

# Soy-Based 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 funded research is the use of soy in formaldehyde free glues for use in interior hardwood plywood, not oriented strand board and softwood plywood.



Current soy based technology for use in composite wood panels centers around several different systems. All of these technologies were developed to produce lower cost or more environmentally friendly systems.

The first system is soy phenol formaldehyde, wherein soy flour is converted to a soy hydrolyzate which is in turn co-reacts with a phenolic resin. Low-cost soymeal/soyflour can be substituted for up to 40 percent of the more expensive phenol component for use in softwood plywood, OSB and engineered wood products. The process provides a method for converting soymeal/soyflour into a soy phenol formaldehyde resin with properties comparable to a phenol formaldehyde resin.

The second resin 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 for use 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 soymeal/soyflour in formaldehyde-free adhesives developed to minimize the amount of formaldehyde emitted from wood composite boards. In 2004, the International Agency for Cancer Research announced that formaldehyde was a known carcinogen, and many composite wood panel manufacturers looked for alternatives to current urea formaldehyde resin systems.

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 Sate University and Hercules International. Hercules was granted a worldwide license to use this Pure Bond technology in the wood-composite-panel market. Columbia was awarded a license to utilize this patented adhesive system on an exclusive basis for all of its North American panel business, which included interior hardwood plywood and particleboard. In addition, Hercules has granted Columbia permission to be the exclusive seller and application specialist for Pure Bond technology in interior decorative panels. These soy adhesives systems are easy to prepare in the panel mills and do not require harsh reaction conditions.

The USB is made up of 68 farmer-directors who oversee the investments of the soybean checkoff 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.

