The calculated results are quite sensitive to the assumed initial water content. Again, using the above assumptions we may calculate

Assumed Final Temperature, °C	Assumed Initial NaAc wt. Fraction in Solution	Computed Starting Temperature °C
50	0.49	32.8
50	0.50	27.5
50	0.51	22.1

In making up the problem, the value of 50 wt% NaAc was chosen because the resulting calculations gave the best match to the experimental tests. (By phone a Prism staff member said the concentration was between 50 and 55 wt%, but declined to say exactly what the value was.)

The heat of crystallization was computed from the data in reference 3.

REFERENCES

1. Prism Technologies, 3111 N. Knox, Chicago, IL 60641 (312-685-0999)
2. *International Critical Tables,* E. W. Washburn, ed., Vol. 5, pg 100, McGraw-Hill, NY (1929)
3. *Gmelins Handbuch der anorganischen Chemie* 8. Auflage, System Nummer 21, Natrium , Verlag Chemie, GmbH, Berlin, pg. 822 (1928)
4. Rossini, F.D., et al., "Selected Values of Chemical Thermodynamic Properties," *NBS Circular 500*, pg. 470 (1952) ❐

ChE **book review**

PROCESS CONTROL: STRUCTURES AND APPLICATIONS

by Jens Balchen and Kenneth Mummé
Van Nostrand Reinhold, 115 Fifth Ave., New York, NY 10003; $59.95 (1987)

Reviewed by
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This book aims to "bridge the long-standing gap between process and control." Toward this end, the second chapter reviews most control theory and control system design methods. Chapter 3 gives a mainly qualitative description of many important chemical and physical processes, ranging in complexity from valves to crystallization and reaction processes. Chapters 4 and 5 present alternate control structures for the processes described in Chapter 3. These structures are combinations of PID, ratio, feedforward, and cascade controllers, along with arithmetic and logic blocks which are standard in most distributed control systems. The book concludes by presenting the control structures for several integrated process systems such as a paper machine and an ammonia plant. The discussion is mostly qualitative.

The authors have undertaken to present an immense amount of material to an extremely wide audience; indeed, too much material to too wide an audience. Chapter 2, by necessity, gives only the most cursory overview of the topics covered. In some places the need to be concise has led to inaccurate and/or misleading statements as, for example, on page thirteen where it is stated that in order for a feedback controller to be effective, the loop transfer function $h_0(s)$ must satisfy $|h_0(s)| >> 1$. The discussion on multivariable decoupling and predictive control completely omits treatment of control effort constraints. Such an omission is unforgivable in a text that claims to bridge gaps.

Later chapters suffer from very uneven coverage of subject matter. While most discussions describe various pieces of equipment and how they work, every so often the discussion gets very detailed. In the discussion of compressors, for example, it is pointed out that "it is important that the pressure and temperature be such that the gas does not reach the critical point." This somewhat imprecise statement is then illustrated by PVT diagrams (page 103) for water and carbon dioxide, with no explanation of how to use the diagrams. In the discussion of chemical reactors, the reader is presented with a partial differential equation model for the reaction $A \rightarrow B$ in a plug flow tubular reactor (pages 238-239). These equations are then followed immediately by the statement that if the heat transfer coefficient can be used as a control variable, it can be expressed in terms of a new variable which is the relative change in heat transfer coefficient with respect to the steady-state heat transfer coefficient. No justification is given for the equation which follows nor is it clear why the change of variable was even mentioned since the subject is immediately dropped. This reviewer remains confused as to why we would even wish to use variations in heat transfer coefficient as a control variable for tubular reactors.

In summary, it is difficult to know to whom to recommend this book. It assumes too much chemical engineering background for the average control engineer and too much control background for the average chemical engineer. Perhaps, my academic colleagues will find useful some of the detailed process descriptions and P&I diagrams. ❐