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# Closing the Circle News

In this edition of *Closing the Circle News*, we are pleased to highlight Federal agency use of biobased products and trust that you will find it timely and informative. Federal agencies now have a great opportunity to purchase biobased products for their offices, buildings, fleets, and other operations. We first reported on Federal use of biobased products in the Fall 2001 edition of *Closing the Circle News*. As you'll see in the articles in this edition of the newsletter, Federal agencies have been expanding their testing and use of biobased products, including biofuels.

For this edition, we asked several agencies to prepare articles about their biobased product activities. We begin with an update on the U.S. Department of Agriculture's designations of biobased products and acquisition tools USDA is developing for its own and other agencies' use. USDA's Cooperative State Research, Education, and Extension Service discusses biobased

products developed, and under development, through government-sponsored research and development projects. We then turn to highlights of agency activities, showcasing a range of uses, including fuels and building construction. We finish with articles by Cargill and DuPont, manufacturers of both intermediate feedstocks and finished biobased products, who we asked to explain some of the intermediate feedstocks and how they compare to competing, non-biobased products.

Biobased products, be they fuels, lubricants, or even building materials, are becoming more prevalent in America, and around the world. In our continued commitment to lead by example, the Federal government is doing what it can to use, promote, and showcase biobased products. Not only will this improve our environmental and economic footprint, but it will also increase general public awareness and, hopefully, availability and affordability of these products for all. ■



Ed Pinero  
Federal Environmental Executive



# Promoting Energy Security and the Farm Economy Through Federal Procurement

In the Farm Security and Rural Investment Act of 2002 (FSRIA), Congress created a program to use Federal purchasing power to create and sustain markets for products made with biobased feedstocks. According to the U.S. Department of Agriculture (USDA), the program has three primary objectives: (1) improve demand for biobased products, which should increase demand for agricultural commodities, (2) spur the development of the industrial base through value-added agricultural processing and manufacturing in rural communities, and (3) enhance U.S. energy security by substituting biobased products for fossil energy-based products. USDA has

the lead in designating biobased products for Federal agencies to purchase and providing recommendations for purchasing the products, including recommended levels of biobased content.

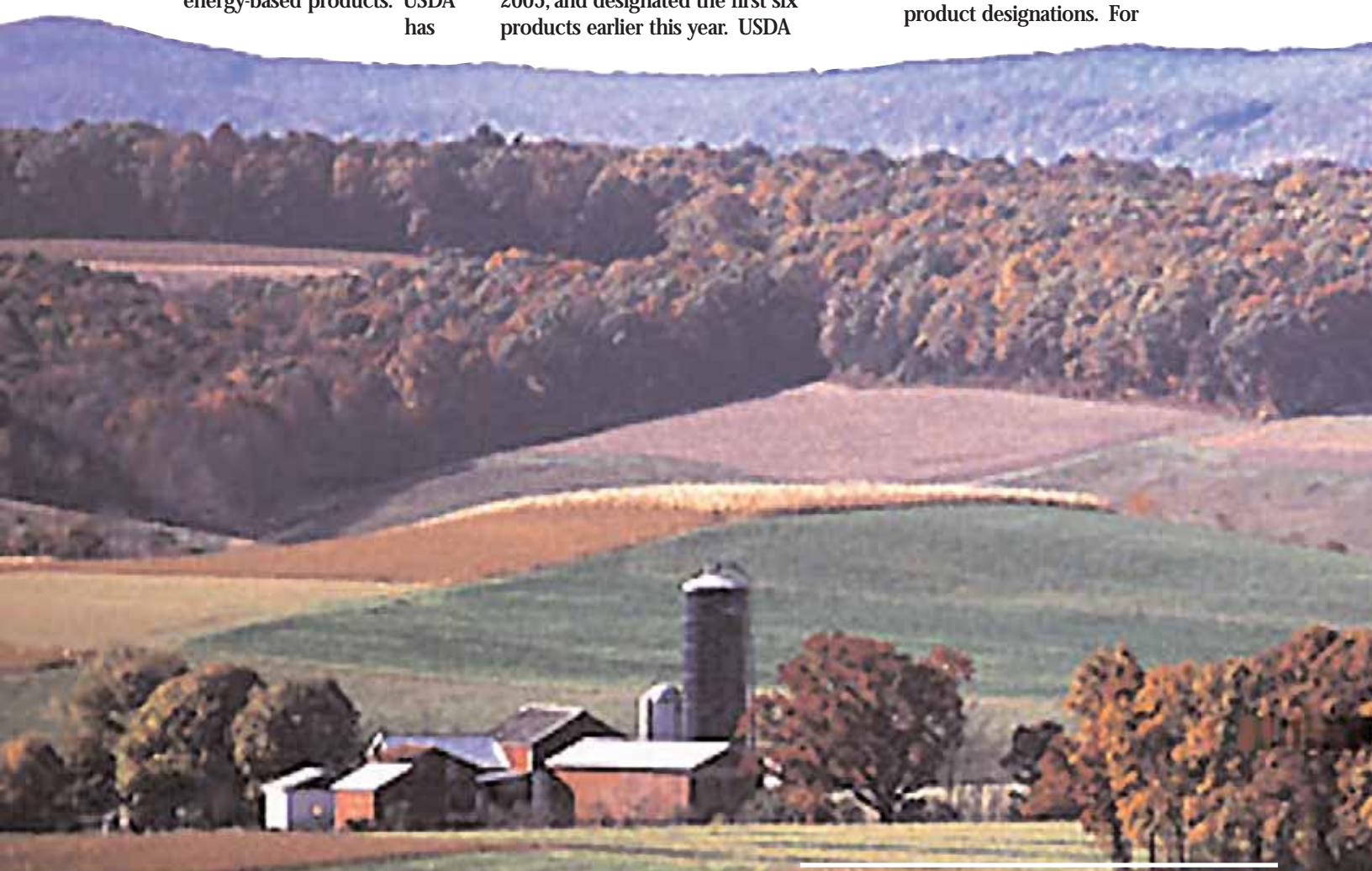
FSRIA defines biobased products as “commercial or industrial products, as determined by the Secretary of Agriculture, other than food or feed, which are entirely or significantly composed of biological products or renewable domestic agricultural materials or forestry materials.”

USDA established the framework for the Federal Biobased Products Preferred Purchasing Program (FB4P) in January, 2005, and designated the first six products earlier this year. USDA

proposed to designate an additional 20 products in August. Ultimately, USDA could designate more than 100 products. (See sidebar next page.)

