IFE
Material Handling

New paths in
Compost processing

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CONTAMINANTS

Due to items incorrectly thrown into the bio-waste bin, the initial material for high-quality compost is tainted with contaminants. Even though environmental awareness in society is on the rise, the contaminant content in bio-waste and green waste is steadily increasing.

Plastics and plastic film

Above all, plastic material poses challenges to the operators of composting systems, as this material can make its way through the final compost product despite prior processing. Studies have shown that plastic material, and film in particular, makes up by far the largest contaminant fraction.

Biodegradable plastics

This also applies to many „bioplastic“ materials marketed to the public as biodegradable. While it is true that they are biodegradable, it takes them much longer to rot, which is why they must be regarded as contaminants.

„Natural“ contaminants

Stones, wooden branches, roots and typical waste cut from bushes are biologically unproblematic but must still be regarded as contaminants due to their size.

Further contaminants

Even broken glass and aluminium (coffee capsules, etc) already constitute significant contaminant fractions. This list can be extended to contain other contaminants incorrectly thrown into the bio-waste bin such as cigarettes or ashes.

Legislators have already introduced limit values in the current ordinances

Germany

In Germany, the Düngemittelverordnung (Fertilizer Ordinance) is currently in effect, with limit values in Section 4. RAL quality assurance is also widespread, and it likewise limits the contaminant content in compost.

There is a lively discussion going on in Germany about a revision of the bio-waste ordinance, as legislation wants to limit contaminants even on the input side, i.e. before the rotting process.

Austria

In Austria, the limit values are defined in the Kompostverordnung (Compost Ordinance), and again, stricter limits for contaminant content in compost are to be expected in the near future.

STATE OF THE ART OF TECHNOLOGY

Mobile screens and windsifters are currently the most common machines for separating contaminants in professional composting systems. This mobile design inherently comes with various advantages and disadvantages.

ADVANTAGES

- Flexibility in setup
- Low purchase price
- Easy start-up
- Independence from external energy sources

DISADVANTAGES

- High operating costs (e.g. fuel)
- Subject to exhaust gas standards
- Low maximum throughput rate enforced, as the design was optimized for road traffic
- Often cover only one processing step; multiple machines are required
- Complicated operation and coordination of the individual machines

Here is an overview of widespread individual machines that are frequently used in mobile designs for compost processing, but which are also available in semi-mobile and stationary designs.

DRUM SCREEN

ADVANTAGES

- Not sensitive to oversize particles
- High separating accuracy

DISADVANTAGES

- Has a tendency to clog if compost is moist
- Cleaning brushes wear out
- Rolling results in pelletization of the particles
- Rag formation of plastic film
- Separation of long, thin particles difficult

STAR SCREEN

ADVANTAGES

- Not sensitive to oversize particles
- High separating accuracy

DISADVANTAGES

- Poor separating accuracy if particles are stick-shaped (e.g. branches); they can stand vertically and fall through
- Film wraps around the stars
- Long, thin particles assume a vertical position and fall through

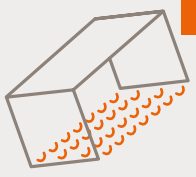
WINDSIFTER

ADVANTAGES

- Separates films effectively

DISADVANTAGES

- Compost dust and small compost particles are also separated



FLIP-FLOP SCREEN

ADVANTAGES

- Does not clog even if the material is moist
- Material is evenly and loosely processed
- Separation accuracy is good even if the particles are stick-shaped
- Films do not get stuck

DISADVANTAGES

- A certain minimum inclination and structural height are required

THE AEROSELECTOR

This machine combines the advantages of ballistic separation, windsifting and screening. Up to four fractions can be produced in one cycle, which can be mostly recirculated to the rotting process. There are further advantages if the machine is integrated into a system, e.g. with a flip-flop screen and magnetic overband separator.

HOW THE AEROSELECTOR WORKS

1 The dry or moist screen residue is fed from the upstream screen or transport belt onto an acceleration belt.

2 At the end of this belt, the residue drops onto a transport belt. The distance, inclination and angle of the acceleration belt and the belt speed are set in such a way that heavy contaminants (stones, concrete, brick, etc.) bounce back from the pulley of the transport belt and drop down.

