

# **BOXER: A unique equipment designed for pneumatic transfer**

## **Overview**

BOXER is a new sophisticated, modular and compact design made especially for pneumatic transfer of variety of solid materials. It not only ensures dust free operation but also provides smooth material discharge into subsequent equipment/system.

## **Working principle**

BOXER works on the principle of pneumatic conveying of material. Pneumatic conveying is the method of transferring bulk material through pipes from one point to another using air as the conveying media.

It is a step based process including sucking of material from the pick-up equipment, transfer to desired point where material is collected before it is dumped, collection of dust generated during transfer by means of filter which is purged for removal of the particles accumulated on filter surface followed by discharged to the receiving equipment  
Thus, it is a cyclic process consisting of suck, dump and purging.

Components: Having a simple and modular design BOXER consist of the following parts/components: (Figure 2)

### **1. Top cover: mounted**

Lid of the unit consist of a spout structure to connect blower for vacuum suck and dump operation and inlet for purging compressed air to dislodge majority of particulate matter trapped in the pores of the filter.

### **2. Pleated filter:**

A filter (pleated) is mounted at the top of the main unit to trap the dust generated during transfer. Pleated filters offer greater particulate capture - that is a much higher level of filtration. An antistatic filter material is structured into pleats (Figure 1) to provide a compact filter keeping intact the surface area of contact between the dust particles and filter pores.

This allows the filter to trap particles and maintain its working efficiency in a compact space. Pleated filters help maintain cleaner air passage to the blower, low pressure drops, durability and thus reduced filtration cost. Purging is done to maintain process feasibility, increase reliability and maintain working efficiency of the filter. Polytetrafluoroethylene – PTFE is a coating media used to coat the filter in order to enhance the overall performance and reliability.

**Advantage:** With PTFE coating, the surface filtration to hold incoming particulate matter is improved. The property of PTFE material resists majority of the particulate matter from adhering to the filter. This in turn reduces the pressure loss and blocking/blinding of pores.

**Figure 1: Pleated filter**



**3. Compressed air purging cylinder:**

Purging is done with purging media which is generally compressed air or inert gases for explosive material. Purging is passing of compressed air/inert gas through the filter media at regular intervals in order to dislodge the particles trapped and clear the pores which help in maintaining the vacuum created.

**4. Body with inlet port:**

The main unit of BOXER is a cylinder with an inlet port for material to enter when it is getting sucked.

### 5. Flap damper for discharging:

It is a 90-degree rotating swing flap for dumping material to the subsequent equipment. It allows quick discharge and prevents reverse flow of material. Gravity causes material to drop through the flap damper.

**Advantage:** As the flap damper mechanism is a 90-degree rotating swing flap, there is no obstruction to the discharge flow. Thus, difficult to handle and/or lumpy material can be discharged easily.

## Figure 2: BOXER – components



## Operation

- Vacuum transfer begins when blower starts sucking air and a negative pressure is created in the chamber. This negative pressure – vacuum created inside the main unit of BOXER is replaced by the material. The main unit starts getting filled with material as it is sucked. The material enters boxer through the inlet port and gets stored at the bottom in the main chamber.
- When the transfer is in process, dust generation occurs, and those dust particles too get sucked along with the air and into the blower.
- Entry of any foreign particles can damage the blower and thus reduce its life. In order to avoid that, a filter is present which traps the particles onto its surface to avoid their escape.
- This filter has special design structure – pleated (arrangement of filter into a pleated form for compact size) and a specific pore size depending on the properties of the particulate matter to withhold. Filters are generally made of PE – polyethylene material with an additional PTFE – Polytetrafluoroethylene coating to enhance the properties of the filter.
- The filter acts as a trapping barrier to trap particles more than its size thus restricting them to pass through it. But as the dust particles get trapped, they fill up the pores on the filter and thus block the passage for airflow hence increasing the pressure differential.
- To avoid major failure due to blocking, purging is done at regular intervals (depending on properties of the particulate matter). This burst of compressed air dislodges the material from the filter pores.
- When pre-decided quantity of material is filled up in the main unit, the discharger – flap damper at the outlet end of the BOXER opens and dumps the material into the subsequent equipment.
- A flap damper is a 90-degree swing plate which prevents reverse flow and gives quick discharge.
- Once complete discharge is done the flap damper takes its original position (closed) again and the whole cycle of sucking the material till this last step is repeated – making it a cyclic process.
- Apart from cleaning with purging the pleated filters can be easily removed from the main unit and cleaned with the help of compressed air. The filter material is tough enough to hold its pleated shape and stay intact even while it is cleaned with a compressed air force stream. Maintaining of filter unit regularly enables longer life span.
- A pre-filter is provided before the blower which creates vacuum in order to protect any minute particulate matter from entering the blower. This pre filter thus protects the blower and increases its life.

**Assembly-disassembly is simple and leakproof by use of gaskets and easy openable clamps. (Figure 3)**



### **Features and advantages:**

<b>Features</b>	<b>Advantages</b>
<b>Efficient design</b>	Capacity can be increased with minimum modifications.
<b>Internal finish</b>	Internal finish is smooth to minimize discharge problems.
<b>Filter type</b>	PE with PTFE coating pleated filter for improved and durable filtration.
<b>Purging</b>	Generally, air Inert gases - if flammable material to be handled
<b>Dumping</b>	Flap damper for discharge.
<b>Easy assembling</b>	Easy operated clamps.
<b>Leakproof</b>	Gaskets for leakproof connections.
<b>Desired connection at discharge end</b>	Processor / storage vessel can be at the receiving end.

## Application

Food products	Enzymes, powdered sugar, granulated sugar, wheat flour, breadcrumbs, seasonings, pulverized soybean, pepper, rice, cocoa, creaming powder, freeze-dried coffee, curry powder, lactose, starch, etc.
Pharmaceutical products	Pharmaceutical intermediates, calcium carbonate, lactose, cellulose, barium, magnesium, salts, etc.
Chemicals	Aluminum hydroxide, bentonite, calcium carbonate, calcium hydroxide, metal soap, zeolite, pigment, Dye, cellulose, etc.
Electronic material	Ferrite, toners, ceramics, silica, battery materials, etc.
Resins	Fire-retardants, polyester film, film chips, PVC powder, resin pellets, etc.

## Specification

Type		M-1	M-2	M-3	M-4	M-5
Transfer quantity		300-500 kg/hr.		500-1300 kg/hr.		
Required power		2.2-2.6 kW		3-3.5 kW		
Internal capacity	X	8L	10L	13L	20L	20L
	X-1	10L	10L	13L	25L	25L
	XF	10L	10L	13L	25L	25L



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