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LETTERS TO THE EDITOR

Twelfth International Particleboard Symposium held at Washington State University* Developments in Structural Panel Materials, Binders, and Fire and Explosion Prevention Presented

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Over 370 individuals from some 23 countries attended the 12th International Particleboard Symposium held at Washington State University in April 1978. The worldwide character of the audience has become an important feature of this symposium providing an opportunity for experts with widely varying experiences to confer with each other on mutual problems.

Symposium sessions were held on Structural Panels; Binders, Formaldehyde Release and Blending; Explosion/Fire Prevention and Control; and Special Considerations. As with all of the symposia in this series, a complete Proceedings is available.

Great interest has been shown over the last several years in the area of structural panels, either of all particleboard or of veneer/particleboard composites and such interest will continue. One composite plant is already operating in the United States. This plant is making a composite or oriented flakeboard core with veneer faces. It is a cross-ply construction the same as in plywood. Another such plant is now under construction. A pilot plant making a composite panel with randomly formed particleboard cores of shavings-type particles and veneer faces has been operating for several years. This product uses isocyanate binder. A commercial plant is now under construction.

Waferboard has been successful in Canada for a number of years. Much of the product is exported to the United States. The one waferboard plant now operating in the United States will soon be joined by a new one and several others are reportedly in the planning stages. Final plans for a structural panel plant are nearing completion where oriented flakeboard will be made into the final panel by means of the plywood type of cross-ply construction.

This widely varying industrial activity has been accompanied by extensive research and development activities on all of these materials. Using hardwoods for flakeboard roof decking is a new concept. The economics of producing such material is favorable. It is designed to compete in the same industrial market as wide-ribbed steel deck (folded plate decking is another term used) spanning 6 ft (1.83 m). Insulation and built-up roofing are normally used on the top of such roof construction. Structural adequacy, within limits panel weight, and cost competitiveness has been demonstrated. The use of mostly underutilized hardwoods near the major markets is an important advantage with this development in the United States.

An overview of the massive research and development program of the U.S. Forest Service on manufacturing costs for structural flakeboard from forest residues showed that such products could be made from many different types of residues. Commodity products such as structural sheathing appeared to be the best market. A method for conducting economic analyses of product manufacture at different sites showed that sites closer to major markets were best due to freight advantages. The method developed will be valuable for use in future analyses. The possibility of converting older particleboard plants into structural board plants was also broached.

Composite panel research at the American Plywood Association Laboratories is in its second phase. This large project had the following objectives: (1) To refine the tests for glue-bond durability and to extend them to cover other products; e.g., fully exterior siding panels; (2) To

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* Previous symposia have been reviewed in Wood Science and Technology as follows: Vol. 1, 1967, pp. 239–240; Vol. 2, 1968, pp. 231–232; Vol. 3, 1969, pp. 175–176; Vol. 4, 1970, pp. 313–314; Vol. 5, 1971, pp. 313–314; Vol. 6, 1972, pp. 314–316; Vol. 7, 1973, pp. 317–320; Vol. 9, 1975, pp. 75–79; Vol. 10, 1976, pp. 155–157; Vol. 11, 1977, pp. 79–81; and Vol. 11, 1977, pp. 319–321

investigate the effects of actual weathering on the strength of the composite while attempting to correlate it with various accelerated weathering tests; (3) To investigate the finishing properties of composite panels as part of the development of a siding product with particular attention to finding an accelerated performance test for evaluating exterior finishes; (4) To investigate the structural requirements for wall sheathing and siding with the intention of finding a performance specification for these applications; and (5) To investigate dimensional stability for various applications, including single-layer floors, roof sheathing, siding, and ultimately other applications, such as concrete forms.

The information developed is to be used for the production of composite panels which can be substituted directly for softwood plywood in most of its conventional applications for building and industrial uses. Specifications for production by association members are being developed. The first one available covers single-layer floors as a tongue-and-groove underlayment grade panel.

Particle orientation is well known to enhance static bending and linear expansion properties in the aligned direction of composition boards. A number of systems for either mechanically or electrically orienting particles have been developed. A newer system using a series of disc rolls was described. This system aligns particles of appropriate size by passing them between spaced discs on adjacent shafts. The discs comb the particles through in aligned position. Slender flakes or strands are needed for this system. Good orientation expressed as a ratio of bending strength in the aligned direction to that of the non-aligned direction was excellent.

