Safety Considerations in Super Sack Handling Equipment

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Bulk bags, FIBC’s (Flexible Intermediate Containers), Super Sacks®, Big Bags, Jumbo Totes, Flexi Totes, etc. Whatever name you give them, the use of FIBC bags is on a meteoric rise. In 2013 well over 34 million bags were used in the US. Much of that increase has been driven by economics (more packaging material costs), however, the ergonomic advantages of bulk bags over small bags (primarily 50# and 25kg), small boxes, and drums has had a significant impact as well. These smaller packages can cause back and joint injuries due to the repetitive lifting, and can limit the type and age of personnel that can perform those duties. While bulk bags offer ergonomic advantages, the proliferation in bulk bag use has created a new class of safety issues. Moreover, due to the significant weights (in some cases over 2 tons) the results of these incidents can be catastrophic. In this report we will discuss some of the more common issues, risks, and their remedies.

Below is a common type of tag (and required to be attached) to bulk bags used in the US. This tag should always be checked for items like capacity (weight rating) and other handling guidelines. Most will include pictographs and examples of the do’s and don’ts of bag handling.
Historically these bags were used in just a few industries (agriculture and mining in particular), and even then in small numbers. Much of the early equipment to handle the bags was either poorly designed or not suited to the task. But due to infrequent use and small numbers, injuries were rare. When this equipment was pressed into greater service and operators were forced to handle more bags with these sub-par systems the injury rates began to climb. Injuries caused by use (or misuse) of the bags fall into (4) primary categories:

- Filling
- Unloading
- Lifting
- Storage

We will take a look at each of these individually, and then discuss additional good practices in bulk bag handling.

**Filling**

Probably the category with the lowest risk and fewest injuries is filling bulk bags, however, there are some notable issues and easy remedies. One of the most common injuries is lack of suitable bag support as the bag fills, leaving it susceptible to leaning or toppling. In the best of cases these issues cause little or no harm, in the worst cases, operators or their appendages have been crushed. Another related set of injuries can occur when supporting the bag from a something non-permanent (most notably a fork-lift). While the forklift may have suitable capacity for supporting the bag, it requires the operator to work in close proximity to it. This can lead to being run over or hit by the lift, getting caught between the lift and other equipment, or someone errantly lowering the bag onto another operator or their appendages. A proper filling frame is always recommended that is rated to support the entire weight of the bag in a suspended mode (not typically necessary for proper filling, but eliminates any doubt to its suitability).

Other common filling injuries are related to support and sealing of the bag fill spout. Operators should not be required to hold the spout in awkward positions (see photo below), use inferior sealing devices (bungee cords for example), or be exposed to dust as the bag is filled but not properly vented. Any reputable manufacturer’s basic filling frames will provide a safe and efficient system. The more automated machines can offer significant ergonomic advantages (easy attach lift loops systems, automatic loop release, automatic discharge of the bag to accumulation conveyors, pallet feeders, automatic size (height) change, etc.).
Overfilling or overloading of bags. This may seem obvious, but when bags are either overfilled, or filled with more weight than they are rated for they may fail (falling over, bursting, seams or lift loops that rip open or off, etc.). Bags are typically rated at a 5:1 or 6:1 safe working load (if the bag is rated to hold 2,000#, it must pass a test at 10,000# to achieve a 5:1 ratio).

Another consideration is the potential shock to operators, or even dust explosion caused as the bag is filling. For some materials a significant static charge can be created as it is filled. If this static reaches a high enough charge, and a spark is created, a combustible material may ignite, or the dust itself can explode. Below is a short list of hazards of static material handling in bulk bags, however, there are many resources that cover this subject in great detail. In general, these handling systems are required to completely ground the bag and the equipment (and the operator) when working with combustible materials and ground-able (conductive) bags. Conductivity (continuity) instruments can be used to ensure the bag/equipment is safe to use, or even “lock-out” equipment if this isn't grounded properly.

