

# SOY-BASED ADHESIVES



**Environmental concerns and cost of petrochemicals lead to a resurgence in soy-based wood adhesives.**

## BACKGROUND

Soy-based adhesives have been used to manufacture common wood products, such as plywood, for over 70 years. While soy adhesives are still used in some specific applications, the introduction of urea-formaldehyde and phenol-formaldehyde resins in the late 1930s provided greater water resistance and lower costs than the older soy products. Environmental concerns and rising costs for petrochemical-based resins and requests from users for adhesives made from a renewable feedstock have caused a resurgence of interest in developing new soy-based products for the wood adhesives industry. One of the primary successes of United Soybean Board (USB)-funded research is the use of soy in formaldehyde-free glues for use in interior hardwood plywood.

## TECHNOLOGY

Current soy based technology for use in composite wood panels centers on several different technologies, all developed to produce lower-cost or more environmentally friendly systems.

The first system was developed for softwood plywood, oriented strand board and engineered wood products. Low-cost soy meal/soy flour can be substituted for up to 40 percent of the more expensive phenol component. The soy flour is first converted to a soy hydrolyzate, which is then co-reacted with a phenolic resin. The resulting soy-phenol formaldehyde resin exhibits properties comparable to a phenol-formaldehyde resin.

The second system involves the use of soy flour in foamed glue-extruded systems for laminating plywood veneers. In this system, soy flour is substituted for animal blood, which is used as a foaming agent for phenol-formaldehyde resins. The main benefit for foamed glues over other application systems is the savings in resin usage. Other benefits are reduced glue spread, reduced glue waste and minimal cleanup time. Reduced resin content also results in reduced formaldehyde emissions. The soy flours have been introduced to replace animal blood as a foaming agent because it is cost-competitive, avoids odors and is safer to use and handle.





## SOY-BASED ADHESIVES

The most current technology involves the use of soy meal/soy flour in formaldehyde-free adhesives developed to minimize the amount of formaldehyde emitted from the resin in wood composite boards. In 2004, the International Agency for Cancer Research classified formaldehyde as a known carcinogen, causing many composite wood panel manufacturers to look for alternatives to urea-based formulations where the formaldehyde is released into the environment, particularly in hot and humid conditions.

### ADHESIVE PRODUCTS

In 2005, Columbia Forest Products announced the first use of formaldehyde-free glue systems when it converted from the use of urea-formaldehyde adhesives to a patented soy system cooperatively developed by Columbia, the College of Forestry at Oregon State University and Hercules International. Hercules was granted a worldwide license to use this technology in the wood composite panel market. Columbia was awarded a lifetime license to utilize this patented adhesive system for all of its North American panel business, which included interior hardwood plywood. PureBond® is the trademark Columbia uses for formaldehyde-free plywood panels utilizing this soy adhesive technology. Hercules, purchased by Ashland in 2008, in conjunction with Heartland Resource Technologies, continued in the development of a completely formulated soy adhesive, SOYAD®, for use in wood composites, including particleboard and medium density fiberboard. These soy adhesive systems are easy to prepare in the panel mills and do not require harsh reaction conditions.

### ABOUT USB

USB is made up of 68 U.S. farmer-directors who oversee the investments of the soybean checkoff, a U.S. soybean research and promotion program, on behalf of all U.S. soybean farmers. Checkoff funds are invested in the areas of animal utilization, human utilization, industrial utilization, industry relations, market access and supply. As stipulated in the Soybean Promotion, Research and Consumer Information Act, USDA's Agricultural Marketing Service has oversight responsibilities for USB and the soybean checkoff.



For more information, visit: [soynewuses.org](http://soynewuses.org)



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