

EMT big bag triple container at the side of a ship 80 tph.



SERIOUS ABOUT STORAGE

GUSTAAF ZEEMAN, EMT, THE NETHERLANDS, EXPLAINS WHY CAREFUL BAG SELECTION IS CRUCIAL TO ACHIEVING EFFICIENT FERTILIZER HANDLING OPERATIONS.

The storage capacity of bags used for holding fertilizer can range from between 100 – 1000 kg or more. Due to these differences in size and variations in handling requirements from country to country, a range of different machines are required for fertilizer bagging operations.

Big bags (bags capable of holding 100 – 1000 kg of fertilizer) will be the main focus of this article. However, it only takes a brief internet search to reveal that there is currently no standard definition of what constitutes a 'big bag'.

To begin, this discussion will concentrate on bags that are too heavy to be handled by personnel, for

instance, loads upwards of 50 kg or more. There are many different names for big bags, for instance 'jumbo bags', or flexible intermediate bulk containers (FIBC). As a result, different types of machines are needed to fill these bags; fixed machines, portable machines and net or gross weighing systems. The capacity that these machines are capable of handling per hour can vary, as can the filling methods.

Generally, the system of choice is a gross weighing system, where a digital scale is placed on the floor and the bag is filled with the fertilizer by an automatic metering slide or valve. However, the handling is done manually.

The scale measures the empty weight of the big bag. All the systems described in this article are



Figure 1. EMT high-speed big bag twin line 140 tph.

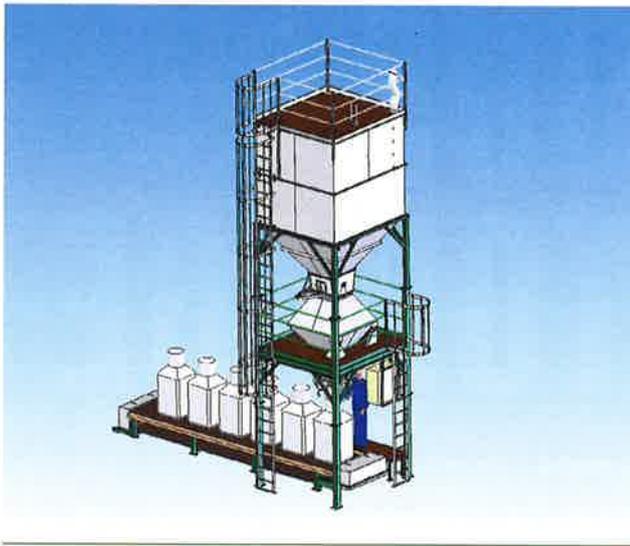


Figure 2. EMT high-speed big bag line 70 tph.



Figure 3. 3D CAD representation of a big bag line and blender.

capable of handling bags with either one, two or four loop bags. The bagging systems are equipped with two ventilators, one for blowing the big bags full of air to create enough space for the material and to stretch the polyethylene lining of the bag to touch the polypropylene bag outside.

The other ventilator sucks air out of the big bag and dust out of the surroundings to provide a clean environment for the operator.

The gross weighing big bags systems have a handling capacity of 30 – 60 bags/hr for 500 kg bags, which is also the same for 1000 kg bags.

The negative aspects of this type of machine are that when a problem occurs during the filling process, fertilizer can spill onto the floor and onto the weighing scale, which is difficult to clean. In addition, the operator can change the weight of the bag by accidentally applying pressure to it or standing on the scale. However, on the plus side the machine can be easily installed or moved. The most common set up is that the big bags are weighed on a scale on the floor that is integrated into the moving bag conveyor, allowing the big bag to be removed from the fill pipe with a conveyor system. This can be done with or without a pallet under the big bag. The most common big bag in use in the fertilizer industry is the one loop bag where bag handling can be done without a pallet.

The EMT high-speed big bag line weighs loads above the bag; this is called a net weighing process. Then, a weighing hopper is installed above the big bag and the product that needs to be filled is pre-weighed. These net weighing scales commonly handle volumes of 1500 l, however they have the capacity to fill up to 1000 kg for light density fertilizer, such as urea. This type of high speed net big bag fill system can fill up to three big bags of 500 kg/min.