## How Does This Program Interact with the Other Green Purchasing Components?

It is the intent of the Office of the Federal Environmental Executive and the Office of Federal Procurement Policy that the managers of the component programs designate products in consultation with one another and provide agencies with complimentary product designations. For



example, biobased roof coatings can meet the requirements for Energy Star® roofing materials.

In some instances, a product will fall within multiple components of the Federal green purchasing program. Mobile equipment hydraulic fluid, for example, overlaps with the U.S. Environmental Protection Agency's existing designation of re-refined hydraulic fluid. Although FSRIA provides that the recycled content designation takes precedent over the biobased designation, OFEE recommends that agencies choose the product that best meets their performance and availability needs.

## USDA Web Site and Pilot Project Opportunities

USDA is providing information about biobased products, including background information, sources of the designated products, and information supplied by product manufacturers, on its web site, [www.oce.usda.gov](http://www.oce.usda.gov). The site also has a pilot projects page on which companies can post products for which they are seeking agencies to test on a pilot basis. As of the end of September, 2006, a company was looking for a

lithographic printing facility with sheet fed or web presses for testing blanket and roller wash, and another company was looking to pilot biobased, biodegradable lubricants. These are great opportunities to try products to see if they meet your agency's performance needs.

For more information on the pilot opportunities, go to <http://www.biobased.oce.usda.gov/public/pilotprogram.cfm>. ■

## USDA Designated Biobased Products

Product	Recommended Biobased Content (%)*
Mobile equipment hydraulic fluids**	.44
Diesel fuel additives**	.90
Penetrating lubricants**	.68
Roof coatings	.20
Water tank coatings***	.59
Bedding/bed linens/towels***	.12

### Notes:

- \* Biobased content is based on the amount of qualifying carbon in the product as a percent of the weight of the total organic carbon in the finished product.
- \*\* The requirement does not apply to combat, combat-related, and space-related applications.
- \*\*\* The requirement to purchase these products is deferred until there is more than one source.

# Are You Ready to Purchase Biobased Products?

By Mike Green and Shana Y. Love, USDA

By now, the term “biobased products” should be a “household” word within the Federal government, and all Federal agencies should have in place an affirmative procurement program for purchasing USDA-designated biobased products.

If this is not the case within your agency, or, if you are looking for additional ways to expand your biobased procurement activities, outlined in this article are a few of the “tools” that USDA has developed to assist you in your efforts.

FSRIA and the Biobased Products Guidelines published January 11, 2005 required all agencies to develop an Affirmative Procurement Program (APP) for biobased products by January 2006. Each APP must contain at a minimum a) a biobased product preference program; b) a biobased product procurement promotion program; and c) an annual review and monitoring of program effectiveness.

Once designated by USDA, biobased items shall receive a procurement preference if they a) are reasonably available, b) meet performance standards, and c) reasonably priced.

USDA published its Biobased APP in January 2006 and made it available to all Federal agencies to use as a model procurement program. USDA’s Biobased APP formally establishes the Department’s program and provides department-wide guidance for implementing an effective biobased procurement program.

## Procurement “Tools” Included in USDA’s Biobased APP:

**Contract Templates** – These sample templates provide contracting language for Section C “Statement of Work,” Section L “Instructions to Offerors” and Section M “Evaluation Factors for Award” for various types of services that could include biobased products. There are presently three templates available for:

- Custodial Services
- Maintenance and Repair
- Vehicle Maintenance

Each of the templates can be revised to reflect additional or unique tasks peculiar to your agency’s activities. In FY 2007, USDA will create sample templates for grounds maintenance, facility construction operations, and construction contracts.

**Procurement Guidelines to Determine Cost Availability** – These guidelines are designed to assist program managers and requirement officials in determining the cost and availability of biobased products to include as requirements in a statement of work.

**Online Designated Biobased Product Catalog** – This catalog should be used as a resource for

identifying biobased products that meet the minimum content standards as outlined in the item designations. The products in the catalog have been voluntarily submitted and self-certified by the manufacturers. This list does not represent an exhaustive collection of available products but will be continually populated as items are designated.

**Biobased Awareness Brochure** – The awareness brochure can be used as an introduction to the program.

In addition, USDA has established several internal performance measures and guidelines that could be used as a model within your agency.

**Performance Measure to Increase Biobased Purchases** – To demonstrate USDA’s commitment to the success of the program, the Department has established a goal to increase the number of USDA contracts containing biobased products by at least 50 percent by FY 2012. To accomplish this goal, USDA will establish its baseline in FY 2007, and beginning in FY 2008, USDA will increase the number of its contracts containing biobased products by 10 percent over the 2007 baseline and by another 10 percent each

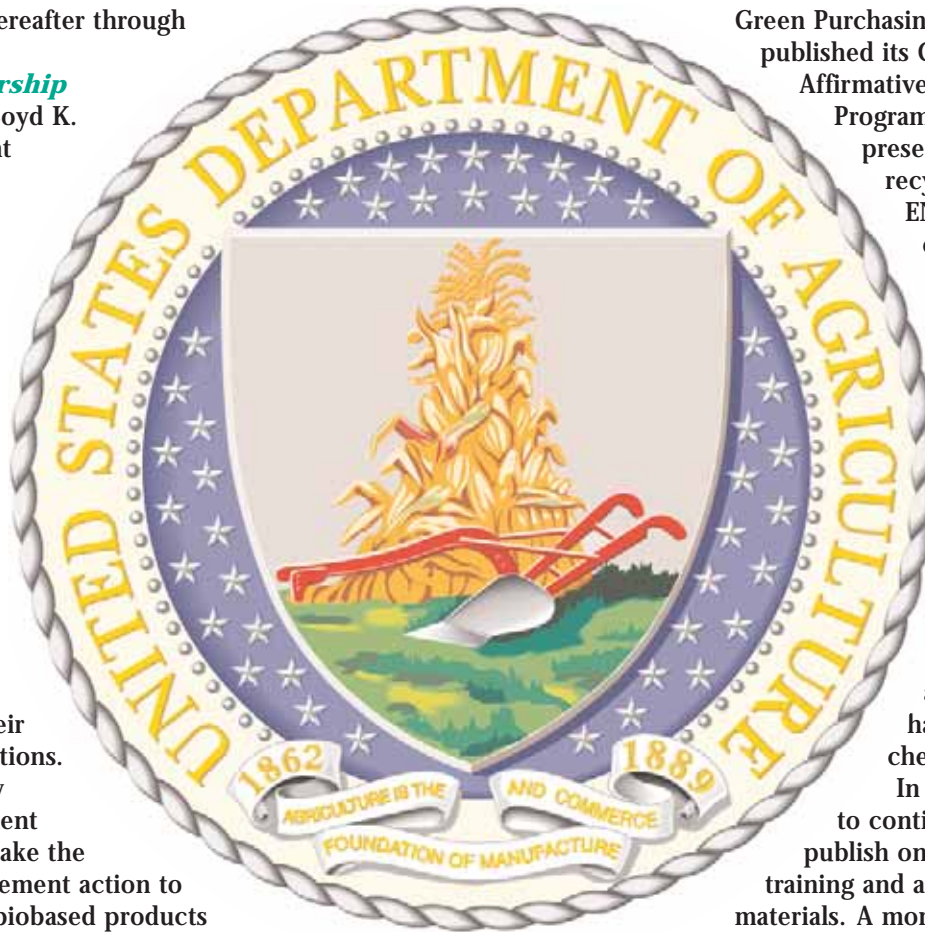
subsequent year thereafter through FY 2012.

