BOOKS

Feedback Control: Theory and Design

By K. J. Kurman, Elsevier Science Publishing Co., Inc., 1984, 527 pp., $94.25.

Chapter 1 describes the typical textbook examples of feedback control (thermostat, liquid level, etc.) and includes a discussion of the motivation for feedback. Chapter 2 (⅓ of the book) deals with nonlinear problems. The discussed analysis techniques for steady state accuracy and dynamic performance are mostly graphical in nature (phase-plane and state-plane methods). Chapter 3 (⅓ of the book) covers linear problems. The Laplace transform is introduced; block diagram manipulations, stability criteria, and frequency response are discussed for single input-single output systems. "Loop shaping" rules constitute the main part of Chapter 4; about 25 pages are devoted to multivariable systems.

Presumably the reader does not need any background in control, but I would not recommend any novice to try to learn the basics from this book. Because not a single reference is given, it is also impossible to fill in "holes" from other sources. The book is described to be "both a handbook for engineers and a challenge for theoreticians." It is neither. The theoretical foundations are at least 35 years old. State plane techniques cannot be applied to systems of order higher than two. Today, when interactive computer graphics are becoming commonplace, involved pencil-paper rules lose their appeal. For these reasons practicing chemical engineers will find Chapter 2 of very limited usefulness (mechanical and electrical engineers might have a different point of view).

The author hails the "experimental proof" and provides a wealth of heuristics for designing dynamic compensators. Without a discussion of the limitations of these rules of thumb, they can be very misleading. For example, gain and phase margins bear *no* relationship with the maximum peak M_p contrary to what is claimed. There is much general superficial philosophy and criticism of "modern control theory," which reflects a lack of understanding. For example, the shortcomings of the state space techniques are not their inability to account for "the nature of the dominant disturbance," but rather their inability to deal with model/plant mismatch.

On the positive side, the discussion of nonminimum phase systems is excellent, and the insights into the decoupling of multivariable systems are deep though not deep enough to give rise to a general design technique. A wealth of examples is worked out in detail and should be useful to anybody teaching an introductory course.

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LETTERS TO THE EDITOR

To the Editor:

In the paper entitled "Trickle-Bed Effectiveness Factors for Liquid-Phase Reactants" (Sept., 1984), Pan Zhenglu, Feng Han-Yu, and J. M. Smith considered trickle-bed effectiveness factors when the rate of reaction is determined solely by the concentration of a nonvolatile liquid reactant. They compared the weighting factor approximation of Tan and Smith (1980) to the complete cubic particle solution of Herskowitz et al. (1979). Finding significant disagreement between the approaches, they proposed a new equation and showed it to be a good approximation over a wide range of conditions.

The purpose of this letter is to point out that the new equation presented by Zhenglu et al. was developed in 1978 and published in 1982 by Sakornwimon and Sylvester (1982).

Although it is likely that Zhenglu et al. were unaware of the work of Sakornwimon and Sylvester, it is appropriate that your readers be informed of this earlier publication. Unfortunately, this situation of previous publication of research results is becoming more of a problem as the time delay in publication increases.

Literature Cited

Herskowitz, M., R. G. Carbonell, and J. M. Smith, "Effectiveness Factors and Mass Transfer in Trickle-Bed Reactors," *AIChE J.*, 25, 272 (1979).

Sakornwimon, W., and N. D. Sylvester, "Effectiveness Factors for Partially Wetted Catalysts in Trickle-Bed Reactors," *Ind. Eng. Chem. Process Des. Dev.*, 21, 16 (1982).

Tan, C. S., and J. M. Smith, "Catalyst Particles Effectiveness with Unsymmetrical Boundary Conditions," *Chem. Eng. Sci.*, 35, 1601 (1980).

Zhenglu, P., Feng Han-Yu, and J. M. Smith, "Trickle-Bed Effectiveness Factors for Liquid-Phase Reactants," *AIChE J.*, 30, 818 (1984).

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