CE 250
Pneumatic transport

Learning objectives/experiments

- learning the fundamental principle and method of operation of a pneumatic conveyor system
- observation of different transport states dependent on solid content and air velocity
- determination of the suspension velocity of the solid
- determination of the solid content of the flow
- pressure loss dependent on solid content and air velocity

Description

- **pneumatic pressure-lifting of solids in a vertical tube**
- **transparent tubes and tanks to observe different transport states**
- **practical experiments on a laboratory scale**

Pneumatic conveyors can be used to transport dispersed solids over great distances in pipelines.

The solid is transported out of a feed tank via a vibrating trough into an air flow. An interchangeable injector disperses the solid in the air flow. The air flow transports the solid upwards in the tube. The transport terminates in a collector tank.

Depending on the velocity and solid content of the air flow, different transport states may occur. At high velocities, the solid is dispersed evenly across the cross-section of the tube (dilute phase transport). If the velocity is reduced, strands and balls form on the wall of the tube which then slide down owing to their higher settling velocity. The strands and balls disintegrate again in the air flow and reform. Reducing the velocity to below the settling velocity of the individual particles ultimately results in plug transport. The different transport states can be observed through the transparent tube.

To identify the pressure loss and the flow velocity, measuring points are provided at all relevant positions. The velocity of the air flow is adjusted by a pressure regulator. The solid mass flow can be adjusted by way of the throw of the vibrating trough on a potentiometer. The compressed air has to be provided from the laboratory supply.

Peas or plastic granulate are recommended for use as the solid.

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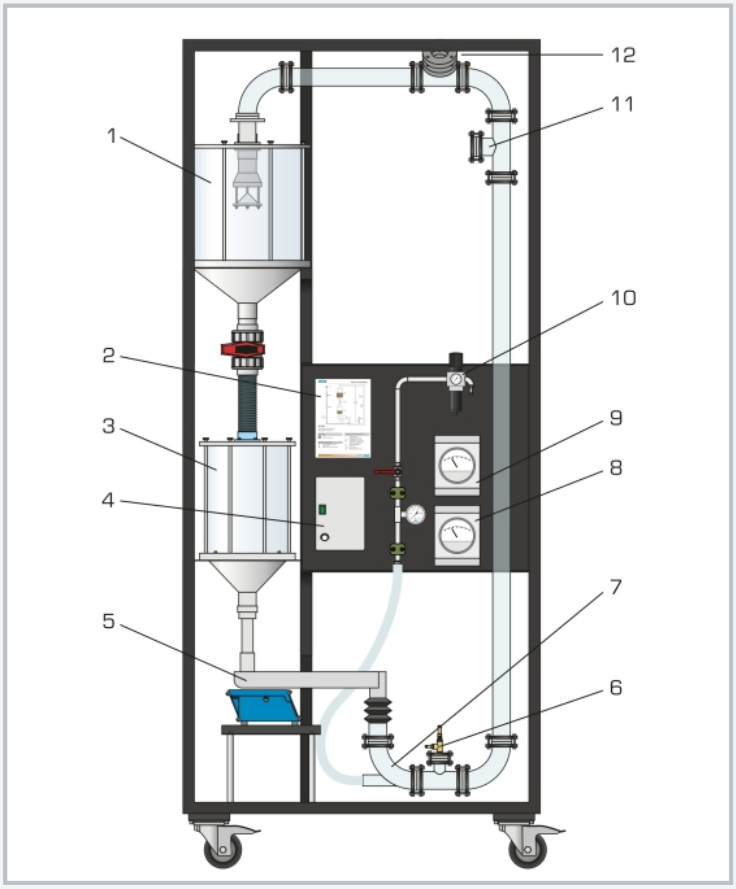
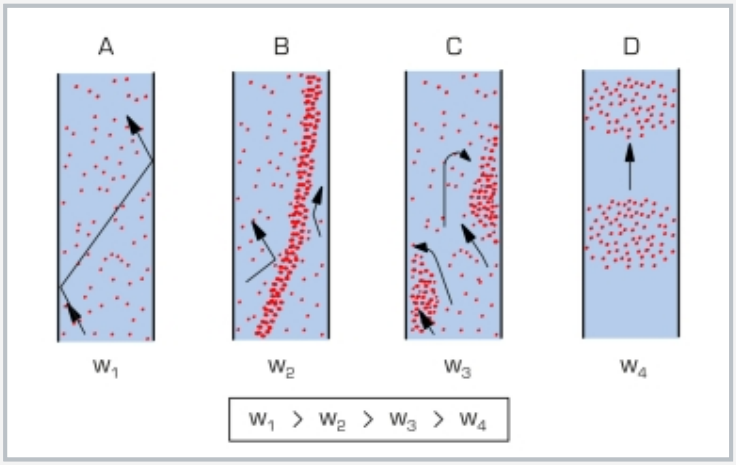


1 collector tank, 2 process schematic, 3 feed tank, 4 vibrating trough controls, 5 vibrating trough, 6 pressure measurement point, 7 injector, 8 differential pressure indicator, 9 velocity indicator, 10 precision pressure regulator, 11 velocity measurement point (Pitot tube), 12 pressure measurement point



Transport states in vertical transport: A dilute phase transport, B strand transport, C ball transport, D plug transport; w air velocity

Specification

[1] pneumatic pressure-lifting of solids in a vertical tube
[2] feed of solid into air flow via vibrating trough with adjustable throw
[3] 4 interchangeable injectors to disperse the feed material into the air flow
[4] vertical tube made of glass
[5] collector and feed tanks made of transparent material (PMMA)
[6] collector and feed tanks interconnected by tube with plug valve
[7] precision pressure regulator to adjust input pressure and flow rate
[8] measuring points for pressure loss and flow velocity

Technical data

Vertical tube
- height: 2m
- diameter: 50mm

Tanks
- feed: 20L
- collector: 40L

Measuring ranges
- velocity: 0...36m/s
- differential pressure: 0...10kPa
- pressure: 0...1bar

230V, 50Hz, 1 phase
120V, 60Hz, 1 phase
UL/CSA optional
LxWxH: 1280x800x2880mm
Weight: approx. 190kg

Required for operation

compressed air: min. 1500mbar, 250m^3/h

Scope of delivery

1 trainer
4 nozzles
1 packing unit of plastic granulate (PP; 30kg)
1 set of accessories
1 set of instructional material