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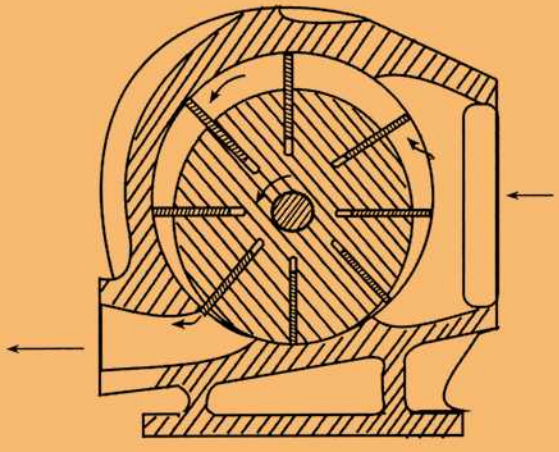

David Mills
Mark G. Jones
Vijay K. Agarwal

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David Mills
University of Newcastle
Callaghan, New South Wales, Australia

Mark G. Jones
University of Newcastle
Callaghan, New South Wales, Australia

Vijay K. Agarwal
Indian Institute of Technology
Hauz Khaas, New Delhi, India

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To the memory of our colleague
Predrag Marjanovic
who died suddenly in September 2001

Preface

Pneumatic conveying is widely used for the transport of dry bulk particulate materials. However, there is considerable misunderstanding on exactly how materials are conveyed and what velocity is required to prevent pipeline blockage. In this handbook dilute and dense phase conveying are discussed and a detailed review is given of various positive pressure and vacuum systems. Extensive consideration has also been given to the numerous means available for feeding materials into pipelines for high, low, and negative pressure systems, as well as to evaluation of major components such as blowers, compressors, exhausters, filters, and the multitude of valves employed.

Specification of air requirements is critical to the successful operation of any system. Air, or any other gas used, is compressible and so great care must be taken in evaluating velocities. All the models required for system specification have been developed using U.S. engineering units. Chapter 9 is entirely devoted to stepped pipelines and includes a number of first approximation design methods. This material should be invaluable in feasibility studies where a quick check on power requirements and operating costs may be required.

Many industries have processes that involve the transport of a wide variety of materials conveyed in powdered and granular form. Bulk materials are conveyed in the food, chemical, mining, agriculture, pharmaceutical, metals, paint and rubber industries, among others. A number of chapters are therefore devoted specifically to different industries and typical conveying data for various materials conveyed. Those materials include coal and fly ash, polyethylene and soda ash, flour and sugar, iron powder, cement, alumina, and drilling mud powders.

The issue of bends in pipelines has been addressed with extensive information on pressure and velocity profiles, equivalent length, location and geometry, and the influence of bends on material degradation and their vulnerability to ero-

sive wear. Similar consideration is given to flows in vertical pipelines, both up and down, and the use of flexible hose. System capabilities in terms of maximum operating pressure, conveying distance, and material flow rates are also discussed.

Engineers who commission, operate, and maintain pneumatic conveying systems will find this book to be a valuable resource. Pipeline blockages and systems not capable of achieving the desired material flow rate are common. Step-by-step procedures are presented to identify problems and which operating parameters need to be adjusted to optimize system performance. The conveying of friable and abrasive materials is particularly problematic in pneumatic conveying systems, but there are numerous ways these problems can be minimized.

Pneumatic conveying is a subject that tends to be neglected in educational provision. Engineers required to design, operate, and maintain these complex systems may have received little more than an hour or two of lectures on the subject during a three- or four-year engineering degree course. Nevertheless, they are expected to take on the responsibility for these systems when working in industry. There is clearly a need for a book on this subject and it is hoped that this text will help to fill the curriculum gap in this very important branch of engineering.

A vast amount of personal hands-on experience is required to address this subject, and I have asked my former students, Mark Jones and Vijay Agarwal, who are actively involved in the field, to join me. The point of reference for us all was Thames Polytechnic in London, where Stan Mason was head of the Department of Mechanical Engineering. He had the foresight to establish pneumatic conveying as a major research area in the department.

The authors would have included Predrag Marjanović, who also studied pneumatic conveying with me at Thames Polytechnic and was later appointed Professor at Glasgow Caledonian University. Sadly, Predrag died a few weeks before work was started on this book and it is dedicated to his memory.

A practical book, by necessity, has many diagrams and graphs, and we acknowledge Neeti Rajput for her excellent work in preparing the material. I would like to thank my wife, Philippa, who contributed her IT expertise and enabled me to process this work. We also thank Vijay's wife, Sangeeta, Mark's wife, Jane, and our families for their forbearance.

David Mills

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