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## Preface

The growing amount of knowledge creates new opportunities as well as challenges. Unfortunately, the challenges often start to be the problems. In chemical and process engineering, the most common problems related to the huge amount of available data, information and knowledge are: difficulties with estimation of their quality, lack of efficient methods enabling the fast access to the relevant information or knowledge and “use once” model of knowledge application. The above-mentioned problems are common for all activities in chemical and process engineering: modelling, simulation, design and control. However, design phase is critical from the point of view of the satisfactory functioning of the process unit or the whole system. The wrong assumptions or errors made at this stage could be corrected only with the great amount of time and money but often it is too late for any essential change. The design is difficult as usually there is a lot of uncertainty involved. The good designers used to deal with the problem using their intuition supported by the past experience. The trouble is that industry and society are more and more innovation hungry. There is a growing demand for designs which are less and less similar to their predecessors.

There are two major approaches to deal with this situation, either to make new experiments, develop new models and on this basis build new designs or to use the existing information and knowledge. The second option is much more economically viable and less time demanding than the first one.

The use of the existing information and knowledge is performed in two ways. First method is aimed at getting new information by searching the exiting knowledge repositories. It is so-called knowledge discovery from literature. This approach usually leads to radical innovations. The second method is based on the assumption that the similar problems have the similar solutions. It is a basis of case-based reasoning. It usually leads to incremental innovations.

The objective of this book is to bridge a gap between the huge amount of available knowledge and its very small subset which is not only generated and stored but also actively used. The book is a sort of guide in a store where

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knowledge is stocked up and we are invited to look for the pieces which could be useful for us in solving new problems. The authors have penetrated only a very small fragment of this huge warehouse – a room in which some elements of knowledge related to chemical and process engineering have been left.

This book is about knowledge re-use by applying of case-based reasoning to the problems typical in chemical product and process design. It is composed of three parts: description of the product and process design and decision support methods related to it, presentation of case-based design principles, issues related to adaptation of the retrieved solutions and case-based reasoning environment and finally examples of application of case-based reasoning to product and process design. The application part covers the broad spectrum of examples dealing with products formulation, synthesis of the system of processing units and mathematical models re-use.

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We hope that this book will contribute to a broader use of case-based design in engineering practice.

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