

PNEUMATIC CONVEYING SYSTEMS

Malik Engineers, Vasai manufacture Pneumatic Conveying System for transporting particles ranging from fine powders to pellets and bulk densities of 16 to 3250 Kg/m³

A pneumatic conveying system is a process by which bulk materials of almost any type are transferred or injected using air as the conveying medium from one or more sources to one or more destinations. A well designed pneumatic conveying system is often a more practical and economical method of transporting materials from one point to another than alternative mechanical systems (belt conveyors, screw conveyors, vibrating conveyors, drag conveyors and other methodologies) because of two reasons:

1. First, pneumatic systems are relatively economical to install and operate
2. Second, pneumatic systems are totally enclosed and if required can operate entirely without moving parts coming into contact with the conveyed material. Being enclosed these are relatively clean, more environmentally acceptable and simple to maintain.

The Dilute phase Pneumatic Conveying System (PCS) is commonly used in many industry like Plastic, Chemical, Food processing, etc. wherever solid particles need to be moved from one point to another, or from one point to multiple points or vice-versa. The particles are held in suspension as they are moved through lines by high volume, high velocity, pressurized air. The arrangement is very simple without much complications.

For a Plastic processing industry, PCS might consist of moving the powdered PVC resin from storage to Extruder hopper, and moving the extruded pellets from the die to packing, etc. A typical PCS for Food processing plant might include storage bins for raw-materials (e.g Soy, wheat or maize flour & other solid ingredients), Screw feeders for dropping the materials in an Air charged line to move them through the process of Batch Mixing, Sieving, Extrusion Forming, etc. In this instance, it works with Mechanical feeders (screws) to proportion the various components forming the product. After Extrusion, the formed product can be again handled by PCS to push via air charged line (or can be sucked under Vacuum) for further Drying/Cooling/Packing etc. The PLC control panel is part of a PCS offered by us. Full line can be programmed to suit the application and lends itself for automatic working and control.

The PCS is tailor made to suit application.

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DILUTE-PHASE CONVEYING

Dilute phase conveying is the most common used method of transporting materials.

This process uses a relatively large amount of air to convey a relatively small amount of material and at lower pressures than dense phase systems. The material is transported at high velocities through the system while being suspended in air.

Dilute-Phase - (Suspension Flow)

Dilute phase system is characterized by:

- High velocity conveying @ 3,200 to 8,000 feet per minute
- Operating pressures in range of 5-12 PSIG (positive) or negative pressures of 4-12" Hg

- High air to solids loading ratios (> 2.0)

There is virtually no limit to the range of materials that can be conveyed with dilute – phase system. Products commonly conveyed in dilute phase systems include flour, resins, specialty chemicals, ground feeds, and granular and palletized products. Of the various types of pneumatic systems, a dilute phase system will generally be lowest in capital cost.

Limitations

A relatively high air volume and velocity is required: so power requirements are also high. Higher air velocities will have the following other disadvantages:

1. The wear caused by the product on the pipe is considerably higher therefore this process is NOT suitable for materials which are susceptible to degradation and/or are abrasive in nature.
2. The products can get deformed or crushed therefore this process is NOT recommended for friable products.

TYPES OF DILUTE – PHASE SYSTEMS

The dilute-phase system can be designed in three ways:

1. Positive pressure system
2. Negative pressure or vacuum system
3. Combination of positive – negative system

Positive pressure – Dilute phase

Positive pressure systems operate above atmospheric pressure and are used to convey bulk materials from a single or multiple sources to one or multiple destinations, over medium distances and with greater capacity than possible using vacuum systems. A typical positive pressure dilute phase system will consist of a rotary valve; pipe-work which would include long radius reinforced bends; a filter receiver or cyclone/filter

arrangement; and positive displacement (roots type) air blowers. The schematic below shows a typical arrangement of the components of positive pressure systems:

Dilute phase transport positive pressure system

The product enters the convey line, which is at a higher pressure, via a special feeding device, usually a rotary valve airlock, or a venturi. The product is frequently suspended in the airflow, moving at relatively high velocities depending on the particle sizes and densities. The suspended material-air stream is separated at terminal point by means of a filter receiver/cyclone separator, or fed directly into process vessels that are vented to downstream dust collection devices.

In this type of system, the material does not go through the fan/blower. There are two advantages to this. First, the fan wheel does not damage the material. Second, the fan does not experience any wear and tear from the material. These systems generally operate on a continuous basis - product is constantly supplied at the starting point, and arriving at the destination without interruption. This allows this type of system to be easily adapted for dosing and continuous weighing applications.

Applications

Dilute phase pressure conveying is particularly suitable for systems which convey materials at low to moderate capacities over medium distances, from single or multiple sources to single or multiple destinations. These systems are versatile and adaptable for different materials and the low operating pressures allow lower cost pipelines and fittings. Cement, fly ash, food items, resins and dry chemicals are examples of products that can be conveyed successfully using this method.

<u>Typical Specifications</u>	
Convey Rates:	Low to High, typically from <1 to 50 tons/hr
Convey Velocities:	Typically 3200 – 8000 fpm
Convey Distances:	Up to 600 ft or longer
Air Mover:	Positive displacement (roots Type) blower, or fan
Operating Pressure:	Up to 14.7 psig
Air/Material Ratios:	> 2.0