sesotec

White Paper

Metal contamination in plastics processing – causes and countermeasures

Content

1. Problems caused by metal contamination
2. Causes of metal contamination: where is all this metal coming from?
3. Measures to reduce metal contamination in plastics processing
4. Summary and conclusion

Plastics processors around the world expect their machinery to incur a certain amount of wear and tear. Every few years, they need to replace machines, retrofit systems or exchange parts. Depending on the specifics of the individual company's production activities, wear and tear is dependent – to varying degrees – on the materials processed and the products manufactured.

1. Problems caused by metal contamination

Real-world experience shows that wear and tear increase once metal enters the product flow, leading to a rise in costs and spare parts consumption. The need for maintenance and unscheduled downtime increases, while the service life of parts that come into contact with products is shortened and the efficiency of the production process decreases. Other consequences include quality problems caused by metal parts and potential customer complaints.

Unfortunately, it is not easy to detect metal in the product flow. Metal particles are virtually invisible when mixed in with granulate, yet they are capable of causing tremendous damage.

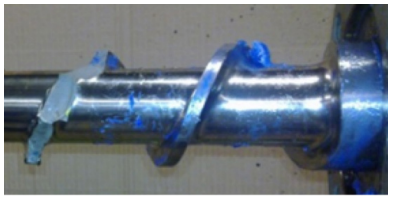
It is therefore impossible to properly detect metal without metal detectors.

There are various signs in production that can indicate metal contamination:

- **Metal in screen changers**
  Frequently finding metal in screens or needing to clear screen changers of metal transported along with melt are clear indications of metal contamination in your material, both of which can be observed in some extruders and injection-moulding machines.

Extruder screen without use of a metal detector

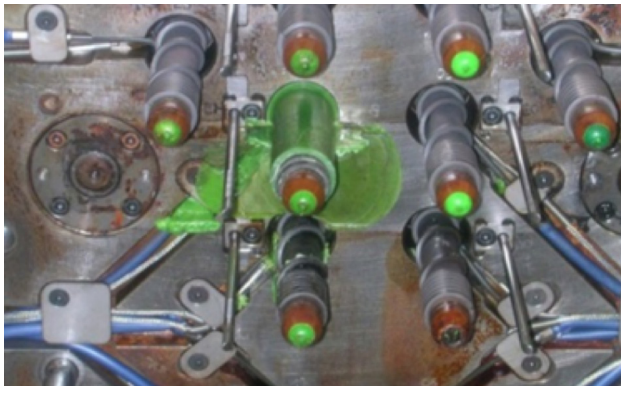
- **Unusually severe wear and tear**
  Excessive wear and tear of the processing unit with surface irregularities or spalling may also indicate the presence of metal parts in the plastic material flow. Generally speaking, premature wear and wear, as well as the need to replace metal components ahead of schedule, may be caused by unintended metal contamination.



Broken plasticising screw

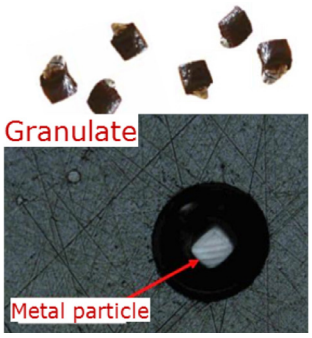
Damaged conveyor pipe due to wear and tear

- **Blocked tool channels**
  Frequent blockages of injection-moulding tool channels by metal parts may be caused by metal in the product flow, often necessitating production downtime and tool cleaning.



Blockage-induced plastic leakage from an injection-moulding tool

- **Metal inclusions in the product**
  Finding metal in raw materials or finished products is a clear sign that a metal detector is needed. Metal particles in products reduce the quality of the finished product and usually lead to complaints.



MMetal inclusion in granulate

Metal inclusion in finished product

2. Causes of metal contamination: Where is all this metal coming from?

Metal can come from the supplied raw materials. Materials have to be processed and transported at the supplier's plant or by logistics partners before they can be manufactured into finished products, potentially introducing metal into the product flow.

This situation occurs more frequently with recycled goods than with new products, as repurposing raw materials requires far more mechanical processing steps before the materials can be reused.

