

Optimizing Granulator Plants: Separating Foreign Matter from Plastic Scrap



There are two basic methods of separating metal and mineral foreign matter within a size reduction system:

- Location and removal prior to feeding
- Removal from the granulate

It is not possible to substitute one of these methods for the other, as they are both complimentary to each other:

- A relatively large foreign body can be located prior to feeding into the granulator. This protects the granulator against damage but not the plasticizer unit that follows. With the present day state of the art it is possible to locate pieces the size of an M5 - M8 nut by using a **metal detector**.

- **Metal separators** for locating metal in the granulate are suitable for eliminating much smaller pieces of foreign matter down to 0.5 mm, 19 mil. Ø. This ensures that the downstream equipment is well protected, since even metal pieces that may break off during the granulation process (e.g. splinters from the knives or the screen) are being removed by the metal separator.

Up stream of the granulator: The electronic metal detector.

For locating all types of metal, i.e. special steel and non-ferrous metals the use of electronic metal detectors is recommended. These units do not operate on a magnetic basis but on the principle of induction which locates all electrical conductors. Detectors are usually installed above conveyor belts situated in front of the granulator (Figure 1).



Figure 1: Conveyor belt with metal detector

HERBOLD has installed an additional safety feature in the control box of this unit: Once the detector locates metal it does not only switch off the belt but also reverses the belt's running direction for a few seconds. This eliminates the possibility of human errors. Should the operator fail to completely remove the located metal from the belt the detector will register the fault again and again until the piece of metal will finally be eliminated.

Below are some of the variations based on this system that HERBOLD has developed for and with the assistance of the users:

Downstream of the granulator: Separation of foreign matter from the granulate

a) Permanent- or electro-magnetic systems

If only magnetic foreign matter is to be expected, magnet grids are being used for free flowing granulate or cascade magnets (Figure 2) whenever large quantities of material as well as no free-flowing granulates are to be handled. In special cases, above all when granulating films, we recommend the use of a tube mounted magnet positioned in the pneumatic material transport pipe work. Cascade magnets and tube mounted magnets can also be equipped for an automatic cleaning, but then the material flow has to be redirected for a short period of time while the magnets are getting demagnetized.

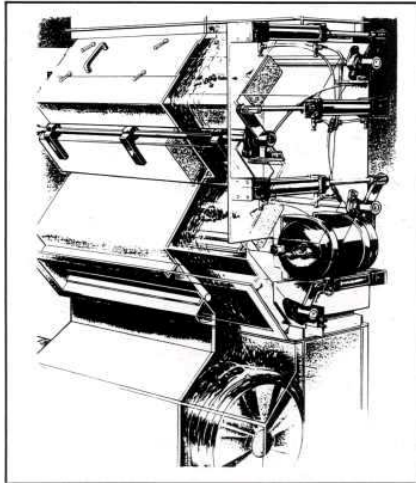


Figure 2: Cascade magnet

- Conveyor belt with a downstream time-delayed reversing belt or material directing flap for a non-manual, fully **automatic** separation of any foreign matter.
- Air cushion conveyors or vibro-troughs (screen troughs) as low maintenance alternatives to belt conveyors: In some special cases these conveyor units are able to make use of the physical properties, e.g. the specific weight of the metal, for separation purposes so that an additional metal detector will no longer be required.
- Two stage size reduction system with a separator for heavy material in the form of a water bath or an air classifier for applications with a high proportion of foreign matter (see special brochure).

Inductive metal separators can also be installed in the pneumatic material transport pipe work for special applications. However, they are normally used, when material is in free fall, e.g. directly underneath the material discharge from a cyclone separator.

c) Classifier systems (see also [Information Sheet 17](#))

Classifiers are particularly suited for applications where - apart from large quantities of metal - also fines and other foreign matter that can be separated on the basis of its specific weight, e.g. glass and stones, are to be eliminated.

