

TECHNICAL ARTICLE

Imagine scooping and scrapping a 55 gallon drum of tomato paste by hand. Imagine you do this 5, 10, even 20 times per day. Surprisingly, this is many food producers' method of choice for unload ingredients from containers. Not only does this seem inefficient and labor intensive, but with arms scooping into drums about three feet deep, this method taxing to the human body and not at all ideal from a sanitation perspective. Even more surprising is that hand scooping is used with many high viscosity ingredients that are thick, sticky, and will not pour or fill back in when scooped. Some examples are peanut butter, tomato paste, icing, caramel, and fruit filling. When it comes to getting these materials out of a drum, it is much more difficult than squeezing a tube of toothpaste or pouring a can of tomato sauce.

There are four general methods typically used for unloading high viscosity ingredients: scooping, dumping, pumping with a stand along pump, and unloading with a container unloading system. There are general pros and cons to each option detailed below.

Unloading by Manual Scooping

Despite the fact that this method used to be virtually the only option available to food manufacturers, scooping is becoming less and less common for four main reasons: labor costs, ergonomics, sanitation, and waste. Scooping is the most labor intensive of the four options and is not normally feasible from an economic standpoint in areas where labor is more costly such as the United States, Canada, and Europe and is more prevalent in areas where labor is less expensive such as South America, Asia, and Mexico. In the later areas, manual scooping can be the least costly option when compared to purchasing equipment to dump or unload ingredients. Other drawbacks for manual unloading include the effect that it has on employees. Ergonomics can be an issue and it is not uncommon for employees to become injured from performing this task repeatedly. Compensation claims can quickly negate any cost savings realized by not investing in other equipment up front. In addition, manually unloading leaves the ingredients exposed to atmosphere and allowing employees to introduce contaminants into the food product when scooping and handling. A person who has been scooping tomato paste all day would understandable be dirty and sweaty and can easily introduce bacteria and contaminants into the food products. Lastly, with manual scooping there is generally a significant amount of material waste left in the drum. The food manufacturer must account for these purchased ingredients that are now being thrown away.

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Unloading High Viscosity Food Ingredients Safely and Effectively

Unloading by Dumping Systems

One solution that has replaced manual unloading is dumping of ingredients into a mixing kettle or hopper for further processing. There are several options for products that will lift an entire drum or tote of material and dump it out into the kettle. Another option for dumping is to grab the aseptic liner or plastic bag liner inside the drum or tote and cut it open over the kettle or hopper. This allows for all products from the bag to fall into the kettle for the mixing process. You will also see squeegees or rollers that will squeeze and roll the liner to remove any residual material left in the liner. This rolling of the liner reduces waste that would be thrown away overall the dumping process is a quick and efficient method to get the product out of the container.

There are several concerns with dumping product out of the containers or liners. First, when the material is dumped it is exposed to airborne contaminants and can have bacteria introduced into the product during the dumping process. The second issue, is when you are dumping 500 to 1,000 to 2,500 pounds of material into a mixing kettle end users can have issues with the weight of the material damaging the mixing blades when dumped or damaging other items in the kettle or hopper. The third issue is from a safety standpoint, there is a lot of weight in the bag or drum that is being held up in the air, potentially over workers that are working in the area. Often times workers will have to be the one who cuts the bag open and allows the material to dump out. This process can provide potential safety concerns with the dumping methods that are employed in facilities today. The final concern is that in order for systems to have enough power to raise and lower that amount of weight there is often hydraulics involved and the industrial style components can get dirty and drop debris into the mixing kettle when holding the bags for dumping. As you can see, even though the dumping process is quick, there are other issues that it brings into the food manufacturing facility.

Unloading with a Stand Alone Pump

The third option mentioned is using a stand alone pump, such as a progressive cavity pump or rotary lobe pump to pump the material out of the container. The issue with this option is that with higher viscosity materials it is very difficult to load the pump properly without watering down the product to allow it to flow into the pump. Adding water to the product can be okay but it is typically done with an open top drum and a pump on a winch and chain being hung over the open drum which can drop debris into the product. This method can leave a large amount of residual waste in the container and still be labor intensive for users. Pumps and equipment can also be damaged due to not loading properly and run dry conditions causing additional costs and time in maintenance and parts.

Unloading with a Container Unloading System

The fourth option is utilizing a container unloading system with a pump mounted to it. The main difference between this method and the above standalone pump is that the container unloading solutions utilize what is called a ram system to help feed the product into the pump. The ram system puts pressure down on the material which helps force it into the pump properly so it can be moved to other areas or mixing kettles in the facility. The nice thing about container unloading systems is that once the container is opened and placed under the system, the ram plate covers and seals the container and material not allowing airborne contaminants to enter into the product during evacuation. This helps prevent contamination and bacteria growth within the food manufacturing process.

Ram units consist of a ram plate and an inflatable seal to seal on the plate and the outside of the drum.

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This inflatable seal does not require any fasteners to affix it to the ram plate which makes cleaning easy. The inflatable seal also allows for evacuation of 99% or more of the material from the container to minimize the potential product waste for end users. It also allows for easy removal of ram plate from the drum since users have the ability to deflate the seal at the bottom of the container prior to moving the ram plate. Container unloading systems have a pneumatic piston pump mounted on the ram plate which has the capability of generating up to 1,200 psi of outlet pressure which is often required to move higher viscosity materials such as peanut butter. Piston pumps offer users other advantages beyond the pressure, they are self-priming and can be run dry without damage to the pump which means when you start unloading a drum and finish unloading a drum you are not worried about the pump getting damaged during the end or the loading process where it will run dry. Container systems to unload totes can be outfitted with multiple piston pumps (up to four) to unload the large volume in 7 to 8 minutes if required. These unloading systems also remove the requirement of workers to scoop and move material around by hand saving on workplace injuries claims.

Summary

There are several methods that are utilized for unloading high viscosity ingredients within the food manufacturing process. Arguably the most flexible, cleanest, and most ergonomically safe option would be the container unloading systems that address many of the concerns with the other methods employed within the facilities.

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