

## REVIEW: Engineering Optimization

Continued from page 159.

to common sense to understand each of the optimization methods considered. Also, every method is followed with an example to illustrate it. This format is exactly right as the focus is on how to use the methods. As the jacket flyer states, "... proofs and derivations are included only if they serve to explain key steps and properties of algorithms." The authors also offer their opinions as to the strengths and weaknesses of the various methods, and I found myself agreeing with them in virtually all cases.

The book occasionally stops rather abruptly on a topic, perhaps most noticeably with the chapter on linear programming. The theory behind sensitivity analysis for linear programming is not that difficult to present, yet the text simply presents some of the 'how to' aspects of this useful subject. Also it does not develop generalized duality theory, which can actually be done rather agreeably at a level consistent with the rest of the book. This theory is useful when attempting to understand a number of concepts, such as the saddlepoint conditions and dual bounding.

The variety of methods covered in the first 11 chapters is impressive. The authors have obviously scoured the engineering literature for the methods that have found their way into practical use for engineering problems. Included are direct and gradient based methods for unconstrained optimization problems; a simple presentation of the simplex algorithm for linear programming; the important theorems for constrained optimality; both ordinary and generalized penalty function methods; successive linearization methods; the very effective generalized reduced gradient method; gradient projection methods; and very importantly the ideas behind successive quadratic programming methods, perhaps the best of the methods developed so far for nonlinear constrained optimization. The final chapter on methods, Chapter 11, covers briefly mixed integer linear programming, quadratic programming and geometric programming.

The last three chapters of the book, Chapters 12 to 14, are a chapter on studies which have been performed to compare many of the methods presented, a very readable and *important* chapter of the issues one must worry about when embarking on an optimization study, and finally a chapter describing three larger case studies, obviously one

per author. The first of these chapters emphasizes what the authors feel must be included in a comparison study for methods if the study is to be meaningful.

The homework problems are plentiful and seem appropriate for the topics covered. Students using this book will be much better off if they have had a course on linear algebra.

The material could be taught in one semester, if one is careful about not overdoing the detail on some of the methods. □

---

## PNEUMATIC AND HYDRAULIC CONVEYING OF SOLIDS

by O. A. Williams

Marcel Dekker, Inc., 1983, 319 pages.

Reviewed by T. D. Wheelock  
Iowa State University

This volume is the 13th in a special series of reference books and textbooks relating to the chemical industries. It treats pneumatic and hydraulic conveying as separate and independent subjects with seven chapters devoted to the former and ten chapters to the latter. An additional chapter is devoted to solid waste disposal areas, landfills, and sluice ponds. The volume is based largely on the author's considerable experience as a designer and user of conveying systems. In line with the author's statement that "the design of a pneumatic conveying system is almost as much of an art as it is in engineering function," the treatment is largely descriptive and highly empirical. Various types of conveying systems and their operating characteristics are described. Also discussed are important features of system components such as bins, feeders, exhausters, blowers, pumps, piping, gates, and control units. In addition two chapters are devoted to detailed design calculations for a number of different systems.

Since the volume provides a broad and rather detailed introduction to the layout, design, and operation of pneumatic and hydraulic conveying systems, it will be of particular value to engineers responsible for the design and/or operation of such systems. It may also serve as a useful reference for college-level process design courses. In addition, because it illustrates the highly empirical nature of solids conveying technology, it may stimulate further research and development in this important field. □