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Book Review

ADHESIVES FOR THE COMPOSITE WOOD PANEL INDUSTRY, G. S. Koch, F. Klareich, B. Exstrum, Noyes Publications, Park Ridge, New Jersey, U.S.A., 1987, 144 pp. (US\$36.00).

The energy crisis of the 1970's resulted in many disruptions in the American way of life. Among the problems that developed one, in particular, affected the wood industry's efforts to supply much-needed panel products for construction. This resulted from the fact that the adhesives used in panel production were based almost entirely upon petrochemicals, and these had experienced increased costs and decreased availability. It was estimated that the wood industry consumed approximately 25 percent of the total U.S. production of adhesives. Consequently, considerable energy savings might be realized if alternate adhesives could be developed from biomass sources. The U.S. Department of Energy sponsored an investigation to evaluate the potential of developing biomass-based adhesives and the likelihood of energy conservation. This book describes this investigation and the conclusions reached by the research team.

The synthetic thermosetting resins used in wood panel production consisted mainly of phenol-formaldehyde, resorcinol-formaldehyde, urea-formaldehyde, and melamine-formaldehyde, with phenol- and urea-resins having the largest consumption by far. The materials of biomass origin that were evaluated in this report as alternatives were lignin and tannins. Because of their unique bonding properties, the diisocyanates were evaluated as a third alternative, even though petroleum-derived. These were the principal materials under investigation at the time the analysis was made.

A general overview is presented of the composite wood panel industry in the U.S. up to about 1986. This includes the markets for

both hardwood and softwood plywood and for particleboard with all its variations of particle sizes, shapes, orientations, and layer differences. The adhesives used, methods of panel manufacture, markets, and future of the industry are briefly reviewed. Similar information is presented for each of the conventional adhesives to include methods of manufacture, markets, and application processes. Tables of market data are provided for resin feedstock, thermosetting adhesive producers, resin production, and costs for production of Southern plywood, waferboard, and oriented strandboard.

The R & D efforts on alternative adhesive systems were reviewed intensively and extensively on an international scale. For example, a list of contributors of information used to prepare the report contained forty-two U.S. sources involving universities, government agencies and government-sponsored laboratories, trade associations and professional societies, and the private sector. In addition, seventy-seven organizations in twenty-four foreign countries supplied information for the report. Over one-hundred individuals were listed as contacts for the various organizations involved. The appendix lists one-hundred and fifty-three references. The major R & D needs for future research on each alternate adhesive were listed along with an assessment of whether or not energy conservation might result in each case.

The authors recognized that energy savings might result from lower cost feed stocks from which the raw materials are derived, from lower costs in processing the raw materials and formulating adhesives, and from bonding costs during adhesive applications in use in the wood industry. Many trade-offs exist among the different alternatives, and the potential for energy savings in some cases could be significant. The authors felt that while there were technical and economic problems still to be solved, it is likely that some biomass-derived adhesive will enter the market in the wood industry in the next 5–10 years.

Petroleum supplies, having again become abundant, will certainly not remain so forever. There will be a continuing need for alternative sources of raw materials for adhesives. This book provides an excellent review of the situation prevailing in the early 1980's for adhesives in the wood industry, for the research being done on biomass-derived adhesives, where the research is being

done, and what problems remain to be solved. Investigators interested in this area of research will find this book to be a source of useful information.

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