

Tietjen Verfahrenstechnik is a German manufacturer of depackaging, separating and crushing equipment for organic waste. Here, the company shares its knowledge of the challenges of depackaging processes and its understanding of core factors like purity, water consumption and overall efficiency

Achieving a successful depackaging process

Tietjen's machines are well-established and operate in the plants of leading disposers of organic waste and food waste in Germany and around the world.

Efficient, pure and reliable depackaging processes: the core factors

Due to climate goals and, consequently, the intention to improve the circular economy, waste is recognised as a valuable material. Thus, worldwide organic waste — such as agriculture waste, food waste or damaged or expired goods — is used more and more as a resource for biogas production. This can also reduce the amount of waste that goes into landfills.

Based on Tietjen's long experience in this sector, this article focusses on the core factors for a successful depackaging process:

- purity of the resulting organic biomass;
- reliability of the system;
- water consumption;
- overall economic efficiency of the system.

Depackaging processes

There are different approaches for the unpacking of organic waste. Some common ones include one-shaft horizontal depackers, single-rotor depacking grinders and pulpers. These horizontal systems, with partly low forces or single-rotor grinders with



System with depackaging machine DRM and screw press PRS gains the highest biomass yield

fast rejection of packaging material, may result in losing organic material during the separation process. That is to say, more organic material than desired could be separated with the waste stream. Pulpers require a lot of liquid to wash and dilute organic matter, and they are comparatively costly. The clogging of screens inside all the systems can cause shutdowns as well. Hence a robust system as well as a sharp separation needs to be achieved.

Double rotor setup for best performance

Another approach is the depacking, which has a unique two-shaft design. Tietjen's depackaging solution, the separation mill DRM, offers the unique feature of two rotors equipped with free-hanging wide beaters to separate the impurities from the organic waste.

The advantage of this setup

is that the first rotor has a ripping and preparatory function. With the second rotor, a sharp separation from impurities is achieved. At the same time, the second rotor ensures that as little organic material as possible is discharged from the process. During the whole process, the organic fraction of the waste is pressed through the screen perforation and thus corresponds to the desired particle size.

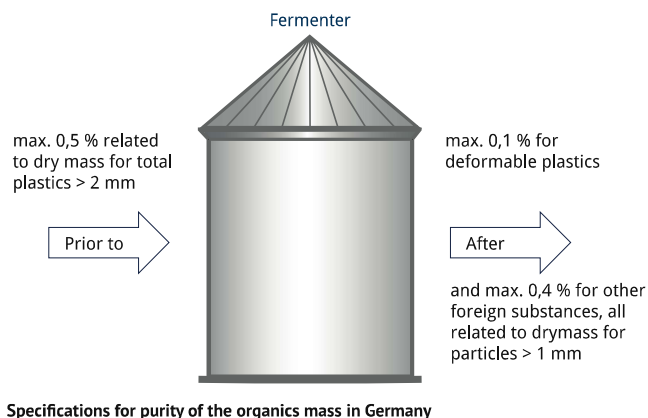
Thanks to this operating principle and the stainless

steel construction, the separation mill DRM is extremely robust and separates with the highest purity results on the one hand, and easily copes with hard materials like stones — as well as other bulky contaminants — on the other.

Purity of the process is the key factor

The purity of the organic mass after pre-processing is one of the most important issues to address, in order to comply with the limits prescribed by the German government. The government's main purpose is to reduce the input of plastics into the environment through the soil-based recycling of biowaste.

In Germany, where Tietjen is headquartered and where it has installed the majority of its machines, further amendments to the Biowaste Ordinance (BioAbfV) are upcoming — they have already been approved by the Federal Standards Body.



The changes include a new law concerning plastic content in the pre-processed organic waste prior to further treatment in a fermenter. The specifications are a plastic content of less than 0.5% for particles greater than 2mm, based on dry matter.

In addition, the content of deformable plastics after the fermentation process has to be less than 0.1% on a dry matter basis for particles greater than 1mm, and the content of other foreign matter such as glass or metal should be less than 0.4% for particles greater than 1mm. The separation mill DRM can meet these challenges and Tietjen is constantly optimising the process in order to achieve the highest standards.

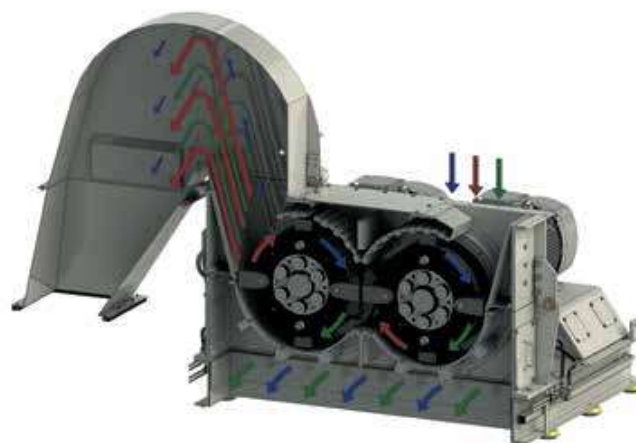
Precise interpretation of purity

In the organic waste recycling industry, it is common to talk about 99% or 99.5% purity. However, these values are often misleading. In fact, these values refer to the purity in relation to the total organic mass. For example, if we assume 5kg of foreign matter in the resulting pre-processed waste stream of 1t, a purity grade of 99.5% follows. However, the consideration of the dry mass is decisive for compliance with the guideline values.

Assuming a dry mass content of 20%, the waste stream minus water is reduced from 1t to 200kg. However, the amount of foreign matter remains the same at 5kg, resulting in a foreign matter content of 97.5% purity in relation to the 200kg.

Water as a valuable resource

A common solution is to use large quantities of water to process organic waste, as it needs to be sufficiently diluted to filter out foreign matter with current technological approaches. In general, more liquid is used to make it easier



Cross section of the depackaging machine DRM, with the double-rotor construction visible

to separate plastic particles from the organic matter, due to differences in density.

Furthermore, water makes it easier to rinse out the plastic particles. The drawback of this process, apart from the water costs, is that energy has to be expended to thicken the pulp again. This is necessary to increase the energy content of the sludge, because a watery sludge needs a larger fermenter capacity and hence a higher investment. Tietjen's approach considers water as a valuable resource and tries to minimise this consumption as much as possible, and at the same time, ensures the

same high purity standards due to the double rotor setup of its depackaging machine.

Dewatering of the packaging

The dewatering of the inorganic fraction after the separation is another important step. Due to transport or incineration efficiency, it is important to keep the material as dry and as light as possible, which could be achieved by using a dewatering press, like Tietjen's screw press PRS. The liquid obtained with the help of the screw can be reused for the treatment of subsequent waste streams and saves water as well.



Depackaging machine DRM

Summary

Most important for Tietjen's customers is the purity of the organic waste after treatment. The part of dry matter needs to be taken into account. A further core factor is the economic efficiency of the process. A higher level of robustness, lower water dependency and long durability of the construction and spare parts keep costs down. Tietjen's separation mill DRM combines these aspects in an exceptional way and at the same time meets the highest purity requirements for the resulting pulp. ●

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