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Solid state

When it comes to unloading and handling bulk solids, time is the critical factor within many process plants, writes Michelle Knott

The market for so-called ‘big bags’ is set to grow by over 7% a year to 2019 according to a recent report from Infiniti Research, largely thanks to rising demand from food and pharmaceuticals sectors.

It’s clear Flexible Intermediate Bulk Containers (FIBCs) can offer these industries a low-cost, lightweight option for shifting bulk solids, but they can also present them with significant challenges when it comes to unloading their contents into onsite storage or conveying systems.

Lifting and manipulating a heavy load into position may require a forklift truck, for instance. Or there may be issues of containment if the material is dusty or potentially hazardous. But one of the most common challenges is material becoming compacted during transport and storage, which can prevent it from flowing freely out of the bag.

The latest generation of bulk bag dischargers include flow promotion devices to help encourage smooth emptying. For example, Flexicon’s systems can include Flow-Flexer bag activators, which raise and lower the bottom edges of the bag to direct material into the spout at the bottom of the bag and form a steep V-shape to promote total emptying.

However, the most extreme flow issues arise in products prone to solidification, in which case a bulk bag conditioner may be required. These systems may be free-standing or integrated into a discharge station, but they are essentially a system of heavy-duty rams designed to break up the solidified material.

For example, Spiroflow’s bulk bag conditioner breaks up solidified material with just one to three powerful squeezes of its hydraulically-driven, horizontal poles, according to the company.

“The likelihood of material solidification being a problem varies widely and is dependent on the material itself and how it is packaged, stored and/or transported,” explains David Boger, Flexicon’s vice president for global business development.

“Regardless of the industry, solidification can occur with a wide range of hygroscopic chemicals, heat-sensitive products and other materials that are prone to solidifying to the point at which flow promotion devices on bulk bag dischargers are ineffective.

“The difficulty in estimating how commonly this type of problem occurs is compounded by the fact that the existence of problematic solidification cannot necessarily be correlated with an industry, a process or even a material,” adds Boger.

“While an industry and the material itself can be identified, the packaging, storage and transport will vary. This can even be true over time within a single facility. For example, a process that has never encountered a problem with solidification could have a problem simply if a company changes suppliers of the material.”

For Morgan Advanced Materials & Technology near Swansea, the challenge was pitch, which is a difficult-to-handle,
viscoelastic raw material that acts as a solid that can shatter at room temperature, even though it’s actually a very slow-flowing liquid.

Morgan blends pitch into a carbon base that is used in a range of advanced materials. The company imports raw pitch in 700 kg capacity bulk bags from the Indian sub-continent and South East Asia.

Temperature changes and long storage periods during transportation cause it to solidify. Prior to installing the bulk bag conditioning system, each bag of pitch was placed on a concrete plinth and smashed with the bucket of a backhoe (digger), which was time consuming and messy, and raised safety concerns.

The solution was a freestanding bulk bag conditioner from Flexicon. Housed in a freestanding support frame, the unit is equipped with two hydraulic rams fitted with specially contoured end plates and a powered scissor lift with variable-height turntable.

Once a forklift loads a palletised bag of pitch onto the conditioner’s platform, the operator closes the safety interlocked doors and programs the ram pressure, number of ram cycles, single or multiple turntable heights and degree of rotation.

Once initiated, the conditioning cycle is automatic: the bulk bag is raised hydraulically to the pre-selected height, the end plates press opposite sides of the bag to loosen the pitch and the bag is rotated 90 degrees to condition the adjacent sides.

The system can be programmed to automatically repeat conditioning cycles at multiple bag heights. The process reduces the pitch to small lumps that can be discharged through the bag spout.

▲ Shifting and unloading bulk solids onsite can present plant managers with significant challenges

The main benefit is time saving, enabling the company to complete the pitch conditioning process in just 10% of the time previously required.

In fact, time is the chief key performance indicator for bulk bag conditioning in many applications. That’s why the suppliers that provide bulk bag discharge stations are increasingly providing the option to integrate bulk bag conditioning equipment within their unloading systems, rather than simply offering standalone units.

According to National Bulk Equipment (NBE), its integrated bulk bag conditioning equipment can speed up the cycle of loading up the bag, conditioning, discharging and unloading at the discharge station by up to 25%, compared to using a free-standing conditioner. “When factored over an eight-hour shift, this reduction in cycle times can increase the number of bulk bag load-to-unload cycles by up to 30%,” says NBE.

► EQUIPMENT

Discharge station unplugs bottleneck

Bulk bag unloading proved to be a production bottleneck for Skretting of Longridge, Lancashire, which manufactures fish food for commercial farming.

The original discharge system comprised a lidded hopper with a spigot, to which the neck of the bag was attached. The set-up required the use of a forklift to support the bag for the entire discharge operation. In addition, an operative needed to be on hand for the duration to ensure the material discharged fully, even if it had become compacted.

The result was that it used to take around half an hour to discharge each bag. With a new discharge station from Spiroflow, each one tonne bulk bag is now discharged in just five minutes.

Another challenge at Skretting was a restriction on headroom, which meant that full bags could not be lifted directly onto the discharger. Spiroflow’s T5 discharger overcame that obstacle by being constructed in two sections. The upper section lifts off the base and lowers to the ground, where a forklift can place the bag into the frame. The top section can then be lifted via fork channels at its base, back onto the discharger.

While the ingredients at Skretting do not usually require full bulk bag conditioning, the discharge station includes pneumatically operated bag base massagers to deal with products that may have become compacted during transport.

Skretting’s production manager, Bill Edmondson, says: “There is just no comparison with the previous system. Our new Spiroflow Discharger has enabled us to increase productivity and we can use the forklift truck for other duties whilst the bulk bags are being emptied – not that that takes long.”