Book Reviews

Process Control, Designing Processes and Control Systems for Dynamic Performance by Thomas E. Marlin

Review of First Edition

Appeared in the *Journal of Process Control, 6, 4, 263 (1996)*

Review of the Second Edition

Appeared in Chemical Engineering Progress, 98, 1, (80) 2002

BOOK REVIEW

Process Control: Designing Processes and Control Systems for Dynamic Performance by Thomas E. Marlin
McGraw-Hill, New York, 1995, 954 pages

An initial browse through this book might convince the reader that here was yet another academic contribution to the undergraduate, chemical engineering oriented, continuous (the word 'batch' does not appear in the Index) process control literature. Although I think such an appraisal falls quite some way short of what this book has to offer, let's begin by looking at in this light.

As an undergraduate offering, it is really two (and a bit) courses in one book. The first dozen or so chapters (with some of the later work on enhancements to basic PID feedback control) would constitute a fairly typical introductory, on semester course in process control. To me, the highlight of this section is Chapter 2 (Control Objectives and Benefits) which is obviously written by someone who has clearly practised process control in the real world. The approach to model development (in Chapter 3) is also worth a mention. With an emphasis on clearly defined sub-goals, it should help students to realise that modelling is not the black-magic exercise that many of them consider it to be.

The second half of the book has clearly been put together with a follow-up course in mind for those students who have some real interest in process control, both in its own right or as an important component of any process design project. If the first half of the book hinted that its author was a man who had worked at the process control rockface, then the second half positively screams that this is indeed so. The examples have that real feel about them, the approach has a nice blend of theory and pragmatism and the author has resisted the temptation to show how clever he is by wallowing in the more esoteric aspects of modern control theory – if industry isn't using it, then its not there! I particularly liked chapters 17, 22 and 23 on Inferential Control, Variable Structure and Constraint Control and Centralised Multivariable Control (essentially Dynamic Matrix Control), respectively.

So despite its length (954 pp) and its insistence on providing both References and Additional Resources at the end of each Chapter, I believe that this book on its own would have a solid future as a process control text. But there's more!

With the text comes a Software laboratory (written in Matlab) and a 100 or so page Workbook, both of which may be freely distributed to students. Its hard not to be impressed by the effort that has gone into these addenda. The software Laboratory actually consists of two types of program. In the first, the actual Matlab coding is given and the student uses the software by making changes to the actual code. In the second category are a suite of general-purpose programs which are accessed via an interactive menu system (no Matlab coding changes are required). These latter programs can be used on a wide variety of problems, not just those in the text or the Workbook. The

exercises proposed are tightly linked to the examples and questions in the text, and seem specifically designed to foster a 'learning by doing' attitude in students. While I would agree with the author that the book 'can be used without software or with other software', if it were used as a teaching text (rather than say as a reference book) I would personally regard the Software laboratory and Workbook as pretty much essential.

A word of caution is perhaps called for at this stage. Any instructor planning to use this integrated package (of text, Software laboratory and Workbook) might do well to realise that this could be as much a challenge for him/herself as for the students. With many more exercised that could ever realistically be covered in full, a suite of general purpose programs, and a class full of MATLAB users, any instructor will need to give careful thought to course structure, content and assessment.

So what can be said in conclusion? This book certainly has many of the characteristics that I admire in the author, having worked closely with him in the past. It is methodical, thorough, experienced-based and driven, as the author says himself, by the fact that in process control 'the ultimate goal is understanding' – not plots or numbers!' Perhaps, I could sum it up thus:

> There was young man from McMaster,
> Who wanted control that was faster,
> So he wrote this here book,
> It's well worth a look,
> So buy it, and use it, hereafter!

Despite the bad poetry, this book deserves to make an impact on the teaching of process control, and I have little doubt that it will.

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BOOK REVIEW

Process Control: Designing Processes and Control Systems for Dynamic Performance
Thomas E. Marlin
McGraw-Hill, New York, 2000, 1,056 pages

The chemical engineering industries are looking more than ever for highly computer-literate and critical thinking individuals. Dr. Marlin, as a scholar and a leading consultant to the industry, introduces process control to the reader both practically and theoretically. While there have been several textbooks on process control. Coughanowr's book was the most liked one by my students. I believe that Marlin's book can take the attention of both students and teachers due to its current content and complementary learning materials, such as the Process Control Interactive Learning Modules and software Laboratory.

Part I starts by laying the ground for the whole subject, and introduces the necessity and background for process control so that the reader can have an overall view. The material in the introduction is highly informative.

Process dynamics is presented in Part II. The plan of attack to problems is introduced first, and, throughout the book, the mathematical background is explained when necessary. This method of approach is critical for proper modelling; so is the mathematical background. Therefore, this book rises above the others as a student-centered one. I also find highlights in the text valuable for a complete understanding of the material presented.

Part III covers feedback control including controller tuning, stability analysis and practical applications. The first three parts, along with a selection of topics in the remainder of the book five students enough knowledge to learn the rest of the material by themselves.

Part IV deals with the enhancements to single-loop feed-ack control including cascade, feedforward, inferential level, and single-variable-model predictive controls. These topics are essential to understand the more-advanced, multivariable design topics, and are keys to design control strategies for complex units.

In practice, some processes require several controlled variables to be maintained at independent set points. Multivariable control is presented in Part V to address these control systems. Multiple loop, variable-structure, constraint, and centralized controls are put forward through several examples. The final part of the textbook introduced process control design. Part VI shows how to carry out the design procedure by presenting its major features and by providing examples.

The examples given throughout the book are worked out in detail and the problems assigned at the end of each chapter are quite solvable. Fundamental problems are included to comprehend the material introduced. Marlin's volume is a current and well-written work that anyone interested in process control should own, and I am looking forward to using it as a textbook.

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