

## Closed Powder Handling Solutions Create Efficiencies and Increase Safety in Process Industries

Today's process industries make widespread use of powders in myriad applications. While many processes employ similar operations to convert raw materials into finished products, the complexities of handling and transferring powders have earned this material category a unique reputation among process engineers and others involved in designing and operating material transfer systems. From challenging dry bulk materials used in plastics manufacturing to fragile tablet granulations and active pharmaceutical ingredients (APIs), each application presents its own set of unique requirements making powder handling and transfer a critical aspect of process manufacturing.

**Read on to learn more.**



Containing fine powders, particles, tablets, and granules has become critically important in today's processing facilities. Not only is there the expense of product waste, but the accumulation of dust that occurs when product escapes during transfer can lead to potentially deadly explosions and worker health issues. Keeping virgin ingredients safe from the processing environment and keeping those working in that environment safe from the products are central design objectives for today's powder transfer systems. Depending on material characteristics and toxicity, one or both of these objectives must be met to ensure Germany's high standards of product quality and operator safety.



There are several powder transfer methods, each with its own unique benefits and challenges. The most basic of these methods is the manual charging of powders into downstream processing equipment. Manual handling is slow and can delay production as well as present countless opportunities for messy spills and cross-contamination

resulting in extensive routine cleanup. While this may seem like a dated approach, it remains a common practice in many facilities where processes involving solids handling are performed. Although this method doesn't require the use of equipment or sophisticated controls, it clearly lacks the advantages of automated transfer solutions. Mechanical transfer presents a second method introducing automation through the use of energy-efficient motors. This method, however, often involves complex costly routing that can make installation complex while leaving issues of containment and operator safety unaddressed. The third and final option is pneumatic conveying and is the best method to ensure the efficient and contained handling of powders.

### **A proactive approach to worker and environmental safety**

In today's competitive and highly regulated markets, operator ergonomics and worker safety is a primary concern. Processes involving the handling and transfer of potentially hazardous materials inherently introduce increased safety risks. Transferring powder from one container to another, whether by pouring or scooping, can release plumes of airborne 'dust' posing significant hazards

when transporting certain materials such as starch or activated carbon. Even inert powders, when inhaled over time, can cause lung damage, and active ingredients can cause lung, skin, and eye irritation or damage, or trigger allergic reactions. Whether regulated or not, companies transferring bulk powders from drums or containers should ensure that their processes meet basic environmental and worker safety requirements. Pharmaceutical companies and other regulated manufacturers are obliged to meet additional protocol requirements as part current Good Manufacturing Processes (GMP).

Environmental safety hazards should not be overlooked. Any airborne flammable dust in sufficient concentrations can explode. Combustible dust on the ground can become airborne and propagate an explosion. Such an event can occur with vegetable and organic materials as well as with metal and other oxidizable dusts. "Hygroscopic materials that absorb moisture from the air and materials that explode due to airborne exposure pose serious health and safety risks for workers and require specialized handling and the use of highly reliable transfer equipment," says Steven Coupal, Global Engineering Leader with ARO, a division of Ingersoll Rand. "With increasingly stringent health and safety regulations, closed powder-handling solutions have become an issue even for industries that have not been concerned until recently. Our material handling experts work with companies to make the necessary process changes and introduce closed, ATEX-certified powder transfer systems in order to mitigate these risks and help make their operations more successful."

Powder transfer systems are designed to effectively move bulk powders throughout a process without compromising worker safety. Specialized air operated diaphragm pumps such as the ARO Powder Transfer System, offer a closed solution designed for the consistent transfer of dry powders in a dust-free operation. With few moving mechanics, noise levels are also lower than comparable electrical pumps. Opting for a closed powder transfer solution is not only an investment in worker health and safety but one with equal benefits in terms of product quality and process efficiency.

### **Changing demands and transfer performance**

Variables such as fluidization, transfer capacity, and pump reliability can either positively or negatively affect batch and overall production times. To address these issues, the ARO Powder Transfer System features regulated aeration ports for optimum powder aeration and diffusion and an integrated delay timer to increase system efficiency, making



this pump a good choice for handling dusty or sticky powders. The system is also outfitted with a stall-free major air valve and patented four-way air induction system that controls the amount of air or other inert gas required for operating resulting in substantial cost and energy savings while eliminating powder pack-out at startup. Air operated transfer systems require less manpower when compared to manual transfer process, allowing workers to focus on higher-value activities.