**Identify Leadership Responsibility** - Boyd K.

Rutherford, Assistant Secretary for Administration and USDA's Chief Acquisition Officer, assigned specific responsibilities to each of the Department's Deputy Administrators for Management to take a personal and proactive commitment to promote the procurement and use of biobased products within their respective organizations. They are to identify biobased procurement opportunities and take the appropriate procurement action to ensure designated biobased products are acquired in accordance with applicable USDA and Federal policy and to document these opportunities in the Department's annual procurement forecasts.

**Agriculture Acquisition Regulation (AGAR) Advisory** -

USDA issued AGAR Advisory 82, which allows for tracking and reporting of USDA contract



requirements that contain the use of biobased products. The AGAR standardizes the synopsis language in the Federal Business Opportunity (FedBizOps) and improves biobased manufacturers' ability to identify USDA contract requirements.

For those agencies who are interested in establishing a broader

Green Purchasing Program, USDA has published its Green Purchasing Affirmative Procurement Program (GPAPP), which presently includes recycled content, ENERGY STAR®, energy-efficient, biobased, and environmentally preferable products and services. This document will be updated in fiscal year 2007 to include alternative fuel vehicles, renewable energy products, and alternatives to hazardous or toxic chemicals programs.

In FY 2007, USDA plans to continue to develop and publish online awareness training and additional outreach materials. A more detailed description of each of the tools and other helpful information can be found at <http://www.usda.gov/biobased>. Keep a periodic check on our web site for these materials and others.

For further information, please call Shana Y. Love, USDA, Special Assistant to the Assistant Secretary for Administration, at 202-205-4008. ■

# Supporting the Future Carbohydrate Economy with R&D Funding

*The mention of commercial products or companies in this article should not be construed as an actual or implied endorsement by OFEE or USDA.*

**N**onfood, nonfeed uses of agricultural and forestry materials, i.e. biobased products, offer the best opportunities to realize the full economic potential that agriculture and forestry can play, beyond the traditional food, feed, and fiber markets. The current focus is on biofuels, but biobased products can play a major role as well. Two research agencies in USDA keep the research and development pipeline full and are making significant progress in providing products and technologies that are commercially adaptable.

The Cooperative State Research, Education, and Extension Service (CSREES) is USDA's principal link to academia and participates as the Federal partner in a nationwide agricultural research planning and coordination system that includes state land-grant universities and the agricultural industry. CSREES promotes research and development for biobased products primarily through its National Research Initiative, Small Business Innovation Research Program (SBIR), and the Agricultural Materials Program. For more information on these programs, visit

<http://www.csrees.usda.gov/nea/plants/plants.html>.

The Agricultural Research Service (ARS), <http://www.ars.usda.gov/main/main.htm>, as the Department of Agriculture's in-house research agency, has a nationwide network of facilities and research scientists who conduct basic and applied research for the purpose of solving problems associated with regional and national high priority issues affecting producers and consumers of U.S. agricultural products. ARS research on biobased products is conducted primarily at the four ARS Regional Research Centers in Albany, CA; New Orleans, LA; Peoria, IL;

and Wyndmoor, PA.

## Examples of biobased products developed through CSREES and ARS

Through collaboration with CSREES, USDA's Office of Energy Policy and New Uses, and U.S. Army TARDEC, Fort Leonard Wood in Missouri has completed a year-long demonstration of canola-based hydraulic fluids in construction equipment. Five products from DoD's Qualified Products List (QPL) that met Mil-Perf 3273, Biodegradable Hydraulic Fluids, were successfully evaluated for equipment and environmental performance. The mil spec was developed to accept biobased hydraulic fluids and to introduce them into military applications.

The University of Northern Iowa Ag-Based Industrial Lubricants Program developed soybean oil-based industrial lubricants and greases. Commercial success has been the most prominent in the truck and rail markets. Performance advantages of these products include better adhesion to metal surfaces, higher flash and fire points, and lower toxicity than the petroleum-based counterparts.

ARS and Pennsylvania State University researchers developed a biodegradable hydraulic fluid made from soybean oil, which is now being used to power the Statue of Liberty's elevator. The National Park Service wanted a product that was environmentally friendly, produced from a renewable resource, economical and non-polluting, and met all industry standards for safety and performance including viscosity, stability, and flame resistance.

What products are in the R&D pipeline?

## Natural rubber latex products.

There has been an increase in serious allergic reactions to natural rubber latex products made from Hevea, the tropical rubber tree in the Far East. An estimated 6.5 percent of the general U.S. population, up to 40 percent of medical workers, and 60 percent of multiple surgery patients have antibodies against Hevea latex products. The most promising alternative source of natural latex is the semiarid-lands-shrub guayule, *Parthenium argentatum*, whose latex has been shown not to cross-react with antibodies to Hevea latex proteins. University and ARS scientists have successfully commercialized guayule as an alternative natural rubber latex. Yulex, a small business, is now growing and processing commercial acreage in Arizona, and an international latex distributor has a purchase agreement with Yulex.

**Soyoil metalworking fluid.** A soybean oil-based metalworking fluid was developed by scientists at Peoria, IL, and tested in the private sector Cooperative Research and Development Agreement (CRADA) <sup>1</sup> partner's pilot plant. The biobased lubricant outperformed the equivalent mineral oil lubes and is economically competitive. The CRADA partner plans to conduct trials next year in large rolling mill plants in the U.S. and Europe.

**Starch-coated plastic.** Scientists at Peoria, IL, developed a commercially viable procedure to deposit thin layers of starch onto the surface of normally water repellent plastics such as polyethylene. These starch coatings impart water receptive properties to the plastic surface, thereby facilitating the absorption of water-based dyes and inks, reducing electrostatic charging, and improving compatibility with



aqueous agents and biological fluids. This technology has applications in plastic containers, biomedical devices, and wrapping materials for sensitive electronic components. The Peoria scientists have filed two patent applications in cooperation with a private sector CRADA partner that is interested in marketing the technology.

