

FOREST TECHNOLOGY

The Changing Face of Wood

Wood is no longer used just as nature made it. New preservation and conservation methods have suggested a variety of uses not explored before.

By ELISABETH MITCHELL

HAVE YOU ever considered what everyday living would be like without nature's most versatile resource, wood?

Throughout the ages man has used this product to live in, to travel in, and even to be buried in. Today approximately 5,000 products come from the forest. The paints and lacquers we use in the home, the film that photographs the children, the rayon that helps clothe us, the cellophane and cellophane tapes that wrap our gifts: these and literally thousands of other items are derived from wood.

The long list of uses is being constantly expanded with the development of better glues and adhesives, better preservatives and fire retardants, and most important of all, greater understanding of the chemical composition of the tree, reports the National Lumber Manufacturers Association, Washington, D. C.

This adaptable resource may even cure some of our ills one day. Scientists at the University of Wisconsin have recently been experimenting with calcium lignin sulfonate, a chemical derivative of wood. It was found to inhibit gastric acid secretion in certain animals. They caution, however, that the chemical has a pronounced blood anticoagulant effect and is somewhat toxic.

The total timber cut in the United States for industry is nearly 204,100,000 tons a year. This does not include bark but only wood substance. Bark would increase the figure by another 20,000,000 tons.

Two main products, lumber and pulpwood, account for 52,000,000 tons and 39,000,000 tons, respectively. Fuelwood and mill residues used for fuel account for the major remaining amount of material. The unused logging and plant residues, which are of interest to the chemical industry as raw materials, amount to 51,000,000 tons.

Chemical Utilization

Trees contain a large number of chemical compounds and are an excellent potential source of raw material for chemicals. The chemical utilization of the tree has developed in the U. S. into an industry producing at an annual rate in excess of \$111,000,000.

Construction is still the largest single market for wood, and is expanding rapidly with development of new techniques for producing stronger beams and arches, for gluing boards into panels, for gluing chips into boards, and for fastening framing and timbers.

Exciting wood effects are now possible using treated papers combined with plas-

tics to surface low-grade veneers, plywood and lumber. Wood can be processed to resemble a honeycomb structure and then pressed together in layers to form a type of sandwich panel. This sandwich construction combines high strength and stiffness with light weight, and promises to be an important structural material of the future.

There are two main problems connected with the use of wood in construction. The first of these is shrinking and swelling. We are all familiar with sticking doors, windows and drawers.

Oldest and most proven method of curbing shrinking and swelling in wood is the use of paints and other sealers. Further progress along this line is promised by a

water soluble plastic now being developed.

The second major problem is the protection of wood against fire. Wood in massive form has excellent fire resistance because of its strength and its self-insulating qualities. The trend in wood construction, however, is toward thinner panels, sandwich-construction, and lightweight supporting beams. All of these tend to decrease the over-all resistance of the structure to rapid destruction by fire.

Study Combustion

Chemists are now studying the combustion of wood in laboratories in order to better understand the reactions that take place, and to find more serviceable, fire-retardant treatments. They are also relating the existing action of flame retardants with chemical properties so that improved flame retardants can be made.

About one-sixth of the lumber produced



WOOD ARCHES—A workman fastens a shear plate to a wood arch made by gluing layers of wood together. This Florida sports arena has a 242.5-foot wood span, which would have been impossible in the U. S. 25 years ago. Today we have buildings with clear span timber structures of 250 feet and wood towers spanning to 300 feet.

is now being used in packaging. A major weakness of wood containers, however, is the fastening. Although glue is excellent for bonding wood it is not usually a good adhesive for containers. Plastic fasteners and plastic nails have recently been developed and may increase the durability of wood structures and containers which undergo rough handling.

Pulp: Big Business

The pulp and paper industry alone is now the fifth largest industry in the country and has been one of the most rapidly expanding ones. With a wide variety of pulp grades, strengths, colors and fiber lengths available for blending in many combinations, more new products are constantly being added. By treatment with wax, asphalt, plastic, starch and other materials, better moisture-proof papers are being made, including paper containers for liquids. Paper is being equipped to do more and more jobs which formerly only glass, leather, and cotton could do.

The chemical industry is constantly finding new uses for the spent liquors remaining from the chemical pulp processes. They are used in making adhesives, road binders, tanning agents, plastics, dyes, rosin soap, acetic acid, turpentine, and fertilizers.

Approximately ten percent of the tree substance is the protective sheathing known as bark. With 20,000,000 tons of bark available for processing to some useful commodity instead of using it as a fuel, research on chemical extracts from bark is especially important. Already they are being used for manufacture of glues, plastics, mulch, fertilizers and insulating materials.

As a general pattern, barks consist of lignin fibers, phenolic compounds such as tannins, and other extractives, such as wax. The chemistry of lignin is still much of a mystery, but scientists are experimenting on separating it in a form which can be used in adhesives and plastics or converted to economically stable compounds.

Research With Carbon 14

Trees have been injected with radioactive carbon to study wood growth, food uptake, and to provide tagged materials for experiment in cellulose chemistry. Wood is around 50% pure cellulose in fiber form, thus trees are the most practical source of this material for industrial use. The results of these experiments have indicated strong possibilities for higher future yields of cellulose per tree plus improved cellulose quality for such large consumers as the rayon, tire, cord, and cellophane industries.

Progressive forestry practices, intelligent tree-farming, careful conservation and scientific research have provided the U. S. with more than adequate supplies of timber to meet all present needs. In fact, an oversupply is foreseen if more new uses and new markets are not found. The lumber industry is facing a sharply increasing competition from plastics, reinforced metals, and the ever-growing aluminum industry. In spite of this, it has been estimated that in the year 2000 the total consumption of timber resources will be more than double that of today's.

Science News Letter, July 11, 1959



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