

Preface to the First Edition

When the four of us decided to collaborate to write this book on pneumatic conveying, there were two aspects which were of some concern. Firstly, how could four people, who live on four different continents, write a book on a fairly complex subject with such wide lines of communications? Secondly, there was the problem that two of the authors are chemical engineers. It has been noted that the majority of chemical engineers who work in the field of pneumatic conveying research have spent most of their time considering flow in vertical pipes. As such, there was some concern that the book might be biased towards vertical pneumatic conveying and that the horizontal aspects (which are clearly the most difficult!) would be somewhat neglected.

We hope that you, as the reader, are going to be satisfied with the fact that you have a truly international dissertation on pneumatic conveying and, also, that there is an even spread between the theoretical and practical aspects of pneumatic conveying technology.

We have attempted to produce a book for which we perceived a need in the market place. The book has been written taking into consideration our experiences in the pneumatic conveying industries, and also taking cognizance of the days when we started off as a junior research workers in this field. In those early days, it was clear that a large amount of information pertaining to pneumatic conveying system design was not documented in the literature. Also, there was a certain amount of scepticism amongst the industry as to the effectiveness of research work carried out at universities. The fact that academics working in the field have been branded as ‘one-inch’ pipe technologists is indicative of the lack of confidence shown by journalists.

As such, we have attempted to address both problems and to cater for a wide cross section of readers, including practising engineers, researchers, graduate students, plant operating personnel and the like. The text has been so arranged to accommodate those researchers who wish to gain more insight into the fundamentals, or to provide a short circuit for those readers who wish to address only the design issues relating to pneumatic conveying.

For the systems designer, it is recommended that Chapter 1 be consulted and, thereafter, the reader should study Chapters 6, 7, 9–11. In Chapter 8 issues pertaining to the design of air-activated gravity conveyors are discussed, whilst a number of practical system design problems are solved in Chapter 14.

The researcher wishing to gain more insight into the technology is advised to consult Chapters 3, 4, 5, 12 and 13. In these chapters an attempt has been made to review the relevant literature.

Those issues which are deemed important, but peripheral to this text, are discussed in Chapter 11, where an attempt has been made to alert the reader on such issues as silo and hopper design, wear and attrition, and ancillary equipment. All these topics are subjects in their own right, and the reader wishing to gain more insight into these aspects is advised to consult more definitive texts.

We hope you find this text both useful and stimulating, and that you will reap the rewards of entering into an exciting yet complex field of fluid mechanics.

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Preface to the Second Edition

Since writing the first edition of this handbook on pneumatic conveying, a number of developments have taken place. First, and very sadly, we bid farewell to our esteemed colleague Ming Leung who after a protracted illness passed away. Ming will be remembered for some of the fundamental work which he did on vertical flow and of course on the tremendous contribution he made to the flow in standpipes. His unique skills endeared him to all those who were fortunate to be able to be associated with him, be it as a student, a colleague or a recipient of his consulting services. Here was an academic who disproved the perception of many industrialists that university doyens, working in the field of pneumatic conveying, have little to contribute to the real world of long-distance and high volumetric throughputs. His greatest claim to fame was his involvement in the design of the world's largest standpipe in operation at the SASOL plant in South Africa. In memory of this very special person, we have dedicated this second edition.

Second, the ever increasing demands for environmentally friendly manufacturing facilities have placed a premium on the use of pneumatic conveying as a viable form of materials handling. There has been a world-wide move towards the use of this technology, allowing users to benefit from all the unique features of being able to contain fine powdered and granular products in a pipe. Alongside this growth in utilization, there has been a corresponding increase in the use of low-velocity systems facilitating the ability to transport friable products with minimal degradation. It is evident that the technology is now well established and is here to stay.

Third, as authors, we are concerned at the diminishing number of academics entering into the field of pneumatic conveying research. We are of the opinion that whilst from an industrial standpoint there are positive signs that fewer people view the technology as a black art, there are still significant challenges which need to be overcome. We are still dealing with highly complex interactions between a gas and a solid which is on average some 1000 times more dense. In the field of measurement alone there is enough scope for more research, whilst the development of the ultimate robust equation for dense phase is still a long way off. We wish to urge the vendors of pneumatic conveying systems and equipment to do all in their power to encourage universities to establish research facilities geared towards finding solutions to the many vexing questions.

We have been overwhelmed with the positive response we have had from many readers. We have also been fortunate in having received some constructive suggestions for inclusion in this second edition. On the basis of feedback we have attempted to improve on the linkages between the various chapters. We have also spent time ensuring an improved relationship between the theory and the practice, and have included some additional worked examples. We hope that you will enjoy this second edition as much as we have enjoyed putting it all together.

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Preface to the Third Edition

As with all good things, the advances made in pneumatic conveying field since the second edition have increased our understanding and application of the technology and science. We have strived to keep pace with these contributions and share them with the community. The field of simulation and modeling in particulate systems has exploded with many fine additions to the pneumatic conveying field. As with all large works, making improvements on the book with nomenclature clarification and designations are essential. We are particularly grateful to the readers and users of the book to help us address these issues. We would also like thank Professor Serap Kara of Anadolou University in Turkey for here diligent and careful analysis of the book including text and equations. In addition Dr. Jae Bum Pakh of the University of Pittsburgh has been very helpful in checking the examples to make sure that the numerical values are correct. We hope that you will find this Third Edition of use to in your analysis and design of pneumatic conveying systems.

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Pneumatic Conveying of Solids

A theoretical and practical approach

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