**Biobased binder for charcoal briquettes.** A cheaper, more efficient binder is needed for commercial production of charcoal briquettes. A team of scientists from Albany, CA, collaborated with engineers from an industrial partner to develop a corn-based binder that is much lower in cost than the currently used binder. The corn binder also improved the strength of the briquettes. This research may save the company \$5 million in material costs and could provide a new niche market for corn.

**Pilot processing capabilities developed for new oilseed crops.** ARS scientists at Peoria, IL constructed a pilot plant facility for developing processing methods to extract new oils from crop seeds. In addition, processes were developed for extracting cuphea seed oil (a potential domestic source of saturated fatty acids for cosmetics), lesquerella seed oil (for engine

lubricants), and milkweed seed oil (a potential specialty oil for soaps and cosmetics).

**Chemical intermediates for biodegradable plastics.** The University of Montana has developed a technology for the cost-effective production of starch-based chemical intermediates that can be easily further modified for specific applications, such as biodegradable plastics.

**New crop development.** The SBIR Program awarded the Great Northern Growers Cooperative in Montana to develop the new crop *Camelina sativa* as a source of biodiesel and lubricants, as well as omega-3 oils for human and animal consumption. *Camelina* is attractive for crop rotation with wheat and is a much needed high value, multi-use crop with relatively low input costs.

**Byproduct from biodiesel production.** The National Research Initiative awarded a project with Rice University for the development of a novel fermentation process to convert the by-products of biodiesel production - glycerol and CO<sub>2</sub> - into succinic acid, which is a higher value feedstock used to produce industrially important chemicals having a domestic market of more than \$1.3 billion annually.

**Aviation de-icer.** Value-added industrial products from soybeans enhance the profitability of small-scale processing capacity at the local community level. Purdue University and ARS scientists have developed an aviation deicer based on glycerol. The product is currently in testing by the largest U.S. aviation deicer supplier, who is formulating biodegradable aviation deicer packages for testing and submission of regulatory changes.

**New crop development.** *Lesquerella*, a native U.S. plant, belongs to the mustard family and produces seed containing a hydroxy fatty acid vegetable oil. U.S. hydroxy fatty acid supplies are imported at a cost of \$100 million per year. The overall goal is to develop and commercialize *lesquerella* as an industrial oilseed crop. Commercial acreage will be planted in Fall, 2006, and a company that produces industrial lubricants will use the oil in product formulations. The company considers industrial chemicals as a key area to utilize plant alternatives to petroleum products. *Lesquerella* offers a savings in energy and an increase in yield without unwanted byproducts. ■

<sup>1</sup> *A Cooperative Research and Development Agreement (CRADA) is a written agreement between a private company and a government agency to work together on a project. Created as a result of the Stevenson-Wydler Technology Innovation Act of 1980, as amended by the Federal Technology Transfer Act of 1986, a CRADA allows the Federal government and non-Federal partners to optimize their resources, share technical expertise in a protected environment, share intellectual property emerging from the effort, and speed the commercialization of federally developed technology.*

# Fort Custer National Cemetery Maintenance Crew Tests Biobased Products

*Reprinted with permission from the United Soybean Board*

There is nothing quite so impressive and moving as a veteran's cemetery with its rows of headstones and markers stretching across acres of carefully tended green lawn. The responsibility of caring for these sacred grounds belongs to the National Cemetery Administration of the Department of Veteran Affairs (VA), and their maintenance employees.

Tim Trittschuh is a mechanic at Fort Custer National Cemetery (FCNC), a 770-acre facility with more than 20,000 graves in south-central Michigan. Trittschuh and the maintenance crew use more than 90 pieces of equipment in their work of keeping the cemetery looking top-notch.

In 2006, he participated in one of a series of pilot projects using biobased products sponsored by the United Soybean Board (USB). Trittschuh was eager to try biobased products because of the, "...need to reduce foreign oil use with cleaner, safer, home-grown products that are much less damaging to our environment."

"All of the products we've used have worked as well—or better—than their non-biobased counterparts, and the equipment they are used in (or on) is performing normally," reports Trittschuh. "In fact, some of our 90-some pieces of equipment use more than one

biobased product. Our backhoe operators have noticed that sticks used to maneuver hydraulic equipment feel tighter and smoother operating. They also say that the hydrostatic transmissions are working the same with biobased fluid as they did before and that operators have not reported any negative characteristics. In addition, operators have mentioned that engine performance is smoother with better idling and a small reduction in soot. The two-cycle engines, chainsaw bars and sprockets—all are performing well."

"One backhoe operator told me that the hydraulic filter clog light does not come on as much as it did with the petroleum-based hydraulic oil. He also mentioned that, overall, the hydraulic system seems to be getting 'smoother'. But you can't expect overnight results, it took a few operating hours for these benefits to take effect," Trittschuh explains.

"We're delighted to participate in this program," says Environmental Program Specialist, VA Office of Acquisition and Material Management Barbara Matos who says they hope to introduce biobased products to other VA facilities once the pilot is done. "It's good for the nation, the environment, for the economy, and, of course, biobased products are now part of a Federal preferential purchasing program."

For more information on the use of biobased products at FCNC, contact Tim Trittschuh at [tim.trittschuh@va.gov](mailto:tim.trittschuh@va.gov), Valerie Barlow at [valerie.barlow@va.gov](mailto:valerie.barlow@va.gov) or Barbara Matos at [barbara.matos@va.gov](mailto:barbara.matos@va.gov).

This profile is provided for information only. The United Soybean Board and the Department of Veterans Affairs do not endorse, promote or make any representations regarding any specific suppliers mentioned herein. ■

## Biobased Products used at Fort Custer National Cemetery

From Renewable Lubricants, [www.renewablelube.com](http://www.renewablelube.com)

Bio-Bar & Chain Oil™

Bio-TC-W3 Two-Cycle Engine Oil™

Bio-Trans-Hydraulic (Universal Tractor) Fluid™

Bio-Hydrostatic Fluid™

Bio-Power Winter Diesel Fuel Conditioner™



# VA Medical Center Tests Biobased Cleaning Products



In May 2004, the Edith Nourse Rogers Memorial Veterans Hospital located in Bedford, MA (Bedford VAMC), began to explore biobased alternatives specific to cleaning chemicals in use at the hospital. The purpose of this exploration was to find substitutes that were better for worker health and the environment.

The Bedford VAMC Environmental Management Service (EMS) had expressed concerns with using toxic cleaning chemicals and had already taken steps to minimize such usage. They had begun purchasing some “green” cleaning products, but were most concerned about the chemicals

used for stripping and refinishing the vinyl composition floor tile. Nursing service employees complained about odors and headaches during the process of removing old floor finish and applying new floor finish.

