

USE OF WOOD FOR ENERGY

Progress in Biomass Conversion—Volume 3 Edited by K. V. Sarkanen, D. A. Tillman & E. C. Jahn. Pp. 291. ISBN 0-12-535903-9. (Academic Press: 1983.) \$24.50.

With the petroleum shocks of the 1970s came increased attention to renewable biomass as a resource of increasing importance. The *Progress in Biomass Conversion* series is a part of the rapidly growing body of literature in an area which had a long period of relative dormancy. In particular, Volume 3 deals with current topics relating to uses of wood in energy production. The title of this work would suggest contents covering a wide range of biomass types, conversion methods, and applications. But, an early scan of the book leads to the conclusion that biomass equals wood and that conversion equals energy production. Perhaps this emphasis reflects the real world of biomass conversion practice. One would hope that future volumes in this series would include papers on other subjects of biomass conversion such as derivation of chemicals and non-wood sources of biomass.

This book covers topics of current and mainly practical interest relating to conversion of wood to energy. The first paper, "Energy From the Forest," is a good overview and sets the tone for the book. This paper starts with a macro view of the earth's forest resource, proceeds through more specific sources of energy and combustion technology, covers conversion of wood to other energy forms, and ends with a section on energy forms. The paper is well supported with tables of data and diagrams.

Readers with an interest in chemistry will probably be most interested in the paper entitled "Chemistry of Pyrolysis and Combustion of Wood." Differences in reaction at elevated temperatures are discussed for the various components of wood. Several chemical mechanisms for combustion and pyrolysis are postulated. Data and discussion are presented on wood and cellulose chars. This well-written paper successfully presents a good deal of what is known on the subject, but what it does not say is also important. This points out our lack of knowledge and suggests areas where

additional basic research is needed to identify and understand chemical mechanisms of combustion and pyrolysis of wood.

The paper titled "A Comparison of European and U.S. Combustion Systems Using Biomass" is probably best described as a review paper. It provides a balanced overview of combustion systems, but as can be expected, there is insufficient detail on each system to make a final choice for a new installation. The serious student will want to study the references listed at the end of the paper and contact equipment manufacturers. However, this paper will help narrow the initial choices for further study.

"Alternative Cogeneration Systems Employing Biomass as Fuel: An Incremental Analysis of Heat Rates" provides an in-depth comparative analysis of three basic cycles: 1) direct combustion steam turbine topping cycle, 2) the indirect heat Brayton cycle, and 3) the gasifier-based systems with emphasis on improved electrical power-to-steam ratios. The analysis concludes that only special circumstances can overcome the losses in efficiency that occur with the Brayton and gasifier based systems. This analysis would have been more powerful if it had included consideration of requirements for capital investment.

The increasing importance of wood fuel in the U.S. is quantified in "Consumption of Wood Fuels in the United States 1971-1980" with data obtained from surveys and various industry associations. It concludes that the portion of U.S. energy provided by wood in the U.S. increased from 2.3 percent to 3.1 percent during the 10-year period. The difficulties in obtaining accurate and reliable data for the residential sector is very effectively pointed out. These problems with the data result in a wider margin of error than may be desired in the total estimated wood fuel usage. Consideration of the contribution of wood space heaters to an increase in fire damage to homes is worthy of further study in the overall equation of wood as an energy source.

Baling of forest biomass, especially as an alternative to in-woods chipping is the theme of "Evaluation of New Concepts in Biomass Fiber Field

Processing and Transportation." Use of two case studies is the key factor in making the points covered in this paper. Situations where baling may be more attractive than chipping, such as rugged terrain and a need for at-mill sorting are well defined in this paper. Operating and capital costs along with equipment requirements are effectively presented.

"A Comparison of Biomass and Coal As Feedstocks for Synthetic Fuels" presents a good discussion of the topic, but its conclusion may not be welcomed by champions of synthetic fuels from biomass. It concludes with the opinion, shared by this reviewer, that coal is likely to be used for synthetic fuel production before biomass except in special circumstances.

Arguments for national policy changes to encourage development of a synthetic-fuels-from-biomass industry are presented in the paper entitled "Biomass Fuels for Energy Security: A Policy Statement Concerning National Needs and Opportunities." Based on conclusions reached in some of the earlier papers, government support is the only way for such a biomass-to-synthetic-fuels industry to develop in today's energy and economic climate. Given the realities of the American political system and its capacity for change, it is doubtful that mere government encouragement would be sufficient. Given the problems that have resulted from past government meddling in energy matters, it may be better to be patient and allow the free enterprise system to respond when the time is ripe.

In conclusion, this book is a useful addition to the energy-from-wood literature and should seriously be considered for addition to the library of anyone interested in this subject. ■

Glenn A. Rasmussen is currently Director, R & D, for Reed Lignin Inc., Rothschild, Wisconsin Laboratory.

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