

# Improving Ceramics Production With AODD Pumps

In a critical global market that is pivotal in the production of many everyday products, Wilden® AODD Pumps offer the versatility and reliability needed to optimize operations



*Since its origination nearly 200 years ago, the ceramics industry has grown into a global behemoth with significant operations on all continents. Ceramics are most prominently used in the production of tiles and sanitaryware and their successful manufacture is reliant on the adherence to strict operational norms, many of which can be optimized through the use of Wilden® Air-Operated Double-Diaphragm (AODD) Pumps that are outfitted with innovative specialty diaphragms.*

## INTRODUCTION

Since originating in Europe in 1830, the ceramic industry has expanded around the globe with great importance for many countries, including significant contribution to their GDPs. In the last few decades the production of tiles and sanitaryware, which had been concentrated in European countries like Italy and Spain, and also the United States, has relocated to the other side of ocean. The emerging countries in the BRIC coalition, (Brazil, India and China) are leading the way in the manufacture of tiles, while Mexico and Turkey, alongside China, are now the the leaders in the production of sanitaryware.

The basic definition of "ceramics," which comes from Greek and means "burnt clay," does not adequately express anymore how technology has helped transform this industry. Giant silos and ovens, printers that can literally

emboss any type of image on a tile, and robots for the automated enameling of sanitaryware, are some of the examples of this great transformation. All of which takes in huge ceramics plants of more than 100.000 m<sup>2</sup>, where 350 or more air-operated double-diaphragm (AODD) pumps are moving highly abrasive products such as barbotine and ceramic enamel every day around the clock.

## THE CHALLENGE

Though global ceramic plants can be located on any continent and the products they produce can number in the thousands, the ceramic-manufacturing process is essentially the same in any ceramic plant around the world. The handling of very abrasive materials, solid-laden slurries and corrosives are part of the

manufacturing process, from tiles to sanitaryware. Finding a way to identify the best efficiencies for the process, that is, the highest flow with volumetric consistency and with the lowest air consumption, with a greater mean time between failure (MTBF), is really the greatest challenge for ceramic-plant operators.

The preparation of the barbotine (the base material in tile and sanitaryware manufacturing) is key to the process. AODD pumps are often used to transfer the barbotine, from the atomization process to the storage silos and then to the pressing process. Transferring barbotine requires high flow rates for a very abrasive liquid at a high temperature. In tile production, the Engobe and Glazer application process is key, where the pump's ability to have the greatest MTBF makes the difference. In sanitaryware production, the molds must be filled as quickly as possible, and as smooth as possible, without the generation of air bubbles that can create craters in the pieces. In both cases, most of the pumps that are used are 2" and 3" (51 mm and 76 mm) since they must deliver high flow rates with low air consumption. "Any" pump is not enough here. You need a simple pump that must also be reliable, and very efficient.

Traditionally, two pump technologies have been used in ceramic production: the first is the progressive cavity pump, which has a number of operational shortcomings. These include an inability to consistently handle liquids with high levels of abrasives, which leads to increased maintenance costs, wear on expensive stators, rotors and mechanical seals that will eventually need to be replaced, and overall higher purchase, operating and repair/replacement costs. The second, the peristaltic (hose) pump, can deliver liquids with a high amount of abrasive particles, but to do that, it may be necessary to oversize the pump since it needs to be run at low speed. There is also the fact that the hoses will wear out rather quickly and need to be replaced, meaning higher costs for maintenance and repair/replacement. The chance that a hose will burst during a production run also requires an alarm in case of leakage, to stop the pump, or you can lose it completely.

## THE SOLUTION

In general, it is the design and method of operation of AODD pumps that enable them to reliably outperform their progressive cavity and/or a peristaltic (hose) pump cousins in ceramics production. The simple design of AODD pumps features few moving parts, which simplifies maintenance, while the seal-less construction results in fewer leaks, which is a critical consideration when handling very abrasive and solid-laden liquids that are prevalent in ceramics production. AODD pumps are available in both metal and plastic housing constructions, while a wide array of elastomers can be used in the diaphragms, some of which eliminate abrasion concerns. AODD pumps also possess the capability to move liquids with low air pressure. This is a powerful combination that fits the needs of sanitaryware manufacture.

All of these features combine to offer many benefits for the user, including:

- Wetted components that are impervious to damage from abrasive, viscous and solid-laden liquids
- Seal-less design that virtually eliminates leaks
- An air motor that can operate in dry, humid or dirty atmospheric conditions
- Consistent startup pressures that will not damage the pump or piping
- Easy assembly and disassembly
- High energy efficiency
- Self-priming, dry-run and high suction-lift capabilities that rule out a slow start
- Simple maintenance with low associated costs for repair or parts inventory/replacement
- Easy automation that is achieved by simply closing the discharge valve



*There are many unique stages of ceramics production, among them atomizing, electroplating, painting, water treatment and press filter. What they all have in common is that performance within all of these stages can be improved through the use of Wilden AODD Pumps that feature Chem-Fuse or EZ-Install diaphragms.*

Within the realm of the AODD pump, the Wilden® brand has risen to the fore as a first-choice technology for ceramics manufacturers. Wilden AODD pumps stand out in these applications because they check all of the boxes for versatile, reliable and robust operations via the features listed above.

Most prominently, Wilden offers multiple models, materials, configuration, elastomers, Air Distribution Systems (ADS), and sizes from 1" to 3" (26 mm to 76 mm).