- **Brush Discharges from the surfaces of Type A (standard insulating) FIBCs and liners**
- **Brush discharges can ignite flammable atmospheres requiring up to approximately 3 – 5mJ for ignition**
- **Propagating Brush discharges can ignite flammable vapor, gas, and dust cloud atmospheres**
- **Spark Discharges from conductive parts of Type C FIBCs (ground-able bags), if left ungrounded, and from conductive threads in corona type FIBCs**
- **Spark discharges from conductive parts of Type C FIBCs can ignite flammable vapor, gas, and many dust cloud atmospheres**
FILLING SYSTEMS - THE BAD

FILLING SYSTEMS - THE GOOD
**Bag Unloading**

Most of the injuries with bulk bags revolve around the discharging operations. In the early days of bag use (late 1960’s) bags were commonly supported by forklifts or cranes and a person would either stand or reach under them to untie a discharge spout or simply cut the bag with a knife. This led to operators who were crushed, covered in material, or were exposed to the hazards of dust inhalation. It is always recommended (and often required by OHSA inspectors) that bags must have a structural support from underneath with the capacity to hold the entire weight of the bag, and that the operator reach under that support to access the bag spout or for cutting the bag. This can be something as exotic as a bag shaped receiver hoppers or paddles/plates on (4) sides, or as simple as a set of tubes, or even lumber, that the bag can be lowered onto for safe access.

Just as in bag filling, there can be static generated as material is discharged from the bag. In these cases the bag and equipment must be properly grounded to create a safe operating environment.

Pinch points are another item to look for when evaluating unloading systems. If there are actuated massaging systems, they may need to be guarded from operators reaching into them. This is also true of bag elongating systems, if they are in proximity of the operator, they can present pinching (tube-in-tube) or crushing opportunities.

Dust mitigation or control is important as well. Bags with dusty/aerated materials should be discharged with systems designed to minimize the operator’s exposure. This can include the use of mechanical or pneumatic spout sealing systems (bag spout is sealed prior to opening), or an isolation valve like an iris valve to allow the operator to untie the bag, but close an access door prior to material flowing from the spout. In extreme cases (toxic or hazardous materials) a glove box access with positive dust control may be required.
BAG UNLOADING – THE BAD

BAG UNLOADING – THE GOOD
Bag Lifting

Bags are typically lifted either by forklift or crane/hoist via lift loops attached to the top of the bag. Both require special attention to equipment and technique. Bags may have 1, 2, 4, or more lift loops or straps sewn into them. The most common bags have (4) lift loops (1 at each corner of the bag). These lift loops can be standard loops or spread straps. Either style can be lifted directly by fork lifts with tines that are not sharp (sharp tines can abrade or cut the lift loops and cause the bag to fail or fall). Forks that are used for lifting bags should be inspected on a regular basis to insure they have rounded edges (it is recommended that they have a 5mm radius on all top edges). Due to the process required to attach bags directly to fork tines by the fork driver alone – fork truck must carefully pull up to top of bag on one side, get off the lift, feed first (2) loops onto tines and hope they don’t fall off as you get back on the lift, drive the lift forward to index the tines to the other side of the bag, get off the lift and feed the second set of loops onto the tines (again, hoping they don’t come off) and get back on the lift to pull forward once more then lift the bag. If another operator is assisting in this process it is faster, but puts the operator in harms way with the fork lift tines and wheels. There are adapters that make this process much quicker and safer. The forklift simply pulls into pockets with the forks, hovers over the bag to be lifted, attaches all of the loops into secure connections, then lifts the bag with the adapter. These adapters should be sourced from reputable suppliers with test load certifications for their designs.

THE BAD

THE GOOD
Bag Storage

Most bags are single layer stored on the floor, or in pallet racking. While double and even triple stacking is permissible in most cases (bags need to be designed for such), there are some dangers operators must be conscience of. If bags are unstable (have materials or bag designs that create unpredictable shapes, are leaning, or are not suited to have the additional bag weight added to the top, stacking should be avoided. Another consideration is when a bag on the first level of a stack has been punctured. This must be handled with the utmost care as bags above these leaking bags can lean or topple, crushing an operator or other equipment.

**THE BAD**

**THE GOOD**

Other Safety Considerations

Reuse of Bags

It is not uncommon that these bag are used for more than one trip. Typically bags that are to be used more than once will have design features (greater capacity ratings, support strapping or reinforcements, etc.) to ensure a safe arrangement. The bags must also be well maintained and inspected to proven issues as they are filled and discharged multiple times. Checking for closed discharge spouts, holes, rips in seams, worn or abraded lift loops are just a few of the items to check.
Summary

As mentioned at the top of this article, FIBC’s are one of the safest and more efficient ways to handle semi-bulk materials. In general you must consider the costs of workmen’s comp claims, wrongful death suits, OHSA fines, and Insurance Carrier premium increases when selecting equipment and training employees on its use. With just a few precautions, you can ensure a safe working environment for operators, workers, and visitors. There are many other resources available online and through your bag or equipment supplier.