A natural, renewable feedstock for industry.

Soy-Based Wood Adhesives and the Environment

Background

Soy-based adhesives have been used in the manufacturing of common wood products such as plywood for over 70 years. While soy adhesives are still used in some specific applications, the introduction in the late 1930s of urea-formaldehyde and phenol-formaldehyde resins derived from petroleum or natural gas, provided performance advantages and lower costs than the older soy products. Today these resins and newer petro-based products, such as methylene diisocyanate (MDI), have replaced soy and other natural products as the basic resins in wood adhesives.

Environmental concerns, including the need for adhesives made from a renewable feedstock, have caused a resurgence of interest in developing new soy-based products for the wood adhesives industry. The United Soybean Board has funded both fundamental and applied research with a goal of developing new soy-based adhesives that can be used along with existing products or alone to provide equal or superior performance, good manufacturing economies and environmental advantages. Current research is concentrating on soy-hydrolyzate and soy-flour adhesives.

Reducing Air Emissions

Air emissions of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) contribute to a variety of modern maladies from smog to the "sick building syndrome." Formaldehyde, a major constituent of many of the wood adhesives today, has been especially targeted, since it contains phenol resins.

The use of soy adhesives may not ultimately replace the VOC issue completely, but may allow continued growth in wood product manufacturing to meet growing world demand, while stabilizing or even reducing total emissions of air pollutants. A two-part contact system in which soy hydrolyzate replaces half of the phenol-resorcinol-formaldehyde is being used to make finger-jointed lumber. This halving of the use of the harmful VOC's has the potential to reduce emissions in the atmosphere and the workplace for greater worker safety. An added benefit is the reduction of °energy needed to cure the soy-based adhesive.

Finally, the soy system allows the jointing of green lumber. The lumber can be processed to remove knots and imperfections, the primary source of VOC emissions, before gluing. This aids significantly in reducing the VOC emissions, or "blue smoke," associated with kiln drying of wood.

Easy Disposal and Handling

Soy-hydrolyzate and soy-flour adhesives do not require hazardous waste disposal. In their uncured form, they are aqueous solutions that wash away easily with water. They are nonvolatile and have a relatively high pH, requiring only normal protective gloves and safety glasses for safe handling.

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For more information, call (888) 235-4332 or visit *unitedsoybean.org/newuses*

A Natural, Renewable Resource

America's soybean farmers currently produce 3 billion bushels of soybeans annually. This large, stable supply of a renewable natural resource presents manufacturers with a virtually inexhaustible raw material.

Soybeans are legumes that fix their own nitrogen from the atmosphere and therefore require no petroleum-based nitrogen fertilizers. In rotation with nitrogen-deficit crops like wheat, cotton, rice or corn, soybeans leave residual nitrogen in the soil to further reduce farm dependence on nitrogen fertilizers, which are made primarily from natural gas.

Benefiting Society

Substituting soy as a raw material for the petroleum ingredients used in making adhesive should lower air emissions, while helping to preserve clean water and reduce worker exposure to potentially toxic compounds. Reducing industry dependence on petrochemicals and farm dependence on nitrogen fertilizers helps to conserve energy. Growth in the farm sector creates new jobs and stimulates both rural and urban economies. Soy adhesives are only one small piece of the puzzle, but with a continued commitment to utilizing natural, renewable materials as raw material feedstocks, a better future can be realized.

The United Soybean Board is made up of 64 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 Customer Information Act, USDA's Agricultural Marketing Service has oversight responsibilities for USB and the soybean checkoff.