Advancing Pump Technologies in Paint & Coatings

AODD ENHANCEMENTS HELP OPERATORS IMPROVE PERFORMANCE, PRODUCT CONTAINMENT AND ENERGY EFFICIENCY

By Edison Brito

Introduction

While the first "paints" came from natural substances like charcoal, blood and berry juice, paints and coatings are now made of a wide variety of highly stylized components using high-tech manufacturing processes. It has been over the past 25 years that most of the major enhancements in paint and coatings manufacturing have taken place. Spurred by these technological advancements, the market has evolved into one of the most diverse and important industries in the world, with paint and coatings now vital components in applications as varied as traffic markings, house coatings, automobile exteriors and aluminum cans.

Though the global recession, which hit the new-housing market exceptionally hard, saw the paint and coatings market stagnate in 2007 and 2008, the first signs of an economic rebound saw paint-and-coatings revenues grow by 2.1% in 2009 to reach a worldwide value of $110.5 billion. With future growth expected to see the industry's worldwide value continue to grow to $128.6 billion by 2014, opportunities abound for paint and coatings manufacturers both at home and abroad.

While this anticipated growth creates opportunities for manufacturers to increase production, the current realities of the manufacturing climate dictate that their production processes be as efficient and environmentally friendly as possible. With pumps playing a key role in all aspects of paint and coatings manufacture, increasing operational efficiency through the utilization of pumps featuring advanced technology should be front-of-mind for the manufacturing-facility operator.

This white paper will examine the current challenges that must be overcome in maximizing the production processes found in paint and coatings manufacture and how a series of recent technological advancements in air-operated double-diaphragm (AODD) pump technology can help manufacturers control costs, reduce product loss, save energy, optimize uptime performance and meet environmental regulations, all while producing paint and coatings of the highest quality.

The Challenge

Today, synthetic pigments and stabilizers are commonly used to mass-produce uniform batches of paint. Substances such as polyurethane and styrene-butadene have improved the performance of paint and coatings, while alkyd resins increase the paint's strength and life-span. While the pigments for paints were ground in stone mills 100 years ago, today sand mills and high-speed dispersion mixers are used to grind easily dispersible pigments. New environmentally friendly low-solvent and solvent-less formulations reduce the emissions of volatile organic compounds (VOCs), making their production and application safer.

Because of these significant changes to the materials used in paint and coatings production, the processes for manufacturing them have become a more refined science. To ensure the highest quality standards, paint and coatings manufacturers must utilize robust equipment that offers the highest degree of flexibility and performance in terms of reliability, product-loss prevention, environmental protection and energy efficiency, while retaining the versatility necessary to handle a wide variety of paint-and-coatings components, all of which have their own unique handling characteristics.

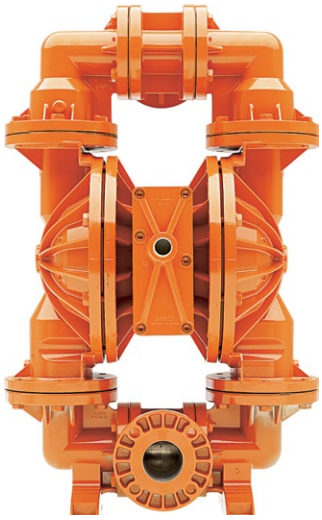
The manufacturers of paint and coatings generally fall into one of two camps: waterborne or solvent-borne producers. Both of these producers may use the same binders, pigments and additives in their products, but there is a major difference in the way they are constructed and perform: waterborne paints are typically water-based emulsions, while solvent-borne paints are most often oil and/or alkyd-based formulations.

Whether waterborne or solvent-borne, all types of paints contain four basic components: pigments (tiny solid particles that enhance the paint's appearance); binders (combine the paint's constituents into a solution that cures into a film after application); liquids/solvents (a medium that allows the pigment and binder to be applied to the painted surface); and additives (ingredients added to provide specific paint properties, such as thickening, mildew/bacteria resistance, defoaming, etc.).

This mélange of styles and components that are found in current-day paint and coatings means that the producer must utilize manufacturing technology that is versatile enough to handle a dizzying array of components in a way that maximizes production schedules, energy efficiency and product containment, all while meeting strict environmental regulations that govern the release of VOCs and hazardous air pollutants (HAPs) to the atmosphere during paint production and application.