The problem of formaldehyde release from urea formaldehyde bonded boards is drawing worldwide attention. Lengthy discussions at the Symposium attempted to put the problem in perspective. The problem has several aspects and all aspects are intertwined. Regulatory agencies are considering emotion and peer pressure as well as science in developing rules governing air quality within industrial and commercial buildings and dwellings. Media coverage has not always been accurate, leading one to believe formaldehyde is a highly dangerous chemical to use. Publicity alleging that it may cause cancer and genetic damage in humans has not been supported scientifically. To day, no increase in the incidence of cancer has been observed and no study has shown that formaldehyde causes any kind of tumor.

Low odor threshold and irritating effects of formaldehyde at low vapor concentration have been primarily responsible for the adverse publicity. Research is underway on the effects of inhalation of formaldehyde vapors but the results of such studies will not be available for about three years. While existing data indicates results will be negative, consumer exposure questions may need further evaluation. Efforts are underway to honestly present the facts and to point out their contrast with erroneous news releases.

There is extensive government activity and concern which could lead to standards on air quality for homes, etc., thereby limiting the levels of a number of substances in the air. There is a multiplicity of agencies with interacting and overlapping responsibilities protecting the general public from health hazards. There is a need for a coordinated approach on the formaldehyde issue based on scientific fact so all, including government, industry, builders, and consumers, would work together in establishing appropriate standards where needed.

Considerable research in laboratories is underway developing appropriate methods for measuring formaldehyde release and investigating more throughly how and where formaldehyde is released from particleboard. Such research should help in the design of new resin systems reducing formaldehyde release from urea formaldehyde systems.

During the oil embargo a few years ago, great concern was expressed about the availability and cost of binders in the late 1970's and the 1980's. Today some price increases are predicted and supply apparently will be adequate barring an extreme change in the world's petroleum and natural gas delivery system. Phenolic binders would be impacted the most if there was a greater demand for them as over 40% goes into plywood and insulation manufacture.

Blending developments and research on the wetting and penetrating of phenolic and lignosulfonate binders indicate that more research and development will be of vital interest in understanding bonding and the best methods of applying binder. Over the years, great strides forward have been taken but much remains to be done.

Fire and explosion problems in plants have always been serious ones requiring attention. These problems have been magnified in recent years as more closed systems have been installed

to meet stricter air quality standards. Systems have been developed for detecting and suppressing fires and dust explosions. However, planning and installing process lines to handle these problems are of vital importance. Proper approaches can eliminate many problems or reduce their hazard. Properly training personnel is also extremely important.

Wood dust explosions have high destructive potential and serious accidents have happened over the years in board plants. It has been found that properly designed explosion venting can effectively control the destructive forces generated by such explosions. Guidelines have been developed to limit severe explosions. Working knowledge of the variables and their effect on the maximum explosion pressure and rate-of-pressure rise is needed to evaluate the hazards. Such understanding, along with proven production techniques, safe operating procedures, and preventive maintenance have been found to reduce the wood dust explosion hazard in plants. Good explosion suppression systems in the plant add to the overall safety to people, equipment, and buildings.

New precision on-line thickness measuring equipment has been developed for plants. Using a non-contact approach and modern electronic technology, accurate measurements of panels immediately out of the press can be taken. Such information can be of immediate use for quality control. Reportedly, significant advances in plant profitability have been achieved.

Radio or high frequency curing of particleboard and fiberboard in the press has been practiced for many years. Recently, more interest has developed in preheating mats before pressing. This can reduce press times up to 40 %; presses with limited pressure systems can produce higher density boards and no shielding is required. Other advantages are possible depending upon the plant and product being manufactured.

Board plant dryers have been, for the most part, adapted from the agriculture industry. Recent studies have been conducted on convective drying of wood particles and a numerical model has been developed. It has been employed to determine the effects of wood loading, gas temperature, gas velocity, and wood moisture content on dryer performance. The research showed that dryer efficiencies approaching 70 % could be achieved.

Fire retardant treated particleboards have not yet achieved widespread use in the United States. Experience in developing such products in France has resorted in the extensive use of such products in many building applications. The research and development already completed should be of value to those in other countries interested in developing similar products.

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Note

The author of the below-mentioned article informed us about the following facts which we would like to bring to the attention of our readers:

"The volume 13, no. 2, issue of Wood Science and Technology (pp. 117–126) contains our article 'Utility Pole Decay – Part III: Detection in Pine by Color Indicators'. In this work we demonstrated that butter yellow is one material that can indicate decay in wood poles.

It has subsequently come to our attention that the U.S. Food & Drug Administration has declared butter yellow to be a carcinogen.

Readers of this article should be alert to the potential dangers associated with the handling of this chemical. Details about safe handling can be obtained from organizations such as the U.S. Department of Labor's Occupational Safety and Health Administration." *Dr. W. E. Eslyn*