David Maine, Environmental Care Specialist, who works in the hospital’s Facility Management Service, also had concerns about the toxicity of toilet bowl cleaners. Mr. Maine led his facility in an effort to identify the potential benefits of replacing conventional products with biobased substitutes. Initial review outcomes showed that the biobased products performed well in a controlled setting

and were as effective as the products the hospital was using.

Given the positive results, the Bedford VAMC is looking at taking the assessment of biobased cleaners to the next level—performance testing in the hospital. Efforts are underway to initiate a study to evaluate the effectiveness of biobased floor stripper and general purpose cleaner as substitutes for the products currently in use at the facility. Bedford VAMC Associate Director, George Poulin, who has been highly supportive of this effort, indicated that he and the EMS staff are excited by the prospects of an on-site study. ■

# Confused by the Terms Biodegradable & Biobased?

By Steve Mojo, Executive Director of the Biodegradable Products Institute

Many are confused by the terms “biodegradable” and “biobased.” While both incorporate the phrase “bio,” **they do not mean the same thing and cannot be used interchangeably.**

The fact is that not all materials that come from renewable or biobased feedstocks are biodegradable. Manufacturers and others need to use the appropriate ASTM tests to pinpoint the percentage of a product that comes from biobased resources. In addition, they need to use other ASTM tests and specifications to determine if the products are biodegradable or compostable.

Just because a product is labeled “biobased” or contains “renewable resources” does not mean that it is based entirely on renewable resources. Rather, many of these products combine both petroleum-based materials with naturally based ones, in order to provide the properties that consumers desire, while at the same time reducing the overall amount of synthetic polymers contained in the product.

## How Can You Verify the Biobased Content in a Product?

*ASTM D6866 “Standard Test Methods for Determining the Biobased Content of Natural Range Materials Using Radiocarbon and Isotope Ratio Mass Spectrometry Analysis”* is the **only** test method which accurately determines the percentage of the product that comes from renewable resources. The U.S. Department of Agriculture is defining the percentage of a product needed in order to use the term “biobased” and earn preferred purchasing status by the federal government. Consumers and users should ask suppliers to provide the necessary information in order to be

able to understand the amount of materials that come from renewably based feedstocks.

## Does Biobased equal Biodegradable? NO!

A product that contains 100 percent annually renewable raw materials MAY or MAY NOT be biodegradable/compostable. It all depends on the molecular structure of the material itself. You need to ask the supplier if he has tested the products for biodegradability and compostability according to ASTM D6400 or ASTM D6868. Better yet, if the product carries the BPI Compostable Logo, then you know that it meets the ASTM Specifications for compostability based on independent testing and verification of the results.

It is important to understand that the BPI’s symbol does determine if a product is biobased or contains carbon from renewable sources. This logo just insures that the products meet ASTM D6400 or ASTM D6868 and will biodegrade swiftly and safely in a professionally managed composting program.

## Why do some of the biobased product groupings proposed by USDA need to meet the requirements for compostability?

The USDA Federal Biobased Product Preferred Purchasing Program guidelines call for some items to meet ASTM D6400, as well as contain large percentages of carbon from renewable sources. In the group of items USDA recently

proposed for designation, these products are “biodegradable containers,” “biodegradable films,” and “biodegradable cutlery.” These items are designed to be used primarily in settings in which large amounts of food scraps are generated.

Studies show that more than 50 percent of the wastes generated by cafeterias, fast food chains, large restaurants and grocery stores are food scraps and potentially compostable. This equates to approximately 13 million tons of food scraps that the U.S. is landfilling or burning every year. Once in a landfill, food scraps (along with other organic materials) generate significant amounts of methane (a potent global warming gas, when released into the atmosphere). Also, once food scraps are landfilled, their carbon can no longer recycle back to nature. If these food scraps were composted, overall greenhouse gases would be reduced and their carbon would be returned to the soils (as humus) and be recycled into new plants. By using compostable food service items, separation of plastics is eliminated, and it will be easier to economically divert and compost this waste stream.

To learn more about the issues surrounding “biobased” and “biodegradable”, read the BPI document at this link: <http://www.bpiworld.org/Files/Article/Art70PeSJ.pdf>. You can find a growing list of BPI approved compostable products at <http://www.bpiworld.org/BPI-Public/Approved.html>. ■



# Biobased Fuels Primer

**B**iobased feedstocks are used in fuels as well as in other products. The Federal government, led by the Defense Energy Support Center (DESC), has been a leader in testing, developing standards and contract provisions, purchasing, and using biobased fuels. The 1992 Energy Policy Act (EPA) required that, as of 1999, agencies that operate fleets of administrative vehicles in certain metropolitan statistical areas (based on population) would be required to purchase a significant number of alternative fuel vehicles (AFVs), in order to promote the use and development of non-petroleum based fuels and decrease Federal fleet usage of petroleum. Specifically, as of 1999 and each year subsequent, 75 percent of all new acquisitions of light-duty type vehicles (trucks and cars) for the applicable Federal fleets must be AFVs.

Agencies use a variety of AFV technologies, including vehicles that operate on compressed natural gas (CNG), liquefied natural gas (LNG), fuel ethanol, and biodiesel-diesel fuel blends. The latter technologies are currently the most prevalent taken advantage of by Federal agencies.

## Biodiesel

Biodiesel is a fuel, or fuel blend stock, that can be derived from any vegetable oil or animal fat source; specifically, it is made by the reaction of oils or fats with alcohol, producing fatty acid methyl-ester or ethyl-ester (the chemical names for biodiesel) and a compound called glycerin (a valuable substance used to make food and toiletry products among others). In most fuel applications, biodiesel is blended with conventional diesel fuel at percentages of up to 20 percent; these blends can have significant reductions in carbon dioxide (CO<sub>2</sub>)

and particulate exhaust emissions over conventional fuels. Most significantly, biodiesel blends can be used in standard diesel engine vehicles without modification, a stark difference from other alternative fuels that must be used in corresponding AFVs. Because of this operational advantage, the Department of Energy (DOE) grants EPA credits for the usage of the fuel itself; for every 450 gallons of pure biodiesel used by a Federal activity in compliance with the fleet requirements, one credit is earned equivalent to the purchase of one light-duty type AFV.