Metal can also make its way into the product flow at a company's own plant as a result of

- wear and tear incurred by machinery and parts;
- the chipping of tools during mechanical processing;
- breakage of transport equipment;
- conversion, retrofitting and maintenance, which can cause screws, nuts or tools to break off into products;
- or personal effects such as jewellery, buttons, pens and tools.

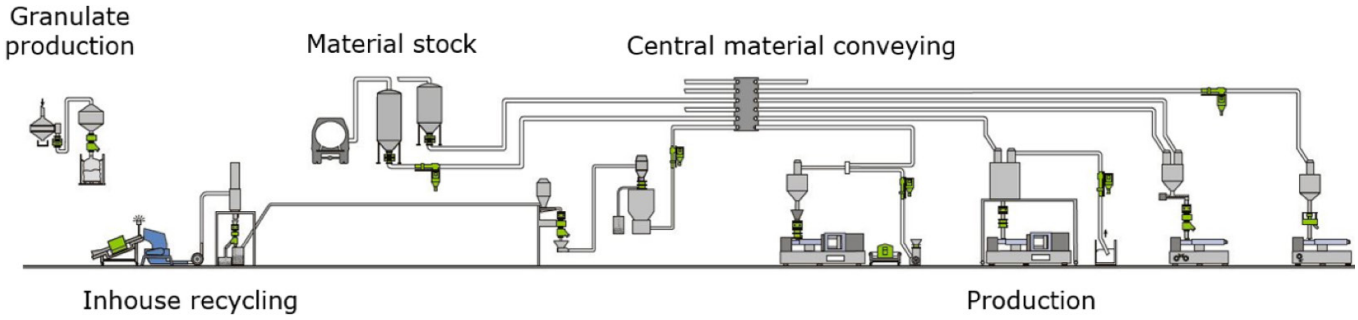
3. Measures to reduce metal contamination in plastics processing

A variety of measures are conceivable depending on the cause of metal contamination:

- **Incoming goods inspection**
  When it comes to supplied materials, it is essential to detect and removed unwanted metal parts as early in the process as possible. Metal detection systems in the incoming goods department are well suited for this task.

- **Staff training**
  Educate your staff. Only by knowing the cause-effect relationship between problems and costs incurred can people actually take action to protect machinery and systems. When it comes to metal in the production process, every machine operator should understand the connection between machine downtime, customer complaints, repairs and maintenance.

- **Exercising additional caution during maintenance and construction**
  Special attention needs to be paid to maintenance, conversion and retrofitting, even when outside companies are responsible for performing the work. It is essential to work cautiously and diligently, safely remove metal filings caused by drilling and protect the products being manufactured from loose metal parts.



- **Installation of metal detectors**
  Installing metal detectors at critical points along the production line can help protect products, machinery and equipment from metal contamination.

  State-of-the-art systems are capable of detecting minuscule particles as small as 0.3 mm in size. Fundamentally speaking, the detection and elimination of even tiny particles helps prevent damage and complaints.

Steel ball (diameter: 0.4 mm) from a test object

  Have you been relying solely on magnet technology? If so, then you should know that magnets are only capable of sorting out magnetic ferrous metals. Even with magnet separators, stainless steel and other non-magnetic metals such as copper, brass or aluminium can still find their way into processing equipment. It makes sense to use magnet separators. However, they should always be used in combination with a metal detector to sort out any iron beforehand, thereby relieving the burden on the downstream metal detector.

- **Analysis of detected metal particles**
  Installing the right metal detectors is an important step. The next step is to mitigate the causes of metal input before materials make their way through the metal detectors. Frequent metal findings by individual detectors indicate problems upstream.

4. Summary and conclusion

Extensive wear and tear affecting production equipment and the detection of metal in the product flow necessitate an investment in metal detectors so as to protect equipment from damage in the long term and save costs. Metal in the product flow can be caused by contamination through raw materials, wear and tear on production equipment and people's personal effects.

Installing metal detectors lets you protect your production equipment in the long run and ensure greater production efficiency, thereby optimising profitability. And don't forget: your customers also expect top-quality, metal-free products.

Sesotec GmbH
Regener Straße 130
D-94513 Schönberg
Tel.: **+49 8554 308 0**
Fax: **+49 8554 308 2606**
Mail: info@sesotec.com