solution

Jim Wilden invented the AODD pump in 1955 – he was looking for a quick, easy way to pump water out of a flooded workshop. The resultant AODD pump technology led to the formation of the Wilden® Pump & Engineering Company, Grand Terrace, CA, USA. Today, Wilden, which became a founding member of the Dover Corporation's Pump Solutions Group (PSG®) in 2008, remains the acknowledged worldwide leader in designing and manufacturing cutting-edge AODD technology for use in many industries.

The company has maintained its enviable position because efficiency innovations have been part of the Wilden DNA since Jim Wilden invented AODD technology.

This commitment to innovation has led to the creation of the Pro-Flo® SHIFT Air Distribution System, which is not just an incremental improvement in ADS technology, but a true game-changer, one that presents an entirely new way of looking at how pneumatic pumps operate.

As mentioned, the inefficiency in traditional ADS operation is the time delay the AODD pump experiences when pressurized air is switched from one air chamber to the other air chamber, which leads to overfilling of the air chamber, with the excess air immediately wasted when it is subsequently vented into the atmosphere.

To combat this 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 of product yield. The result is reduced air consumption while still maintaining maximum operational efficiency and flow rates.

This mode of operation eliminates the need for the operator to manually adjust the pump for efficiency since the ADS automatically does it. This creates a new efficiency point in AODD pump operation, highlighted by improved energy use with no loss of flow rate. Additional benefits of the Pro-Flo SHIFT ADS include:

- Reduced total cost of ownership
- Faster setup time
- Ease of maintenance
- Drop-in configuration capability
- Ability to be retrofitted into existing Wilden AODD pumps
- Ability to be used in harsh operating environments
- No electricity required
- Completely submersible
- Environmental sensitivity

Wilden is currently offering its Pro-Flo SHIFT ADS on the full line of its Original™ Series clamped and Advanced™ Series bolted metal AODD pumps in 1.5-, 2- and 3-inch sizes.



Wilden® PS4 Series Pump



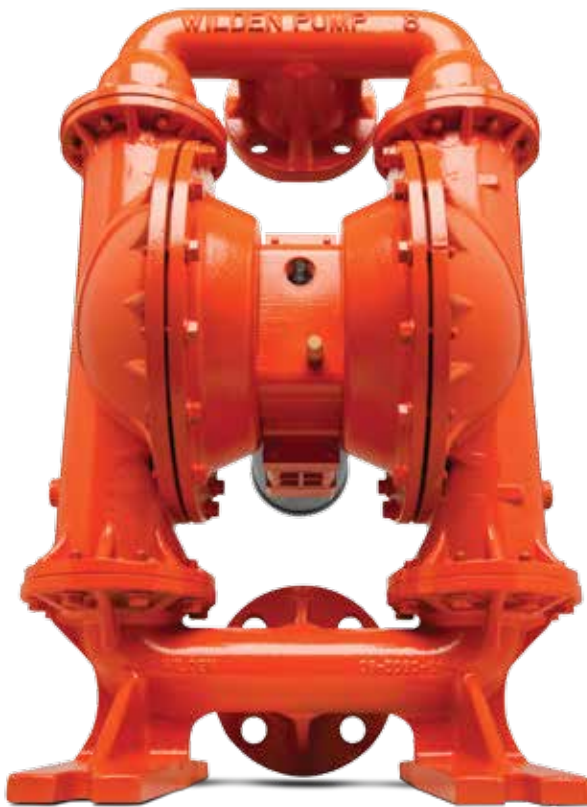
Conclusion

Some industrial manufacturing plants may have as many as 300 AODD pumps in operation at any one time. While the incremental cost of wasted air per pump may not be impressive, when you add it up the overall cost to the plant can be substantial. That's why utilizing the most energy-efficient pumping equipment will not only optimize production rates, but also play a positive role in improving a company's bottom line and environmental stewardship.

That's why the Pro-Flo® SHIFT ADS from Wilden is a true game-changer. In side-by-side comparisons, the Pro-Flo SHIFT outperformed every one of the traditional AODD pumps, along with those featuring so-called "advanced" ADS technology. In many cases, the Pro-Flo SHIFT reduced air consumption by 60%, all while retaining desired flow rates. These capabilities will go a long way in making it the new preferred ADS choice in a variety of process operations, including paint and coatings, mining, chemical, water/wastewater and hygienic applications.

About the Author:

Carl Glauber is an Engineer for Wilden® Pump & Engineering Co., LLC, Grand Terrace, CA, USA, a leading manufacturer of air-operated double-diaphragm (AODD) pumps. He can be reached at (909) 512-1293 or carl.glauber@wildenpump.com. For more information, please go to www.wildenpump.com. Wilden is an operating company within Dover Corporation's Pump Solutions Group (PSG®), Oakbrook Terrace, IL, USA. PSG is comprised of several leading pump companies, including Abaque®, Almatec®, Blackmer®, Ebsray, Griswold™, Maag, Mouvex®, Neptune™, Quattroflow™ and Wilden®. You can find more information on PSG at www.psgdover.com.



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