The Solution

Invented in 1955 by Jim Wilden as the solution for demanding utilitarian pumping applications that require a robust design, positive displacement air-operated double-diaphragm (AODD) pump technology has grown to become the top choice for liquid-handling and transfer in a wide variety of industries, including paint and coatings manufacture. AODD pumps are able to satisfy the demands of the industry because their design allows the product flow to stay constant with the speed of the pump, which is a major consideration in paint and coatings production. Other benefits of AODD technology include its ability to be used in a wide range of pressure and flow specifications; self-priming and low-wear operation; ability to handle corrosive and abrasive solutions; improved energy-efficiency; and overall low maintenance costs.



Wilden® Advanced™ Series Metal PX1500 AODD Pump

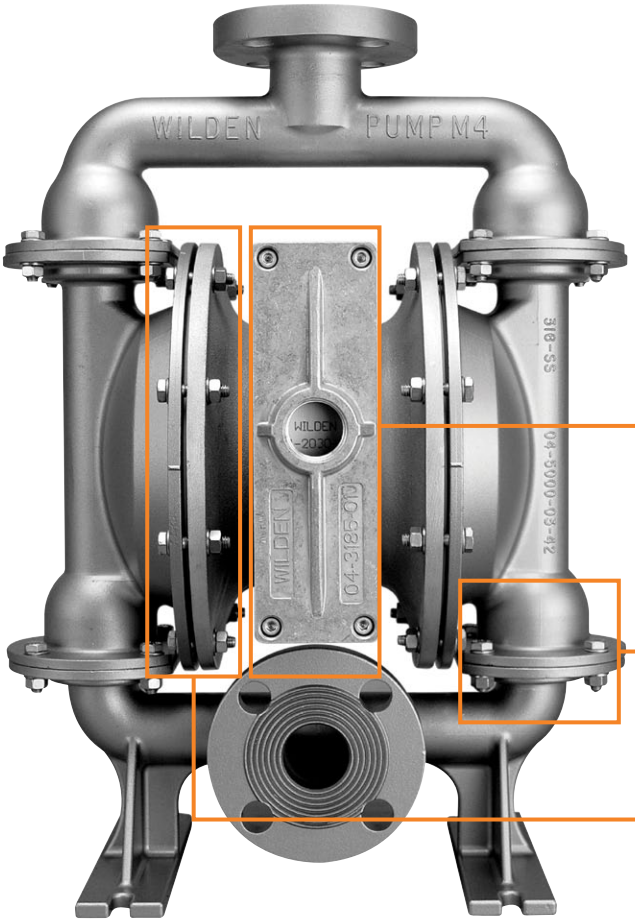
In some large paint and coatings manufacturing facilities, upwards of 200 to 300 air-powered pumps may be in operation at any one time. Thanks to recent technological advancements that Wilden Pump & Engineering LLC, Grand Terrace, CA, USA, has made to its Advanced™ Series Metal AODD Pumps, there is more reason than ever for those pumps to bear the Wilden® name.

Operators of paint and coatings manufacturing facilities are all about speed. They incorporate batch-type operations where the product being manufactured is mixed, then sent to a fill tank and fill line. They also have raw ingredients that are moved off of truck tankers or railcars, transferred to a storage tank, diverted to a mix tank based on the recipe required, moved to a day tank or fill tank, then finally transferred to a filling line. Because of this style of fluid-handling, AODD pump technology is used in every step of this process. They are ideal for these paint-and-coatings manufacturing applications because:

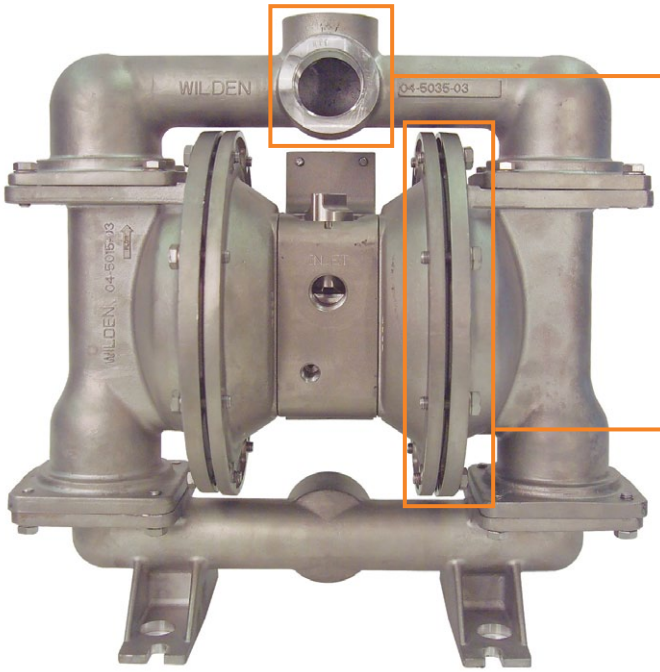
- Most applications require less than 125 psi
- Shear-sensitive fluids that can't be agitated are always in use
- Thick, viscous fluids are also constantly in motion
- Leak-free operation is paramount
- Dead-heading occurs during filling operations, a task that motor-driven pumps are not able to handle effectively

With these considerations in mind, Wilden offers a complete size range of Advanced™ Series Bolted AODD pumps. In addition, Wilden now offers bolted "drop-in" configurations in the following sizes:

- 1-inch (25mm) Stainless Steel and Aluminum
- 1.5-inch (38mm) Stainless Steel
- 2-inch (51mm) Stainless Steel
- 3-inch (76mm) Stainless Steel



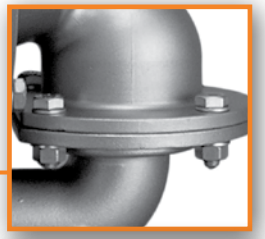
Wilden® 1.5-inch bolted stainless steel



Wilden® 1.5-inch drop-in bolted stainless steel

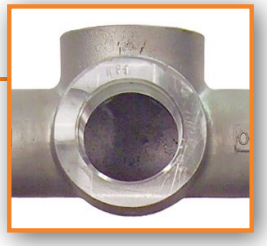
In addition, these pumps now come outfitted with new technologies that make them even more perfectly suited for the manufacture of paint and coatings. These new features include:

Pro-Flo X™ Air-Distribution System (ADS) – Provides top-of-the-line operational flexibility through its patented Efficiency Management System (EMS™) that allows the user to optimize the ADS for any application demands regardless of pump size through the use of a control dial that allows the user to select the flow rate that best suits the application.



Bolted Configuration – Gives the pump better leak-containment and sealing properties at higher pressures when compared to traditional clamped configurations.

Full-Stroke PTFE Diaphragms – The full-stroke design of these diaphragms result in increased product displacement per stroke, which translates into greater flow rates and higher efficiencies when compared with AODD pump brands that rely on reduced-stroke PTFE diaphragms.



Drop-in Pump Configuration – Allows a pump to be installed in an existing footprint without the need to disturb the piping. These drop-in pumps have a larger flow path, resulting in increased flow rates and decreased energy consumption when compared with competing AODD pump technology.

Easy Install Wil-Flex™ Diaphragms – Made of Santoprene®, these diaphragms are easy to install and are an excellent low-cost alternative to PTFE diaphragms when used in Paint & Coatings applications that involve the handling of abrasives. Wilden has recently upgraded its Wil-Flex Diaphragms, introducing a flat-profile design that eliminates the need to invert the diaphragm when rebuilding a pump, which allows for easy, cost-effective installation. Additionally, this design enhancement increases the diaphragm's flex life.

Rating AODD Performance

When highlighting the performance capabilities of their products, manufacturers of air-operated double-diaphragm (AODD) pumps often focus most specifically on what is called the pump's "performance ratio." This ratio is the number of gallons of product that are pumped per standard cubic foot per minute (scfm) of compressed air that is consumed. Since using compressed air is expensive, facility operators and engineers want this ratio to be as high as possible, which signifies that the pump is working at its efficient best.