As discussed above, the EMT big bag line is unaffected by gross weighing. The fertilizer is weighed above the bag before filling begins, and therefore it is a net weighing process as neither the operator nor bag has any influence on the weight of the bag. A more solid conveyor system under the bagging line means it is possible to create vibrations under the bag during filling.

In order to optimise the storage capacity of the bagging line, the handling machine's design must be tailored to the size of the bags being handled.

In general the weighing process is not an issue but rather the operator who has to handle the big bag. To achieve the three bag per minute target, the big bag needs to have a bottle type innerliner fill-mouth and this fill-mouth needs to be wide enough at the opening to allow product to flow easily into the big bag. When there is no bottle liner big bag, there is a need for a bag clamp, to deal with the polyethylene inner liner at the filling process, enabling a capacity of 70 – 80 tph. This capacity is based on a machine with one scale or fill pipe to fill up the big bag. There is the potential to double the handling capacity to 140 tph by doubling the system as a twin line.

In general these gross and net weighing systems are commonly used for one loop bags, which are widely used in the fertilizer industry. A variation of these gross or net



Figure 4. EMT small bags filling line with a total handling capacity of 240 tph, installed for a customer in Thailand.



Figure 5. Warehouse storage, EMT 20 ft vertical container big bag line 140 tph.

weighing systems in a warehouse is the portable big bag fill line, which are produced inside containers. It is possible to move these containers to the product instead of bringing the product to the machine. This type of machine can be installed in 10 ft (3 m), 20 ft (6 m) or 40 ft (12 m) containers. The handling capacity of these systems is the same as that of the fixed machine lines. The benefit of these portable lines is that they are very flexible. These portable lines can be used in warehouses and shipyards so that bulk cargo can be discharged from the ship and repacked into these big bags at ship side. This machine reduces extra product handling, thereby reducing costs.

In some countries four loop big bags are used to handle fertilizers and other bulk products. These four loop bags can also be filled using gross and net big bag weighing systems, however, this can only be done when the big bag is blown up by the ventilator before filling. The four loop bags are often transported by a forklift.

During filling, these loops are used to hang up the big bag during the weighing process. In this way the bag becomes square and can be filled without being blown with air in the big bag. For this method, more handling is necessary for the operators to connect the big bag to the fill pipes and weighing systems.

These four loop bag filling units will be used when less capacity is required. The machines are complicated because to achieve the right weight the big bag needs to be lifted up and down from the conveyor that moves the big bag away from the fill spout.

There are three different methods of handling empty bags. One option is for the machine operator to handle the bags by hand. Alternatively the operator could use an automated handling system. This is done by placing the bag onto an input carousel, although the operator still has to hang the bags onto the loops of the carousel manually. More commonly, robotic arms are used to lift the bags onto a rolling conveyor, so there is no operator needed.

Filling small bags

Small bags used for storing fertilizer usually have a storage capacity of between 20 – 50 kg. The basic machine weighs the load above the bag, the operator then hangs the bags to the machine fill pipe. The bags can either be sealed or sewn shut.

In general these units work with one or two weighing scales above the bag fill pipe. The small bag is hung with a bag clamp to the fill pipe and the correctly weighted product falls into the bag. Once full, the clamp releases the bag and it is transported by a conveyor to the closing system. The capacity of this line is between 1000 – 1200 bags/hr for two weighing scales and one fill pipe. When this machine set up is based on one weighing scale and one fill pipe, this capacity is reduced to 600 bags/hr. The

machines described above are constructed as open mouth bag fill machines. Some users also use valve bags, where the bag is not open, but preformed and closed with only a fill opening at the top side of the bag. This type of filling method takes more time as the pipe is a maximum of 8 cm wide. There are several robotised bagging lines available. This usually means that robot arms are used for loading open mouthed or valve bags, or fully automatic lines like the roll form fill seal machines (RFFS). These machines are fully automated and the polyethylene bag is stacked on a roll.

In general, most fertilizer handling machines are constructed of stainless steel 304. This reduces the chances of the machine rusting.

A further advantage of automatic bagging systems is that they often have climate control features to take away moisture, so these lines are often installed in closed conditions where moisture is regulated by air conditioning or air dryer systems. **WF**