The standard blend of biodiesel used commercially throughout the U.S. and other countries is 20 percent, called B20; for this specific fuel, DOE will grant one EPA credit for every 2,250 gallons used by activities complying with EPA. The majority of biodiesel produced domestically is made from soybeans, which have a relatively high oil content compared to other oil-containing vegetables, making it a highly suitable feedstock. Biodiesel is also produced in the U.S. from recovered used cooking oils obtained from restaurants and food processing plants. (In Europe, the primary feed stock for biodiesel is rapeseed, also known as canola.) The accepted industry production specification for pure biodiesel (also known as B100) used for fuel blending in the U.S. is *ASTM D6751: Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels*. At present, there are no comparable industry standards for any of the blended fuels; users of these fuels rely on specifications developed either by state or local governments, or the users themselves based on technical information provided by industry specialists. DESC currently procures

the fuel to the Army's Commercial Item Description (CID) for B20, which provides parameters similar to those of conventional diesel fuel, with additional tests to help ensure cold weather performance.

## Fuel Ethanol

Ethanol is normally produced worldwide from grains, agricultural wastes, or any material containing starch or sugar. In the U.S., ethanol is produced mainly from corn grown in the Midwest. Ethanol produced industrially is always denatured, meaning that it is combined with a small amount of poison chemical to render it unfit for drinking. Ethanol has been used as an additive for several decades; since the ban on lead compounds in gasolines as octane boosters, it has been used as a comparable substitute to decrease engine knocking. It can also be a blend component in gasoline up to a 10 percent volume. When ethanol is combined with gasoline above the 10 percent level, the resulting blend is no longer a conventional fuel that can be run in standard gasoline engines; the blends must be used in vehicles that can run on a specific ethanol-gasoline blend (Dedicated Fuel Vehicle) or vehicles that can run on any ethanol-gasoline blend of up to 85 percent ethanol (Flexible Fuel Vehicle). Blends of 85 percent ethanol and 15 percent gasoline are commercially known as E85 or fuel ethanol. EPA credits are earned directly through the acquisition of AFVs which can burn ethanol blends; as of 2005, EPA 2005 requires that E85 be used in the vehicles 100 percent of the time in order to be eligible for the credits.

## DESC Activities

Defense Energy Support Center is

responsible for fuel supply services, including alternative fuels, to the Military services and select Federal civilian agencies. DESC establishes supply contracts for all activities that request support for obtaining B20 biodiesel and E85 fuel ethanol, when the products are available. Since 2002, the U.S. Military has avidly used B20 and E85 to meet its Federal fleet EPA requirements, finding them to be convenient and affordable methods to comply with the alternative fuel

mandates. Over 25 million gallons of the fuels have been supplied to the military and federal activities to date at over 150 sites throughout the country.

DESC is also actively working with the American Society of Testing and Materials (ASTM) Committee on Petroleum and Lubricants to develop a commercial industry ASTM specification for B20 biodiesel. This specification will allow for more consistent production quality of B20 throughout the country, and will also

provide automotive engine manufacturers more incentive to honor warranties on equipment that use B20. Increased availability of this product will allow Military and Federal activities far greater latitude to meet the mandates for alternative fuel use and petroleum reduction.

For further information on the use and procurement of biodiesel by the U.S. Government, contact Lindsey H. Hicks, Defense Energy Support Center at [Lindsey.Hicks@dla.mil](mailto:Lindsey.Hicks@dla.mil). ■

The screenshot shows a web browser window with the URL <http://www.desc.dla.mil/DCM/DCMPage.asp?pageid=591>. The page header features the Defense Energy Support Center logo and the text "Total Energy Solutions". A search bar is located in the top right corner.

The main content area is titled "Alternative Fuel Information Station Architecture" and displays five tutorial cards:

- EPAct Compliance Tutorial**: Non-Audio Version (1.2 MB), Audio Version (1.5 MB)
- E85 Tutorial**: Non-Audio Version (1.5 MB), Audio Version (5.8 MB)
- BioDiesel Tutorial**: Non-Audio Version (1.5 MB), Audio Version (2.1 MB)
- Synthetic Fuels Tutorial**: Non-Audio Version (1.2 MB), Audio Version (2.7 MB)
- Alternative Fuel Logistics Tutorial**: Non-Audio Version (1.1 MB), Audio Version (1.5 MB)

An important note states: "(Important Note: Due to the large size of the Audio files below, it may take several minutes for them to open on your system. Please be patient.)"

The page also includes a "Site Index" on the left side with links to various sections like "Home Page", "Introduction to DESC", and "Doing Business with DESC". At the bottom, there are several navigation links such as "How Alternative Fuels help in EPA's Production", "E85 Definition", "Biodiesel Definition", "Hydrogen Definition", and "DESC Processes".

# Biobased Products Benefit the Marine Environment

The Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), Great Lakes Environmental Research Laboratory (GLERL) conducts ecosystem research throughout the Great Lakes region. GLERL research vessels also provide platforms for other NOAA entities and Federal agencies with interests in the Great Lakes.

GLERL's Ship Operations Group, based in Muskegon, MI, created a "Green Ship Initiative" in 1999 to explore innovative ways to reduce the environmental impact of its ships and boats on the nation's greatest fresh water resource. During the past two years, this initiative has transitioned from a series of pilot projects to full implementation. The current emphasis is on outreach and technology transfer as interest grows for environmentally friendly shipboard practices.

An element of the "Green Ship Initiative" is to explore shipboard systems and materials that have the greatest potential to reduce environmental impact, yet may not have extensive field trials. One example is the exclusive use of B100 biodiesel, as opposed to the B20 that is now widely used, particularly in Federal fleet vehicles. Total emissions from B100 are four times lower than B20, and the fuel is significantly less toxic than petroleum diesel, making B100 a better choice for marine applications. Most importantly, B100 eliminates the high sulfur emissions of marine #2 diesel fuel. GLERL's six-year successful experience with B100 has answered many questions about long-term effects on engine performance, life cycle costs, material compatibility, and cold weather operation.

In order to convert to biodiesel, operators of older vessels might need to replace non-compatible materials

such as natural rubber, certain elastomers, or yellow metals. Due to the detergent effect of most biobased oils, GLERL anticipates an increase in the removal of contaminants and dirt with the installation of larger or secondary filters until the initial peak in particulates removal.

During fiscal year 2006, GLERL vessels consumed more than 16,000 gallons of B100 in a diverse list of diesel engine types onboard three vessels. GLERL has assisted other NOAA operating groups and universities with the conversion to B100 fuel onboard six additional research vessels, accounting for another 8,000 gallons this year. Increasingly, institutions with an environmental mission are converting to this cleaner, renewable fuel.