Today's powder-handling facilities must be able to quickly adapt to market demands, with lean production units that can accommodate fast process changes based on mobile or modular technologies. The ARO Powder Transfer System offers flexible installation options and is portable enough to be trolley-mounted or installed on existing process equipment, while offering the added benefit of being easy-to-service.

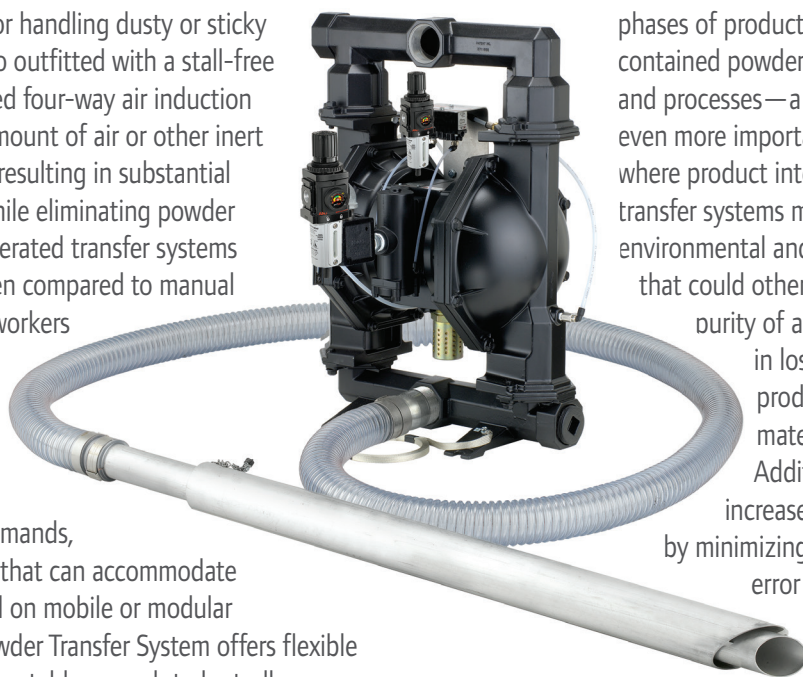
### **Pump design and equipment life**

The ability to keep a vessel closed while introducing powder into the process is considered a best practice for most all applications. Pneumatic powder transfer systems virtually eliminate the need to constantly open storage or processing tank manways, greatly reducing the risk of damage and deterioration. Air operated diaphragm pumps are also optimized for serviceability being that they are much easier to clean and maintain when compared to other pumps. The ARO Powder Transfer system offers a closed system design eliminating exterior contaminants and substantially reducing equipment and facility cleanup, which keeps operations moving. Available in stainless steel and aluminum construction, these pumps are self-priming and can run dry or against a closed discharge without the risk of damage or heat buildup.

With few moving parts and the ability to run without electrical power, the ARO Powder Pump is an ideal choice for a wide variety of powder transfer applications including carbon black, expanded mica, silicones, acrylic resins and pharmaceuticals.

### **Risk management, regulatory compliance and product quality**

For many manufacturers, staying competitive in today's global markets isn't possible without the safe, efficient and hygienic requirements associated with transporting bulk powder ingredients. Numerous quality advantages across multiple



phases of production can be realized with contained powder transfer technologies and processes—a topic which becomes even more important in applications where product integrity is critical. Closed transfer systems minimize the potential for environmental and material contamination that could otherwise jeopardize the purity of an entire batch resulting in lost production time, product losses, wasted raw materials and significant cost. Additional benefits include increased process repeatability by minimizing opportunities for human error and associated rework.

Flow characteristics and pump construction

also factor into product quality. Features such as a smooth flowpath and integrated fluidization capabilities minimize the shear rate and any potential for product damage during pumping. ARO Powder Transfer Systems are constructed using non-reactive, additive or absorptive components so as not to alter the safety, integrity or quality of your product while maintaining the reliability of the pump. These systems are also designed with removable fluid caps offering easy access to the fluid chamber for servicing, cleaning or diaphragm replacement, without the need for tools.

