Contamination from incoming raw materials a real threat for manufacturer's reputation and quality

Suneal Gill - Russell Finex

Pneumatic conveying is a popular method of transporting solids in many processing industries. Dry powders, granules and pellets are the common materials moved either by suspension in an airstream or forced by a gas stream in horizontal or vertical pipes. Pneumatic conveying can be categorized into the following types

1. Dilute phase (pressure, vacuum, or combination)
2. Two phase (mainly pressure)
3. Dense phase (pressure or vacuum)

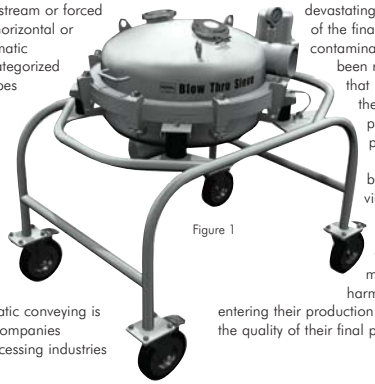

Figure 1

Although, pneumatic conveying is widely used, many companies operating in the processing industries are faced with the challenge of preventing foreign contaminants entering their production lines when they un-load tankers. Materials can become crusted onto tanker walls and have a devastating impact upon the quality of the final product. Cross contamination of materials has also been reported as a major issue that is significantly affecting the quality of the final product of many processing organisations.

In many cases, a tanker being unloaded via a vibratory screener (see figure 1) can provide the answer. By installing this type of sieve, manufacturers can prevent harmful contaminants entering their production processes and damaging the quality of their final products.

The problem

Companies want to ensure that materials delivered to them in tankers do not contain oversize contamination that could affect the quality of their final products or damage their own processing equipment. The contamination in the material being delivered by the tanker could originate from several sources.

- Tankers are notoriously difficult to clean completely and there may be some material left inside from a previous load
- It could have been in the powder when the tanker was loaded.
- It could be material which has agglomerated to form a crust during transportation.

The formation of crusts on the inside tanker walls from the material being transported or from previous load is very common, with hygroscopic materials such as sugar, flour and many minerals which easily absorb water. All of these problems can lead to a different material entering the manufacturer's production process and causing expensive damage to their final product or other downstream production equipment.

The Solution

Perfect for tanker unloading, a Russell Finex Blow Thru Sieve can eliminate of all these problems. It has been designed for use in pneumatic conveying lines and is connected directly to a tanker, enabling users to screen and transport material simultaneously. The Blow Thru Sieve has been developed to solve the need to check-screen raw materials before they enter further downstream processing.

In addition to being connected to unloading tankers the Blow Thru Sieve can also be placed inside a production facility to screen powders in a pneumatic conveying line. For example, it can be used after material has been stored in a silo to remove crusts or other contamination. It can also be used after two materials have been blended to give confidence that no oversize remains.

Some companies also use the Blow Thru Sieve to screen powders before they are loaded into tankers. This ensures that there is no contamination in the product before it is despatched.

The Installation

The sieve is simply placed in the unloading area and then connected to the vehicle (see figure 2) using standard size flexible hoses and material is blown through it via an air blower on the tanker. The material is then conveyed to the plant via the Blow Thru Sieve. Raw materials can be conveyed at maximum pressure of 2 bar(g) (EU) or 14.5 psi(g) (North America).


Figure 2

Case Study

Quarrying/Building

The quarrying and building industry has benefited from installing the Blow Thru Sieve. A firm was finding that oversize contaminants were entering other down stream activities but could not locate the source of these contaminants. The company wanted to learn whether two tanker companies or other sources were the cause of foreign materials such as gravel reducing the quality of its final product. Unloading the 25 tonne tankers usually took 1 hour each.

To combat the problem, the firm installed a Blow Thru Sieve. The unit was placed into the system by connecting it between the road tanker and the receiving silo. The sieve was assembled with a 2000μm mesh screen and the tanker's blower pressure was set to 1.7 bar(g). After installing the Blow Thru Sieve, the firm successfully located the source of the oversize materials. The company found large pieces of material on the mesh screen. After careful examination of the foreign objects they learned that the tanker companies were not the cause of harmful contaminants entering the later stages of its production process. The source of the foreign materials came from a quarry before the raw materials were loaded into the tankers. The unit successfully removed harmful oversize contaminants from the product with no reduction in the material throughput rate of 25 tonnes/hr.