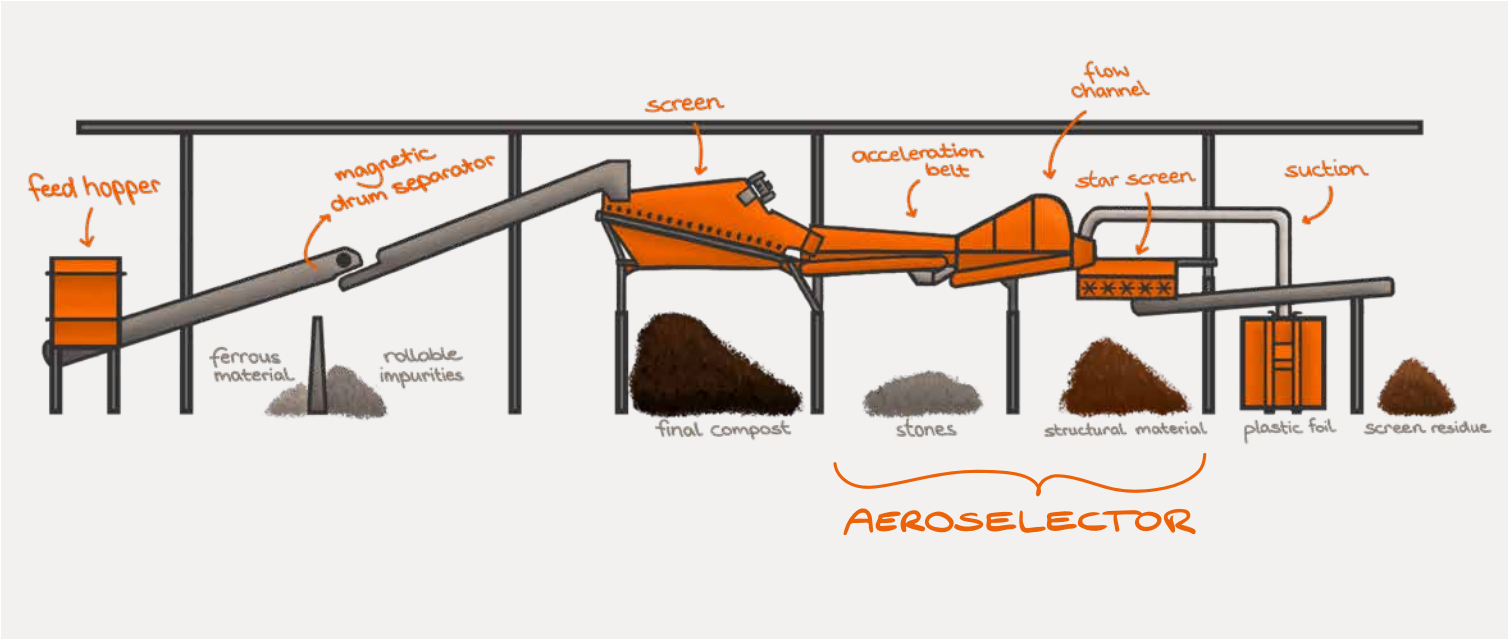
3 Through an adjustable fan nozzle, air is blown into the gap between the acceleration belt and transport belt at the same time. Lightweight materials (e.g. plastic films) can therefore be blown out easily. The transfer of this material from the acceleration to the transport belt results in optimum distribution, which further supports this process.

4 As a result, only the medium-weight fraction (branches of different sizes, roots, compost balls) remains on the transport belt.

5 At the end of the transport belt, the medium-weight fraction is transferred to a star screen, which separates it into a medium-size fraction and an oversize fraction.

6 The extracted film particles move in the flow channel above the transport belt. Above the screen, they are deflected around a separating splitter. This causes the film fraction to be cleaned again, for example cleaning off adhering compost particles.

7 The re-cleaned film particles are extracted by a fan.



THE AEROSELECTOR

INTEGRATION INTO THE COMPOSTING OPERATION

A prototype has allowed us to gather experience of more than 2,000 operating hours so far. In this prototype, the Aeroselector is integrated into the recycling process as follows:

1 **FEEDING HOPPER**
A wheel loader fills the raw compost into a hopper; this compost can be either dry or moist. To ensure a feed rate as uniform as possible for the downstream process steps, a special homogenization roll is installed at the end of the hopper. The roll is capable of breaking down large clumps of compost.

2 **MAGNETIC SEPARATION**
After the material leaves the hopper, it undergoes magnetic separation and magnetic contaminants are removed. This can be achieved by a magnetic roller (integrated in the guide pulley of the conveyor belt) or a magnetic overband separator.

3 **SCREENING**
The remaining input material undergoes screening on a flip-flop screen (at 10 mm). The undersize fraction (between 40 and 50 % of the quantity fed) is finished compost.

4 **AEROSELECTOR**
The oversize fraction of the flip-flop screen is directly fed to the Aeroselector, where it is processed as described above.


Feeding hopper


Magnetic drum / overband separator


Screen


Acceleration belt of the transfer zone


Flow channel


Star screen

THE AEROSELECTOR

UTILIZATION OF THE FRACTIONS

The fractions created can now be put to further use in the composting system. The mass of screen residue is therefore significantly reduced, and valuable resources are produced.

STONES, BRICK, ETC.

Many compost particles remain stuck on the heavy product fraction (stone, etc.). By means of intermediate storage, these adhesion particles can be recovered before the pure heavy product fraction can be disposed of in a landfill for construction residue.

STRUCTURED MATERIAL

The screened medium-size fraction, a fraction of 10-100 mm (20-30 % of the raw compost) is shredded once more to 10-40 mm and recirculated to the rotting process as structured material.

BRANCHES, ROOTS, COMPOST BALLS, ETC.

The oversize fraction (> 100 mm) that has been created is also shredded. However, intermediate storage (re-rotting) is feasible here so that the adhesion particles can be recovered as compost. Depending on its composition, the fraction can then be used as wood chips or recirculated to the rot as structural material.

PLASTIC FILMS

The cleaned plastic film particles are collected in a container and further processed into a substitute fuel, which is used instead of oil or gas in industrial combustion processes, e.g. in the cement industry.

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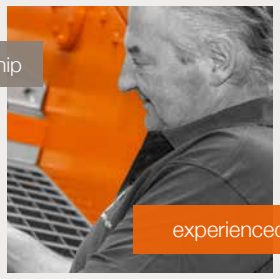

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