### **The right pump for cost and material savings**

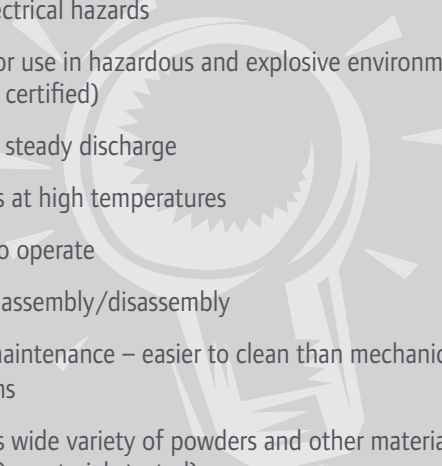
As manufacturers continue to implement new methods and processes to meet production goals while spending less, process engineers must make intelligent decisions when it comes to powder handling. A lower initial investment doesn't necessarily translate to improved operating costs. Poorly constructed or unreliable pumps can increase downtime and power consumption, impact revenue and significantly add to maintenance costs while over-investing in large complex systems may be unnecessary for many applications. When considering alternatives, engineers and others must ultimately make decisions based on the required needs of the application, operational requirements and total cost of ownership. Unlike large installed systems, manufacturers can have confidence that the ARO Powder Transfer Pump will keep material flowing and handle a wide variety of transfer applications in a safe and contained manner. Compact and portable, these pumps are easily introduced to existing equipment configurations without the need for modification.

Powder pumps offer numerous additional benefits including material recovery. Transfer efficiency metrics involving the use of mechanical systems can run as low as 40 percent. Consider handling a load of 200 pounds of bulk powder and transferring only 80-90 pounds before encountering dust-over incidents resulting in frequent shutdowns and time-consuming cleanup. Closed powder transfer systems offer safe, effective and clean transfer with virtually no scrap resulting in less clean up and less manpower for system maintenance. In some cases, moving to a closed powder handling system can also lower the costs associated the use of personal protective equipment (PPE) required with open systems.

### **Countless powders and numerous applications can make finding the best transfer pump a challenge**

Today, myriad bulk powders are transferred quickly and efficiently using powder transfer systems and their closed design is responsible for protecting the environment, workers and the material itself from being disturbed during the process. The overall flexibility of this process has lent itself to handling many challenging materials, including calcium carbonate, carbon black, ceramic dust and lead oxide, among many others. ARO powder handling experts have successfully tested the transfer of more than 1,000 materials using the ARO Powder Transfer System. With extensive test data to support the system's safety and efficacy and a global distributor network, ARO material handling experts can help identify the right pump and system configuration for a wide variety of powder and other solids handling requirements.

### **Benefits of Air Operated Powder Transfer Systems**

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- ✔ Self-priming from any start
  - ✔ Runs dry without damage
  - ✔ Oil free design
  - ✔ No electrical hazards
  - ✔ Safe for use in hazardous and explosive environments (ATEX certified)
  - ✔ Quiet, steady discharge
  - ✔ Pumps at high temperatures
  - ✔ Easy to operate
  - ✔ Quick assembly/disassembly
  - ✔ Low maintenance – easier to clean than mechanical systems
  - ✔ Pumps wide variety of powders and other materials (1,000+ materials tested)
  - ✔ Safely transfers carcinogens, oxygen or skin sensitive and explosive powders
  - ✔ Suitable for transfer of raw, intermediate or finished products
  - ✔ Considerable reduction or elimination of operator exposure
  - ✔ Considerable reduction in transfer times and manpower
  - ✔ Compact and portable for maximum flexibility
  - ✔ Optimized aeration and reduced batch time through integrated fluidization
  - ✔ No additional handling equipment

# ARO®

### **For more information about ARO, contact:**

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### **ARO Makes Success Flow**

ARO is a leading worldwide manufacturer of fluid handling products expertly engineered to deliver performance and serviceability, enabling customers to achieve the best total cost of ownership. For 85 years ARO has been helping customers solve their most complex fluid handling challenges to keep their business moving. For more information about ARO, visit [www.AROzone.com](http://www.AROzone.com). Follow ARO on Twitter at @AROPumps or on YouTube at ARO Pumps/Ingersoll Rand or regular fluid intelligence updates.