

1

Introduction

This book is complementary to the author's earlier books, *Roll Pressing* (1976/1987) [B.13b], *Size Enlargement by Agglomeration* (1991) [B.48], and *Agglomeration Processes – Phenomena, Technologies, Equipment* (2001) [B.97], as well as some major contributions to professional handbooks, such as *Size Enlargement by Agglomeration* (1997) [B.71].

While *Roll Pressing* [B.13b] dealt exclusively with aspects of pressure agglomeration in roller presses, *Size Enlargement by Agglomeration* [B.48] covered the entire operation and some related fields from a fundamental view point. It described in much detail the newly evolving science of the natural phenomenon “Agglomeration”, which has been used by living creatures, including humans and modern mankind, for thousands of years, and the technologies that were derived from it. In contrast, *Agglomeration Processes – Phenomena, Technologies, Equipment* [B.97] was trying to offer a complete, up-to-date compilation of the various agglomeration techniques and, in general terms only, their applications. To that end, in addition to introducing the properties of agglomerates and the specific characteristics of the different technologies, descriptions of equipment and their special features for particular uses as well as engineering know-how and information on specific peripheral equipment were the main topic of the book. Emphasis was on up-to-date practical knowledge, not theory.

The present book again does not claim to be a scientific publication. Agglomeration, both as a phenomenon and as the beneficial size enlargement of particulate solids, has become part of the newly defined interdisciplinary technical field of Mechanical Process Engineering and a science in its own right, as described earlier [B.97], (Chapter 2). Nevertheless, much of the research and development are phenomenological in nature and most of the designs for equipment and industrial plant still rely heavily on the experience and know-how of vendors as well as experts in the field. Therefore, after again reviewing the fundamentals of agglomeration in an even more abbreviated form, this book attempts to summarize and describe the occurrence of agglomeration in industry, the industrial applications of size enlargement by agglomeration, and other beneficial uses of particle adhesion. The latter, in particular, is found increasingly in new fields such as nanotechnology, life sciences, and even the communication industry (nanoelectronics).

Obviously, it is not possible to describe all the many occurrences of agglomeration and to cover every application of size enlargement by agglomeration in industry. Par-

ticularly during the past 50 years, because of an increase in the production of fine and ultra-fine primary, intermediate, and final solid materials as well as the collection of ever finer particulate wastes, circumstances of undesired build-up, lumping, and other troublesome aggregations have increased tremendously. During that same period of time, a better understanding of the agglomeration phenomenon has led to many beneficial applications of desired and controlled size enlargement to obtain an increasing number of benefits (Chapter 6, Tab. 6.1).

Therefore, in planning the contents of this book, in spite of its growing importance, just one chapter was allocated to deal with the undesired occurrences of agglomeration and the most common methods to avoid or at least lessen its effect.

For the presentation of desirable size enlargement processes in industry, the entire field was sub-divided into a number of segments. In each, the most important application(s) is (are) being presented in considerable detail as examples, describing the history, development, and present state of the technique(s). From this, knowledge and guidance may be gleaned for interdisciplinary use during the evaluation of similar applications in other industries and/or for different materials.

In some areas, the author has decided to describe or indicate in varying detail some less well known, normally more partial methods for size enlargement by agglomeration. These were selected to broaden understanding of the possibilities for beneficially applying the phenomenon for obtaining specific product characteristics and may suggest the use of similar approaches for other cases.