HAUG Ionization

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HOTSPOTS OF ELECTROSTATICS

IN VIBRATORY SPIRAL CONVEYORS

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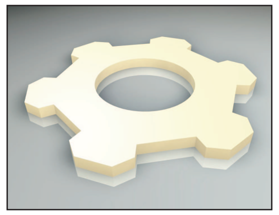
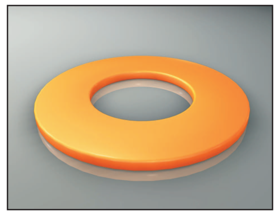
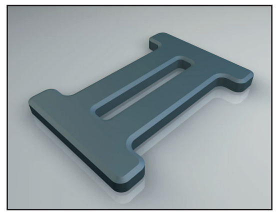
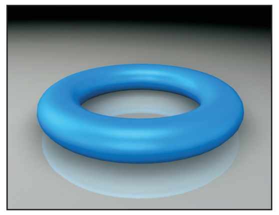
HAUG

Vibratory spiral conveyors also known as vibratory feeders or hoppers are designed for the separation of small parts from a large volume. The parts are often supplied in bulk. The intention is to convey them fast and individually to an assembly line. From the bulk volume, the parts are conveyed up a spiral by means of a vibratory movement into an alignment area and into a linear feed path. Here, the correctly aligned individual part can be picked up by the automatic assembly unit and further processed.

Where do the problems with electrostatic originate from?

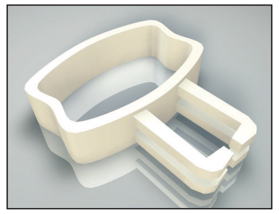
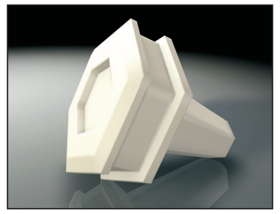
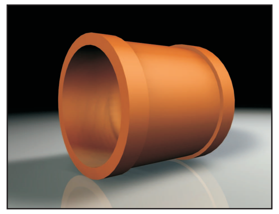
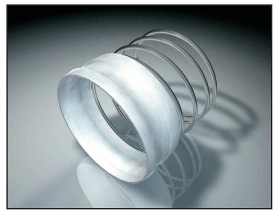
The vibration used for conveying the parts causes them to rub against each other and against the conveyor. This leads to the gradual accumulation of an electrostatic charge. The parts start to stick to each other to form clumps and adhere to the conveyor. A partial blockage is the result. The required rate of delivery can no longer be attained.

Which parts are affected by electrostatic problems?

If the following four properties apply to the parts, we have to expect a strong tendency towards electrostatic charging: light, small, flat and not electrically conductive. Example of such a part: flat sealing rings.

Which parts are rarely or never affected by electrostatic problems?

Parts which are heavy in relation to their size and mass. Their kinetic energy is greater than the adhesive force resulting from electrostatics. This also includes parts which are characterized by a rough structure. They offer only a small area for electrostatic adhesion. Metal parts are electrically conductive; therefore no electrostatic charge can build up.

Which parameters influence the electrostatics?

Electrical conductivity: electrically insulating material shows a high tendency towards charging. Silicone, PP and PE, in particular, frequently pose problems.
Conditioning of the surface of the parts: Dry surfaces of insulating materials are not electrically conductive. If the surfaces of the parts are given the chance of absorbing some moisture, for example from a high humidity of the environment, the charging tendency drops markedly. Very clean surfaces also show a stronger charging tendency. If a dirt film of dust, abrasion, skin grease, soot etc. is allowed to form on the surface, the charging tendency of the parts will be reduced. Plastic parts which have just been removed from the injection moulding machine represent a typical negative example.
Humidity: The lower the relative humidity, the higher the electrostatic charge of the parts. The slowly increasing charge cannot dissipate quickly enough via the humid air. The further the humidity drops below 55%, the greater the danger of accumulation of the charge.
Intensity of vibration: The electrostatic charge will build up the quicker and stronger, the more intense the vibrations are set. The vibration intensity should therefore always be set at the feasible lower threshold value where the articles are just about still conveyed.
Surface area size: The larger the potentially adhesive surface areas of the parts, the greater the tendency towards sticking and agglomeration. Parts which are only supported at a few points and therefore keep a natural distance from other parts and areas therefore demonstrate a lower tendency towards sticking and agglomeration.
Electrical conductivity: Electrically conductive materials have a tendency to accumulate high electrostatic charges. The charge is unable to dissipate from the surface of the parts and will accumulate steadily until the parts start to stick and agglomerate.

What is the influence of the surface of the vibratory spiral conveyor?

Electrical conductivity of the surface of the conveyor: With regard to the continuous build up of the electrostatic charge it is of no significance whether the surface of the conveyor is electrically conductive or coated in one form or another. The charge that builds up on each individual part of the bulk of parts cannot be dissipated from that bulk via an electrical contact.
Surface shape of the conveyor: Parts adhere most easily to smooth, polished surfaces as a result of electrostatic charging. If the surface of the conveyor is somewhat undulating and only small contact points are therefore formed, a light positive effect can be noticed.

What conventional measures are available to the user?