Biobased products are now used exclusively for all GLERL shipboard systems, including fuel, hydraulic, transmission, and engine crankcase systems, and for maintenance products. Canola based motor oil is performing well in the diesel engines and is being analyzed to determine ultimate service life. This canola motor oil/B100 soy biodiesel combination is unique and could yield further emission reductions. Preference has been given to products with the highest biobased content for shaft seal oils and deck hydraulics, where there is a risk of overboard discharge. These products have been tested under the rigors of the marine environment in both warm and cold climates and have been found to be equivalent to petroleum product performance.

There have been a number of operational benefits to the Green Ship Initiative. Technology reviews, pre-trial risk analysis, and product evaluations have improved staff expertise and refocused attention on all mechanical

systems. Calculation of life cycle costs has highlighted the complexity of systems and offered some creative solutions. For example, GLERL addressed the high cost of fueling small boats at remote sites by using 275-gallon tote containers as temporary storage and shuttles to dockside. This provides the economy of tanker truck shipments with fueling flexibility not available through commercial marinas, and the cost of the totes was recouped within two years based on the savings from delivery costs. The less hazardous nature of B100, as compared to #2 diesel, allows greater logistic options. The strong detergency of B100, often viewed as a negative, is being effectively used to overhaul old fuel systems without manual disassembly and cleaning.

One concern raised about biobased oils is shelf stability. Through the use of inventory controls, GLERL keeps minimal amounts of material on hand, which avoids shelf stability problems. GLERL has not encountered any operational problems with age or stability.

Another concern is the impact of cold temperatures on the oils. The B100 fuel is somewhat insulated by the water, so its temperature rarely drops below 50 degrees even when the surface is ice covered. Under extreme conditions, or if a smaller boat is removed from the water, a B20 mix is used instead of B100.

GLERL has participated in a number of public outreach events, including the Michigan Energy Fair, focused on the importance of renewable and environmentally friendly energy sources. The presence of a federal research ship at these events has been a significant public attraction and provides a real world demonstration of

a petroleum free alternative. GLERL involvement with biobased industry groups, such as the Michigan Soybean Promotion Committee, has helped promote biodiesel and other biobased oils in marine recreational and

commercial markets.

To better communicate lessons learned and share technical resources, GLERL established a Green Ship working group with participants from NOAA and university and commercial

vessel operators. Initially focused on science research ships, this network is growing in its scope and diversity. For more information, please contact Dennis Donahue at [dennis.donahue@noaa.gov](mailto:dennis.donahue@noaa.gov). ■



# PPPL Receives Pollution Prevention Honors for Biobased Efforts

*The mention of commercial products or companies in this article should not be construed as an actual or implied endorsement by OFEE or DOE.*

The Department of Energy's Princeton Plasma Physics Laboratory's Maintenance and Operations, and Materiel and Environmental Services staffs have been leaders within DOE in the use of biobased products, including hydraulic systems fluids and cleaning products. PPPL uses biobased hydraulic fluid in two renovated freight elevators and new security gates, and Restore products to clean all restrooms and floors.

## Hydraulic Elevators

"When the L-wing elevator was being replaced, we had to clean up contaminated dirt at the bottom of the elevator because petroleum-based fluid was used to operate it. The removal process was labor intensive and costly. The new elevator at L-wing and at the RF building now use vegetable-based hydraulic fluid, which won't contaminate dirt at the base if there is a leak," said PPPL Pollution Prevention Coordinator Tom McGeachen. PPPL learned of this product from Brookhaven National Lab, which utilizes the product in their car and truck lifts. The biobased fluid is canola-based.

While biobased fluid is slightly more expensive, there is significant savings in environmental and potential clean-up costs. The product utilized in the

elevators is HydroSafe 32 hydraulic fluid, and the total amount of fluid in both systems is 400 gallons. Full technical specification and detailed information can be viewed at: <http://www.hydrosafe.com/vg32.html>.

## Security Gates

The new security gates utilize Mobil EAL 224H hydraulic fluid for the systems that open and close the gates. Mobil EAL 224H is a premium performance, environmentally aware hydraulic fluid designed to provide outstanding performance in hydraulic and circulation systems operating at moderate conditions. It is formulated from select, high-quality, high-VI vegetable oils and a specifically engineered additive system to meet or exceed the performance requirements of most hydraulic pump and system builders while satisfying the stringent criteria for biodegradability and toxicity. This results in easier clean-up and lower remediation costs.

The security gates are stationary, but this fluid has the potential to be utilized in mobile equipment such as backhoes, garbage trucks, man lifts, lawn mowers with large decks; any mobile equipment with hydraulic cylinders. All potential applications are the following:

- Hydraulic systems where spills or

leakage could result in damage to the environment

- In systems where readily biodegradable and virtually non-toxic fluids may be required
- Gear systems requiring either an ISO VG 32 or 46 oil with mild extreme-pressure characteristics
- Systems containing servo-valves
- Hydraulic systems operating with oil temperatures in the range of 0 F to 180 F
- Marine and mobile equipment operating in environmentally sensitive areas
- Circulation systems operating under mild to moderate service conditions
- Industrial hydraulic systems where leaked or spilled fluids could get into plant effluent
- Air line oilers and some limited oil-mist generating systems
- Air-over-hydraulic fluid systems operating in environmentally sensitive areas

Full technical specification and contact information can be viewed at: [http://www.mobil.com/USA-English/Lubes/PDS/GLXXENINDMOMobil\\_EAL\\_224\\_H.asp#FeaturesAdvantageBenefitsTitle](http://www.mobil.com/USA-English/Lubes/PDS/GLXXENINDMOMobil_EAL_224_H.asp#FeaturesAdvantageBenefitsTitle).





## Restroom Cleaning Products

All PPPL restrooms and floors are cleaned with Restore products. These products do not contain any OSHA listed hazardous ingredients and have replaced the petroleum-based ingredients used in other products with renewable plant-

derived sources. Margaret Kevin-King, PPPL Buildings & Grounds Supervisor, has been using the Restore products for three years for all plumbing fixtures, floors, and tile walls in the restrooms and is very pleased with the results. She noted that one of the major advantages from the utilization of these products is

the safety of her cleaning crews. Full details & information can be viewed at: [http://www.restoreproducts.com/general\\_cleaning.html](http://www.restoreproducts.com/general_cleaning.html). For additional information, contact Tom McGeachen at [tmcgeachen@pppl.gov](mailto:tmcgeachen@pppl.gov) or 609-243-2948 and Margaret King at [mking@pppl.gov](mailto:mking@pppl.gov) or 609-243-3375. ■



# Fort Leonard Wood Excels in Using Biobased Fuels

*By Keith Bax, Motor Transport Officer, Directorate of Logistics*

The Fort Leonard Wood Directorate of Logistics-Transportation Division is making large strides to support the use of alternative fuels in the Department of Defense. The installation was the first Army installation to utilize both biodiesel and ethanol fuels. Of the 1,129 total fleet vehicles fueled at the Transportation Motor Pool (TMP), 800 vehicles – or 70 percent of the fleet — use alternative fuel. The TMP uses the alternative fuels in all of the diesel fuel vehicles and Flexible Fuel Vehicles leased from the U.S. General Services Administration (GSA). Since opening biodiesel (B20) and ethanol (E85) fueling stations in March 2003, Fort Leonard Wood has issued more than

600,000 gallons of B20 and 225,000 gallons of E85.