To optimize the performance ratio of its pumps, Wilden® Pump & Engineering LLC, Grand Terrace, CA, USA, has developed the Pro-Flo X™ Air Distribution System (ADS). The Pro-Flo X ADS features a patented Efficiency Management System (EMS) that allows the user, through the use of a control dial, to set the pump's optimal flow rate for any application.

For instance, turning the control to setting "4" on the Pro-Flo X ADS might achieve a pump output of 103 gallons per minute (gpm), but might take 77 scfm to achieve. That's a performance ratio of 1.34 gallons pumped per 1 scfm consumed. However, if the user sets the Pro-Flo X ADS control dial to "2," the pump's output might be 64 gpm, but it will need only 37 scfm to achieve it, which is a performance ratio of 1.73 gallons pumped per 1 scfm consumed.

This is a 22% increase in efficiency that not only reduces the amount of air that is consumed, but is also a reduction in wear on the pump components which can double part life and reduce by 50% downtime, maintenance, labor and part costs.

Operators can use Wilden's free PX Simulator (on www.wildenpump.com/seemoregreen) to see how adjusting the dial on their Pro-Flo X™ ADS can improve the efficiency of their pumps.

Or, consider this: A test was conducted involving a 2-inch AODD pump that did not have an EMS incorporated into its ADS versus one that did. The test was conducted using water as the media. The non-EMS pump was run at a 100 psig air inlet against a discharge pressure of 20 psig. At these conditions, the non-EMS pump used 130 scfm of compressed air to achieve a flow rate of 116 gpm.

When the same test was conducted using an AODD pump with an EMS ADS, the same flow rate of 116 gpm was achieved while "dialing back" the air usage so that the pump was not running at maximum capacity. In this test, the AODD pump with an EMS ADS reduced the air consumption by 42% (or 54 scfm) at the desired flow rate of 116 gpm.

So, while AODD pumps will always play a key role in the manufacture of paint and coatings, only those that feature an ADS with an EMS option will allow the facility operator to reduce the consumption of costly compressed air while still achieving the flow and transfer rates that allow the plant to meet its production quotas.

For more information on optimizing AODD pump performance, please go to www.wildenpump.com/seemoregreen.

The performance-enhancing operation of the upgraded Wilden Advanced™ Series pumps also equates into energy savings for the facility operator as lower amounts of compressed air are needed to maintain desired flow rates and pressures (see Sidebar). All of these features combine to make Wilden's Advanced™ Series Metal AODD Pumps the ultimate answer for all liquid-handling applications in paint and coatings manufacturing operations.

Conclusion

Manufacturers in every industry can no longer be solely concerned with meeting production quotas. As utility costs continue to rise, they must also take measures to guarantee that their operations run in the most efficient manner possible. Then, when all those operational parameters are met, they must also ensure that their production processes meet the tenets of increasingly strict environmental regulations.

These unique, and growing, challenges are why many manufacturers, especially those in the paint and coatings industry, are turning to pumping technologies that not only ensure production quotas are met, but that they are done so in the most cost-effective and environmentally sensitive manner possible. Wilden has recognized these challenges in paint and coatings manufacture and has taken innovative steps to meet these demands through the technological enhancements it has developed for its AODD pumps, specifically the Advanced™ Series Metal AODD lines. These pumps are now designed to offer the best performance in paint and coatings manufacture, performance that will optimize production, energy savings, product containment and environmental consciousness in one of the most important industries on the globe.

Edison Brito is the Chemical Market Development Director – Americas for the Pump Solutions Group (PSG™), Downers Grove, IL, USA. He can be reached at Edison.Brito@pumpsg.com or (973) 780-7985. Wilden Pump & Engineering, LLC, Grand Terrace, CA, USA, is a leading manufacturer of air-operated double-diaphragm (AODD) pumps, and is a member of PSG™. PSG is comprised of seven leading pump brands – Almatec®, Blackmer®, EnviroGear®, Griswold™, Mouvex®, Neptune™ and Wilden For more information on Wilden, please go to www.wildenpump.com.

WILDEN®
A DOVER COMPANY

World Headquarters
Wilden Pump & Engineering, LLC
22069 Van Buren Street
Grand Terrace, CA 92313-5607 USA
T: (909) 422-1730 / F: (909) 783-3440

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