Antistatic sprays: These sprays lead to the short-term formation of an electrically conductive film on the surface of the sprayed parts and the conveyor. However, the surfaces are wetted with chemical substances which may later result in undesired contamination of the filled products, e.g. pharmaceutical products. In addition, this wetting with chemicals may result in smearing, adhesion or contamination problems in downstream processes.
Moisture: By spraying finely dispersed water onto the parts, the electrostatic charge can be dissipated quickly. However, this method may once again result in cleanliness and hygiene problems. Besides the problems associated with antistatic sprays there is also a danger of rust formation in the conveyor.
Talcum powder: The fine powder particles form a barrier between the surfaces. The surface areas capable of rubbing against each other and therefore charging each other are therefore significantly reduced. If the powder particles are additionally more or less ball-shaped, some degree of a ball bearing effect may be assumed between the surfaces.
Grounding cable: By hanging a grounding cable into the conveyor, only a small part of the charge may be dissipated against the ground potential in the best possible scenario, whereby the cable comes into contact with the charged parts. The charge cannot drain off towards the cable from any other points of the charged surfaces, as we are dealing with an electrostatic, stationary charge, not a dynamic one.

What solution does an ionization system offer?

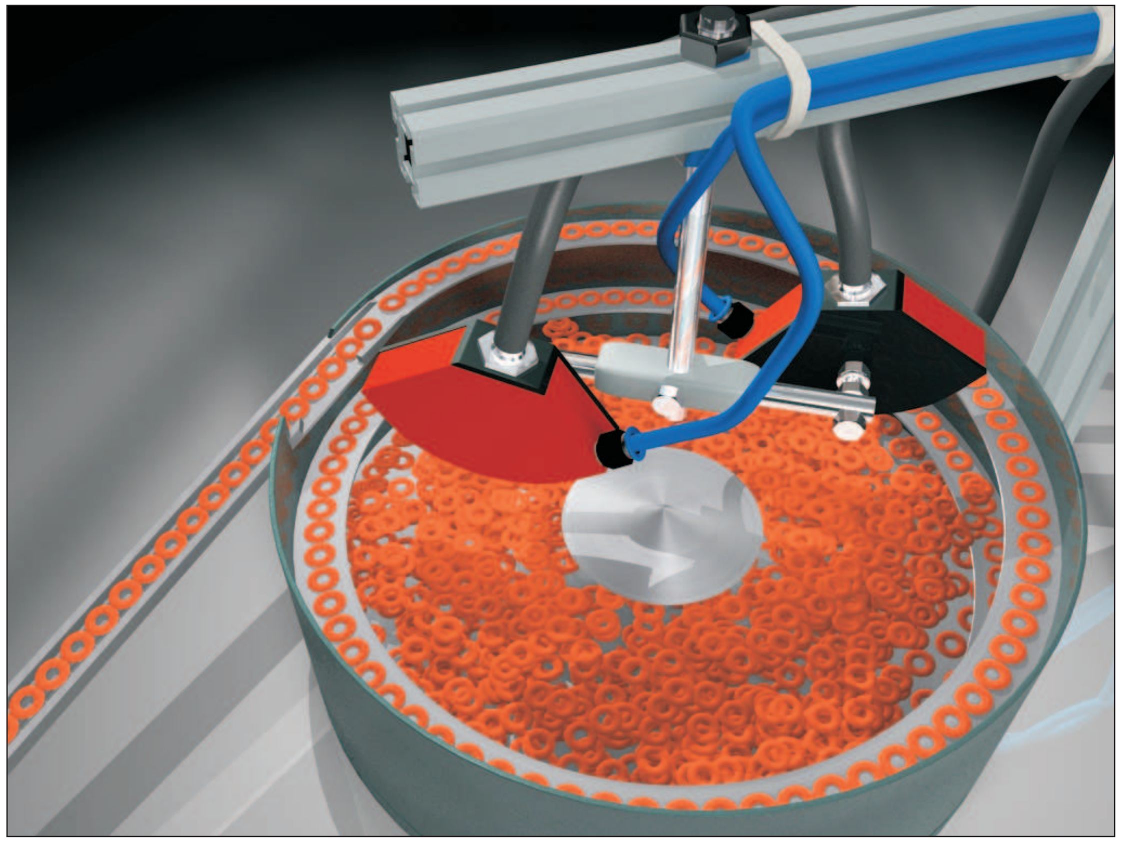
The formation of the electrostatic charge cannot be avoided. However, it can right from the start prevent the charge level from reaching a value where the parts start to agglomerate and stick to the conveyor.

Which ionization systems are suitable?

The best effect can be achieved with compressed air-assisted ionization systems which allow the gas ions to be distributed over as wide an area as possible. The HAUG Delta Blower DA TR allows a wide fan-shaped area to be covered with gas ions.

How is the HAUG Delta Blower DA TR applied properly?

The HAUG Delta Blower DA TR generates gas ions. These gas ions are intended for the neutralization of the electrostatic charges on the surface of the parts. A uniform, fan-shaped air flow from an air-assisted Delta Blower DA TR, enriched with gas ions, should reach all parts, if possible. The highest charge level is generated in the bulk of the parts on the floor of the conveyor. The main air flow which is enriched with the gas ions should therefore be directed to that area. However, each individual part carries its electrostatic charge along on its way up across the spiral. An additional charge is generated as a result of the vibrations during transportation, until finally the parts stick to the spiral. To prevent this from happening, the fan-shaped ionized air flow should therefore also be directed to the parts located in the spiral.
In order not to restrict the effect of the gas ions contained in the air flow too much, care must be taken to ensure that the distance between the Delta Blower DA TR and the charged parts does not exceed 15 cm. Normally, a pressure between 0.8 and 2.0 bar is used. The compressed air should be free from oil and water.



Application example: 2 HAUG Delta blowers DA TR in a vibratory spiral conveyor