Here's a closer look at operational capabilities, of the models within Wilden's pump family, specifically for two key stages of the ceramic-production process, virtually all of which can reach pumping pressures of up to 125 psi (8.6 bar):

- Painting and enameling booth
  - **1" (26 mm):** The PS220/PS230 pumps have a bolted metal configuration that allows them to achieve flow rates up to 56 gpm (212 L/min), depending on the diaphragm type, with the ability to handle solids as large as 1/4" (6.4 mm)
  - **1-1/2" (38 mm):** The PS420/PS430 pumps have a bolted metal configuration that allows to achieve flow rates up to 135 gpm (510 L/min), again depending on the diaphragm type, with the ability to handle solids as large as 1/4" (6.4 mm). The new liquid chamber design allows the creation of higher flow rates, often those of a competitor's 2" pump. A clamped version is also available, if the customer prefers.
- Barbotine transference
  - **2" (51 mm):** The PS820/PS830 pumps have a bolted metal configuration that allows them to achieve flow rates up to 181 gpm (685 L/min), depending on the diaphragm type, with the ability to handle solids as large as 1/4" (6.4 mm), with a clamped version available, if the customer prefers.
  - **3" (76 mm):** The PS1520/PS1530 pumps have a bolted metal configuration that allows them to achieve flow rates up to 271 gpm (1,026 L/min), depending on the diaphragm type, with the ability to handle solids as large as 1/2" (12.7 mm). A clamped version is also available, if the customer prefers.

The full range of Wilden AODD pumps can also be used in many others applications within a ceramic plant, such as to wash/clean sanitaryware molds with corrosive chemicals, water treatment and filter press.

Wilden AODD pumps have become "the pump" for use in ceramic applications due to three recent technological advances:

- New internal flow path (FIT)
- Revolutionary ADS (Pro-Flo® SHIFT)
- State-of-the-art diaphragms (Chem-Fuse and EZ-Install)



*The Wilden Pro-Flo® SHIFT Air Distribution System (ADS) revolutionizes AODD-pump operation through a design that reduces air consumption by up to 60% when compared to competitive models.*

The FIT design in all metallic pumps from 1-1/2" to 3" allows the Wilden pump to "fit" any kind of pipe, even those with dimensions based on competitor's pumps, clamped or bolted, flanged or threaded. The piping does not need to be changed to accommodate the connections. And that's not all, The FIT design has a new internal flow path that is larger than the competition and designed to minimize the change of direction of the liquid, which reduces its velocity and the abrasive effect of any suspended solid. This also helps the flow stay laminar which keeps solids in the current line, reducing the abrasive effect. This new design allows the flow rate to be increased while still running the pump at lower strokes per minute (SPM), which allows a smooth, laminar flow that reduces the abrasive effect even more. The liquid path is designed for longer diaphragm life, minimizing the contact between the diaphragm and the liquid chamber.

It is easier to maintain, and eliminates unnecessary fasteners that can be hard to reach. The manifolds are also interchangeable, allowing modifications to be made quickly and easily.

All Wilden "PS" pump models are powered by the revolutionary Pro-Flo SHIFT ADS. This ADS optimizes air usage through a breakthrough design that reduces air consumption by 60% through the elimination of the wasteful loss of air to the atmosphere at the end of each pump stroke. Many ceramic plants use a huge amount of 3" (76 mm) pumps that consume a large amount of air. Therefore, reducing air consumption by 60% is a tremendous benefit. For example, the amount of compressed air needed to feed a competitor's pump will feed two Wilden pumps, and there would still be air left over.

As Wilden has expanded its AODD pump offering, it has also created new diaphragm materials and designs,





*The latest additions to Wilden's family of diaphragm models are the Chem-Fuse Integral Piston Diaphragm (IPD) and EZ-Install Diaphragm, both of which deliver improved performance through higher levels of reliability, service life and efficiency.*

all of which can improve performance and reliability in any severe liquid-handling application. Two of the most recent advancements in this area are:

- **Chem-Fuse Integral Piston Diaphragms (IPD):** Chem-Fuse diaphragms have been designed to deliver an elevated level of performance, which makes them ideal for use in high-volume ceramics-manufacturing applications. Most significantly, the IPD design eliminates potential leak points at the outer piston, along with outer-piston abrasion that can compromise diaphragm life, especially when pumping abrasive fluids. Chem-Fuse IPDs are also easier to clean than traditional diaphragm models, which makes for faster changeovers within product runs. Chem-Fuse diaphragms are constructed of Wil-Flex®, and they are compatible with all Pro-Flo SHIFT bolted metal and plastic pump models in sizes from 1" to 3".
- **EZ-Install Diaphragms:** The EZ-Install diaphragm models feature a unique convolute shape that requires no need to invert the diaphragm during installation, resulting in quick, easy installation with minimized risk of injury, making them a convenient like-for-like replacement for traditional diaphragms with corresponding reductions in pump downtime. EZ-Install diaphragms are available in many materials of construction, where Wil-Flex and polyurethane are most commonly used in ceramic applications. Available in sizes from 1" to 3".

## CONCLUSION

It's no stretch to say that ceramics help make the world go round, and without them millions of lives would be incredibly different. That's why their fast, reliable production is paramount to protecting the way of life that so many all over the world have come to expect. To meet the needs of this diverse, demanding and critical industry, Wilden offers a complete roster of pumping models, providing the best efficiency you can find, along with advanced diaphragm options, that have all been designed to optimize the various unique, but critical, stages in the ceramic-manufacturing process.