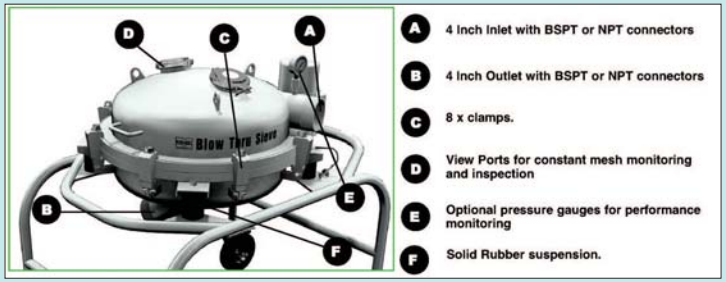

Figure 3

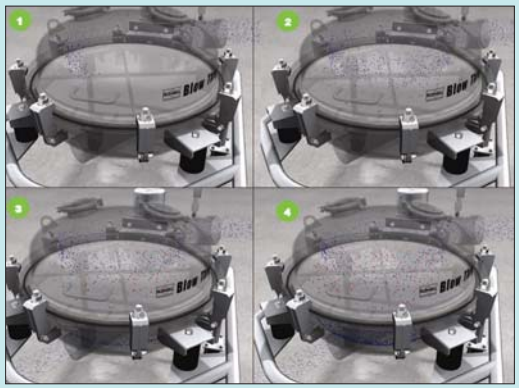
Figure 4

How it works

The Blow Thru Sieve operates like many other standard screeners but is designed to withstand the large pressure used to carry material through it. A vibratory style motor is mounted on the side of the unit which houses a mesh frame. The base is mounted to a rigid construction or a purpose built mobile stand via 4 solid rubber suspension mounts (see figure 3). The action of the vibrating motor is transmitted to the sieving area and moves the mesh in a gyratory motion. This gyratory action is very suitable for sieving as it encourages high throughputs and is not as harsh on particles compared to a large reciprocal movement. It is also possible to adjust weight settings inside the motor to fine tune the movement of the sieve – this in turn means that it is possible to control the movement of the material on the mesh screen as it is sieving.

Although the Blow Thru Sieve operates like a traditional screener there is a difference in the way material is passed through the sieve (see figure 4). With the Blow Thru Sieve, product is conveyed under pressure into the sieve through a tangential inlet. This ensures high throughput rates can be achieved with minimal pressure losses. Good product is allowed to pass through the vibrating mesh screen while oversize material remains on top (see figure 5) where it can be removed at the end of a batch.

Inspection ports are also a feature of Blow Thru Sieves. Glass view ports with or without wipers allow users to easily monitor the unit's activity and adjust the sieve's settings to achieve the desired performance from the machine.

The Blow Thru Sieve conforms to the European Pressure Equipment Directive 97/23/EC. This certifies it for use up to a maximum pressure of 2 bar (g) in Europe. It is suitable for use up to 1 bar (g) pressure (14.5 psi) in North America. This means that the sieve can be easily installed in any tanker unloading application throughout the world and makes the unit ideal for any bulk powder application where quality and efficiency are important.

Benefits

In the past, operators have found it difficult to connect tankers to their sieves because the tanker connections are usually found on the top of the sieve. The Blow Thru Sieve eliminates this problem because the connections are located on the side of the unit making it less cumbersome to connect. The unit is also mounted on a mobile stand making it easy to move around and use in a number of different material unloading areas.

Blow Thru Sieves can be assembled and disassembled very easily by plant operators. Simple clamp bolts are released and the lid of the unit can be lifted open. Opening of the unit is spring assisted to reduce the lifting force required and stop the lid snapping shut which protects operators from injury and harm. Once open, a positive lock-off system secures the lid in the open position which also gives plant employees complete access to clean the unit to avoid any cross contamination of product in further downstream operations. Other safety features include pressure gauges on the unit which indicate when the unit is pressurised so that operators do not attempt to open the unit when it is under pressure.

The state-of-the-art design of unit allows it to achieve throughputs of 25 tonnes per hour. This has enabled processing companies to un-load their tankers at the same rate as where there is no sieve in place using traditional tanker off-loading, but with the advantage of check-screening raw materials before they enter other down stream processes.

The Blow Thru Sieve can also be specified to meet European ATEX legislation for use in potentially explosive atmospheres, including zones 20, 21, 22, 0, 1 and 2.

In today's competitive and heavily regulated environment organizations using pneumatic conveying to offload raw materials from tankers can't afford oversize contaminants affecting their final product quality or damaging their processing equipment. The installation of a Russell Finex Blow Thru Sieve offers a cost effective solution which eliminates both of these problems.

For more information visit www.russellfinex.com


Figure 5