

Pneumatic conveying

Part 1. Glossary of terms

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Committees responsible for this British Standard

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- Agricultural Engineers' Association
- Association of Consulting Engineers
- Automated Material Handling Systems Association
- British Aggregate Construction Materials Industries
- British Coal Corporation
- British Rubber Manufacturers' Association Ltd.
- Coke Oven Managers' Association
- Cranfield University
- Electrical, Electronic, Telecommunications and Plumbing Union
- Electricity Association
- Mechanical Handling Engineers' Association
- Solids Handling and Processing Association Ltd.

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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
Glossary	
Introduction	1
Section 1. Air	2
1.1 Free air terms	2
1.2 Air flow terms	2
Section 2. Solids/gas terms	4
Section 3. Material characterization terms	6
Section 4. Systems	8
Annex	
A (informative) Main types of flow	15
Index	
Figures	
1 Phase diagram for a particulate solid conveyed at a constant flow rate	1
2 Simple pressure system	9
3 Multi-discharge system	10
4 Simple vacuum system	11
5 Multi-pick up system	12
6 Combined vacuum/pressure system	13
7 Closed loop system	14
A.1 Idealized phase diagram for a coarse powder on horizontal co-current flow	16

Foreword

This British Standard has been prepared by Technical Committee MHE/9 in order to set out standard terms for use in the pneumatic conveying industry and in a series of standards being prepared on the subject of pneumatic conveying.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Introduction

Pneumatic conveying is the term used to describe the transport of particulate solids in gas, usually air, through pipes and ducts. The relative concentrations by weight of the solids phase and the gas phase can vary widely. The term solids loading ratio is used to describe the ratio of the mass flow rate of the solids conveyed to the mass flow rate of the gas used for conveying.

A solids–gas phase diagram is a wide ranging graph of pressure gradient versus gas velocity in a pipe containing flowing gas and solids. Because of the difficulty of finding a suitable scale to show all the detail on the same graph it tends to be used only qualitatively as an aid to communication.

Figure 1 shows the relationship between pressure gradient, gas velocity and solids flow rate for a coarse powder. Different modes of flow can be related to specific locations on the diagram. A more complete example of a phase diagram covering a number of flow rates for a coarse powder, showing more detail, is given in figure A.1.

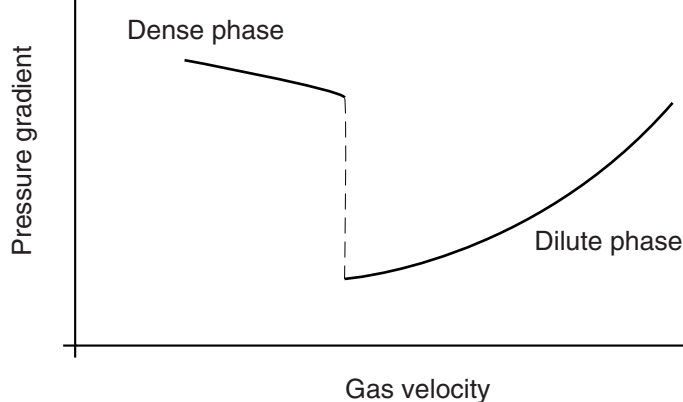


Figure 1. Phase diagram for a particulate solid conveyed at a constant flow rate

Section 1. Air

No.	Term	Definition
1.1 Free air terms		
1101	free air conditions	Those conditions at which $p = 101.3 \text{ kN/m}^2$ absolute (standard atmospheric pressure) and $t = 15^\circ \text{C}$ (standard atmospheric temperature). NOTE. Free air conditions are generally used as the reference conditions for the specification of positive pressure air movers.
1.2 Air flow terms		
1201	free air velocity	The velocity of the air at free air conditions.
1202	superficial gas velocity	The velocity of the gas, disregarding the volume of solid particles or porous media, at the temperature and pressure conditions under consideration within the pipeline. NOTE. In a pipeline it is the velocity based upon the cross-sectional area; the space occupied by the conveyed product is neglected. For flow through a membrane or across a filter, it is the open duct velocity normal to the surface. Gas velocity is dependent upon both pressure and temperature, and so when conveying gas velocities are evaluated at any point in a system, the local values of pressure and temperature at that point are used.
1203	minimum conveying air velocity	The lowest superficial air velocity which can be used to convey a material.
1204	conveying line inlet gas velocity pick-up velocity entrainment velocity	The superficial gas velocity at the point where the product is fed into the pipeline. NOTE. In a single bore pipeline this will be the lowest gas velocity in the conveying line and so it will be greater than the minimum conveying gas velocity required to ensure successful conveying of a product.
1205	conveying line exit gas velocity	The superficial gas velocity at the end of a conveying line where the product is discharged into the receiving hopper. NOTE. In a single bore pipeline this will be the highest gas velocity in the conveying line.
1206	saltation	The process of deposition of solid particles along the bottom of a horizontal pipeline.
1207	saltation velocity	The superficial gas velocity at which solid particles begin to fall from suspension in horizontal flow. NOTE 1. Saltation occurs in dilute phase flow when the gas velocity falls below the minimum conveying gas velocity. NOTE 2. The deposited particles may move slowly along the bottom of the pipe but are not generally re-entrained.
1208	choking	A process which occurs in vertically upward flow and commences when solid particles near the pipe wall begin to flow downwards. NOTE. Choking in vertical transport is somewhat analogous to saltation in horizontal transport, for both phenomena represent saturation conditions in dilute phase conveying.

No.	Term	Definition
1209	choking velocity	The superficial gas velocity at which choking occurs. NOTE 1. For mixed size particles the velocity at which choking occurs is usually lower than the saltation velocity. NOTE 2. An alternative definition for choking velocity takes the superficial velocity at which the entire suspension collapses into slug flow as the choking velocity. However not all powders can be made to collapse into slug flow and the given definition is preferred.
1210	null point	The position in a system where the pressure is equal to the ambient pressure. NOTE. This is often used in relation to closed loop systems and can identify a natural point of access to the system for monitoring or conditioning.
1211	specific humidity	The ratio of the mass of water vapour to the mass of air in a given volume of the mixture. NOTE. Specific humidity gives an indication of the amount of water vapour that is actually contained in the gas.
1212	relative humidity	The ratio of the partial pressure of the gas, at a given temperature, to the partial pressure of the gas when saturated, at the same temperature. NOTE 1. Relative humidity gives an indication of how much water vapour the gas is capable of supporting before it becomes fully saturated. Its value is usually expressed as a percentage. NOTE 2. The relative humidity may change throughout a pneumatic conveying system as relative humidity increases with rise in pressure and decreases with rise in temperature.