These classifier systems, originally developed for separating the Cu/PVC mixture in the recycling of copper cables, master this new task without any problems. They are generally used in recycling plants for bottle crates as well as in plants for recycling PVC profiles. Figure 4 shows a classifier of this type equipped with discharge devices.

b) Inductive metal separators

work on the same principle as metal detectors. Due to their small cross section, however, they are particularly suited for locating much smaller pieces of metal; so, they are mainly employed for the separation of metals from the granulate (Figure 3) and are fitted in front of the granulator. The disadvantage of these units is the high quantity of granulate discharged together with the metal pieces. If large quantities of magnetic foreign matter are to be expected it is advisable to install a permanent magnet or an electro-magnetic system upstream. If large quantities of non-magnetic foreign matter are to be expected, e.g. aluminium from reduced PVC window frame profiles or bottle crates, a classifier system should be used instead.

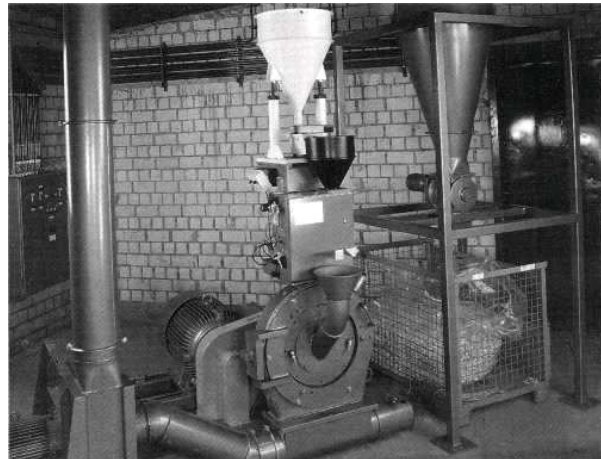


Figure 3: Pulverizer with an inductive metal separator

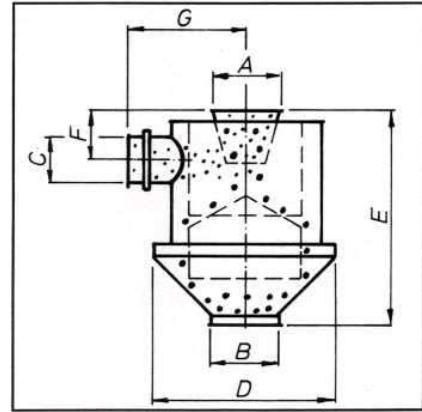
Due to the long dwelling time of the material and the combined vibration fibre bed (developed in the seed treatment industry), these units operate with an extremely precise degree of separation. The dust separator HS (Figure 5, see [special brochure](#)) is a simplified version of this classifier for eliminating dust, fluff and paper from the granulate.



Figure 5: Suction device for granulate with dust classifier



Figure 4: Classifier with intermediate container fitted downstream of a granulator



d) Swim-Sink-Procedure

For the recycling of problematic waste, e.g. agricultural films, soiled and mixed plastic scrap, etc., a continuous separation prior and subsequent to the size reduction process is absolutely necessary. To this purpose two stage reduction systems with swim-and-sink devices are being used (Figure 6). In this example the granulator is equipped as a wet granulator to ensure that the particles of dirt are thoroughly dissolved during size reduction.

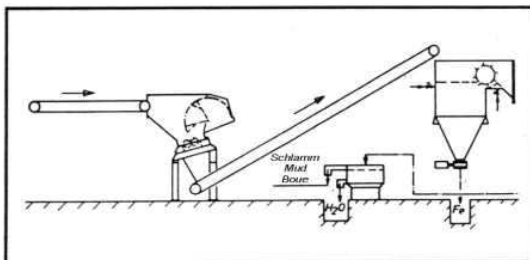


At HERBOLD'S we have specialized in manufacturing "custom made" solutions for mixed and soiled waste as a part of the required size reduction system or as an additional accessory to already existing plants.

Our research department is equipped with the latest technology for running tests with customer-specific materials to determine the best solution to any given problem. HERBOLD offers this service free of charge and without any obligation on behalf of the customer.



Figure 6:
Granulator with a downstream swim-sink tank



Our product range

- Granulators
- Pulverizing Systems
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- HOG Shredders
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