Forest Products Laboratory's Greatest Hits

Since 1910, the USDA Forest Service, Forest Products Laboratory (FPL), has been helping Americans meet their demand for wood in the most efficient, sustainable manner possible. Using the latest in science and technology, FPL's research scientists are looking at ways to promote clean water, better homes, improved recycling processes, and healthier forests. Many breakthrough technologies that influence the way we live today got their start at FPL. Following are just some of the many highlights:

Engineered Wood Products
The Forest Products Laboratory has developed several engineered wood products that provide economic uses for low-grade materials. These products help extend our forest resource by putting previously underutilized materials to use. Finding uses for these materials also helps improve forest health by making necessary thinnings economically feasible.

FPL produced much of the technology for the manufacture and design properties of glued laminated timber (glulam). Glulam is made of layers of wood glued together to form a large beam or arch. Glulam has a high structural value but can be made of low-grade material.

Wooden I-joists—a highly efficient structural component developed by FPL—are made by combining wood with plywood or other panel products. Spurred by military needs of the aircraft industry, wooden I-joist research evolved into mass production in the late 1960s and eventually led to the product becoming a significant structural material for both residential and non-residential construction markets.

FPL also played a role in the development of oriented strandboard (OSB), a composition board that is meant for structural purposes and made with moisture resistant adhesives. The development of OSB and other similar products provided a use for logging residues.

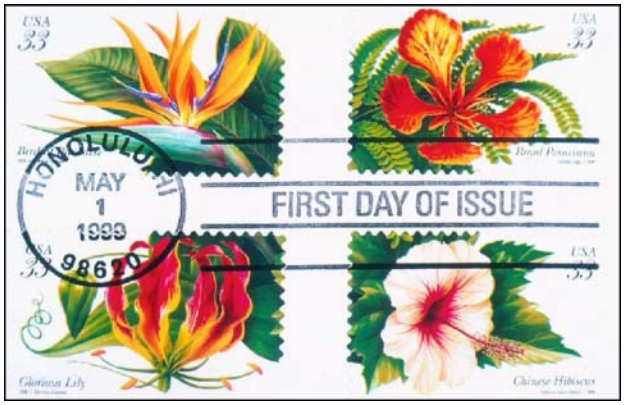
Semichemical pulping
FPL was instrumental in developing the semichemical pulping process as a higher yield offshoot of the kraft process. For decades, semichemical pulping has been the dominant process used for producing corrugating medium in the United States. Corrugating medium, the wavy fluting material in corrugated boxes, is one of 12 major grades of paper and paperboard products. Corrugated boxes are used to ship over 90% of all goods in the U.S. economy.

Packaging
Some of FPL's earliest research developed standardized methods for testing package performance. Research on efficient packaging design saved $50 million during World Wars I and II and greatly reduced packaging volumes and product damage. FPL research allowed the packaging industry to (1) broaden the range of wood species and quality that can be used in packaging; (2) minimize the amount of fiber used, thus extending the timber supply; and (3) optimize fiber use in providing product protection, thereby making fiber the packaging material of choice. The current industry standard for performance testing for shipping containers and systems is based on FPL research.

Recycling
FPL research has led to great progress in recycling materials, from paper to solid wood.

Glulam beams add structural support and architectural beauty to this room.

FPL's pulping innovations have become some of the dominant processes used in the United States today.



FPL researchers helped develop the "lickless" stamp, then refined the recycling process to prevent the pressure sensitive adhesives from gumming up recycling equipment.

Our fiber loading technology for recycling produces more paper from less fiber and reduces the amount of sludge produced during recycling.

Our research on recycling in cooperation with the U.S. Postal Service has resulted in the development of self-adhesive stamps that do not cause problems with recycling operations. As these adhesives are implemented, an additional 20 million tons of mixed wastepaper can be recycled.

FPL research has also made it possible for the U.S. Postal Service to recycle undeliverable or "junk" mail. Researchers overcame technical barriers to recycling this material, and these waste papers are now being used to produce napkins, tissues, envelopes, and printing and writing papers.

FPL researchers created a structural product called Spaceboard that is made with recycled fibers that are not suitable for use in paper production. Spaceboard can be used in furniture, wall, floor, and roof panels, and packaging. It can also be laminated into thick sections and produced as either flat or curved panels.

Research is also working with recycling wood fiber by developing new composite materials that blend wood fiber with plastics. This technology allows the recycling of waste wood and waste paper into value-added products.

Lumber grading and assignment of design values
Ninety years ago, the Forest Products Laboratory developed procedures for the grading of structural lumber. This was the first system that was based on observations from lumber strength tests. The system showed that a 20% increase in design values was justified for major species and identified many other species that were suitable for structural use.

In the 1980s, a changing resource base and demands for more precise establishment of design values resulted in another comprehensive study of lumber properties. This FPL-led "in-grade" program changed the historic basis for property assignments. As a result, design values assigned to 2×4's generally increased significantly, which is of particular importance for the utilization of lumber from small-diameter trees in engineered wood products.

Current grading research at FPL is bringing the use of recycled lumber and timber closer to commercial reality.

Dismantling buildings can be a valuable source of building materials. FPL is working to create a grading system for the recovered lumber.

FPL technology helps sawmills get the most out of each log. This maximizes profits while minimizing the number of trees that need to be cut.

FPL researchers are developing a new grading system to ensure that this lumber and timber will meet performance requirements in many applications. Research on lumber regrading will let wood from old buildings be safely reused, while saving disposal costs and landfill space and extending our forest resource.

Sawing
FPL developed the Best Opening Face (BOF) in the 1970s. BOF, a mathematical sawing model, helps sawmills maximize lumber recovery from small logs. This technology aided in the automation of softwood dimension sawmills and helped prevent an industry collapse when sawmills shifted from old growth to second growth timber. Today, most softwood dimension lumber in the United States and around the world is manufactured using BOF-sawing optimization technology. By conservative estimates, BOF conserves about 1 billion board feet of lumber annually through improved sawmill recovery.

Drying
In the 1950s, FPL developed dry kiln schedules for all our native wood species. These schedules—still the standard used in industry—were published in the 1990 revision of the *Dry Kiln Operators Manual*. The schedules provide the most efficient way of drying lumber by minimizing the loss of wood due to drying defects and also minimizing time, cost, and energy use of drying.

For more: www.fpl.fs.fed.us