



Studies in Computer-Aided Modelling, Design and Operation (Computer-Aided Chemical Engineering)

I. Pallai

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In the chemical process industry, the use of computer-aided simulation and design has seen rapid expansion and large realistic, non-linear problems are now being solved routinely via simulation. These volumes translate the theories and principles of chemical engineering into efficient computer-aided simulation and process design. Part A emphasizes techniques to mathematically describe unit operations and arrange the mathematical relations of the models into solution strategies for machine computations. Chapter 1 introduces the design aspects of convective heat and mass transfer between phases. The following chapter is devoted to models for axial mixing and their applications in reactors and extractors. Chapters 3 and 4 review simulations of hydrodynamic unit operations and heat exchangers. Chapter 5 is devoted to multistage evaporation. Chapters 6 and 7 deal with modelling fluid phase equilibria and the design of separation processes in equilibrium. The next two chapters describe the synthesis of multicomponent distillation systems and the design of heat exchanger networks based on energy integration. Chapter 10 is devoted to modelling the batch and continuous drying processes. The last chapter reviews the simulation and optimization of various chemical reactors. Part B deals with modern methods for solving chemical engineering problems using the systems approach. Chapter 1 emphasizes the importance of systems theory in chemical technology. Chapter 2 covers modern aspects of model identification and parameter estimation using new methods of model reduction. Chapter 3 discusses the structural analysis of chemical engineering networks and applies graph theoretical and matrix representations to the solution of flowsheeting problems. The subject of Chapter 4 is the economic analysis, estimating profitability and different types of costs. Chapter 5 summarizes process control methods. This chapter is not only useful to chemical engineers but also to specialists in process control applications. Chapter 6, which describes measuring systems, bridges the gap between chemical engineers and analytical chemists. Emphasis is on the importance of performance characteristics of measuring systems when applied to quality control. The books have been written both for engineers in industry who are interested in applying computer techniques to the design and analysis of plants, and for advanced students in chemical engineering.

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