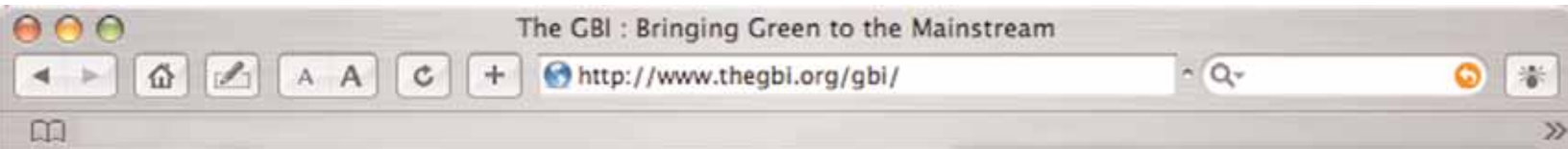
In 2003, Fort Leonard Wood began testing the use of biodiesel in the pool of 312 school-house tactical vehicles. The test plan monitored and evaluated the operational feasibility of utilizing B20 in the light High-Mobility Multipurpose Wheeled Vehicle (HMMWV). The Maintenance Division mechanics closely monitored 70 HMMWVs documenting a variety of operational, environmental, and mechanical performance indicators. It should be noted that, even during extreme cold temperatures, the test HMMWVs started and operated equal to and sometimes better than HMMWVs operating on regular diesel

fuel. Due to sporadic B20 deliveries, the vehicles were switched back and forth between regular diesel and B20. Vehicle operation and maintenance requirements were not affected by this action. Switching back and forth between the two fuel types was transparent. The installation now uses B20 in 470 diesel burning tactical vehicles that are used in the Military Police and Chemical Schools Consolidated Equipment Pool. These vehicles range in size from a light HMMWV to 5-ton trucks. In more than three years of use, there have not been any B20 related maintenance issues.

For further information, contact Keith Bax at 573-596-0814. ■



# Incorporating Biobased Products into Construction Specifications



The Federal government owns nearly 500,000 buildings, accounting for 0.4 percent of the nation's energy usage and emitting about 2 percent of all U.S. building-related greenhouse gases. By incorporating energy efficient and environmentally preferable products in our building construction and renovation, we have the opportunity to reduce the impacts from our buildings and help to create and sustain markets for products with energy efficient and environmentally positive attributes. The Federal biobased products purchasing program includes construction products or products that can be used in building equipment maintenance, so it is important to have tools to help agencies incorporate biobased products into their construction and renovation projects.

## Federal Green Construction Guide for Specifiers

To address the need for a comprehensive guide for procuring green building products and construction services within the Federal government, EPA partnered with the Federal Environmental Executive and the Whole Building Design Guide (WBDG) to provide model green

construction specification language to be used to supplement full project specifications and to "green" guide specifications. Organized according to the Construction Specifications Institute's MasterFormat™, the 60+ section Federal Green Construction Guide for Specifiers provides users with multiple, performance-based options, allowing for flexibility in application. The "Alternative Agricultural Products" section provides specification language for biobased construction products, [http://www.wbdg.org/design/greenspec\\_msl.php?s=06700](http://www.wbdg.org/design/greenspec_msl.php?s=06700). Forthcoming updates will demonstrate additional opportunities to use biobased products in building projects.

## LEED

The U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED®) rating systems for new construction and building renovation provide criteria for implementing sustainable design principles in building design, construction, operation, and maintenance. Points are assigned to each criterion, and building projects can be certified as "Certified," "Silver," "Gold," or "Platinum," depending on the number of points for which the project qualifies. LEED for New Construction and Major

Renovations (LEED-NC) includes a "Materials & Resources" criterion, with one point allocated for the use of rapidly renewable materials, which USGBC defines as plants harvested within a ten-year cycle. Thus, the use of biobased construction products can help agencies obtain LEED certification for their building construction projects. For more information about LEED, visit the USGBC web site, [www.usgbc.org](http://www.usgbc.org).

## Green Globes

Green Globes™ US is a rating system and building design tool provided by The Green Building Initiative. Sustainable design and construction information for a project is submitted into an on-line tool for third-party verification. Similar to LEED, Green Globes offers a tiered approach to building rating – one to four globes. The system is undergoing significant revision via an ANSI consensus process. Currently, Green Globes provides credit (within the 1000 point scale) based upon the "proportion of materials that are bio-based products (such as green chemicals, insulation, renewable plastics, natural fibers and natural structural materials)." For more information about Green Globes, visit The Green Building Initiative's web site, [www.thegbi.org](http://www.thegbi.org). ■

# Fort Hood Incorporates Biobased Construction Products into Sustainable Design

*The discussion of commercial products or companies in this article should not be construed as an actual or implied endorsement by OFEE, the U.S. Army, or the Department of Defense.*

Fort Hood encompasses more than 200,000 acres and has a daytime population of more than 70,000 people. Currently, there are more than 19.8 million square feet of buildings located on the installation; however, that number is expected to increase by over 935,000 square feet by fiscal year 2008. Given its size and growth potential within the installation boundaries, the installation must be accountable for the environment in order to ensure the sustainability and longevity of the land. Fort Hood is continuously thinking of new, more environmentally-friendly ways to do business. One such project is the use of a biobased construction material, Agriboard.

Agriboard is a structural insulated panel, or SIP, used for commercial or residential buildings. Each panel is made by compressing wheat fiber between two panels of oriented strand board, or OSB. The wheat straw, or hay, used by Agriboard is an extremely abundant, rapidly renewable resource and is harvested locally, then sent to the central manufacturing plant near Fort Worth, TX. There, the straw is compressed and sealed to pre-cut forms for each individual project. A construction benefit to using Agriboard is the low labor cost associated with its erection. The SIPs come from the factory in single pieces and are moved into position with a small crane or bulldozer. Walls are connected together

like a large jigsaw puzzle. The panels act as a wall core and insulation. Brick, rock facing, or siding may be applied to the exterior and sheetrock or paint is applied to the interior wall.

Construction times, as compared to normal frame housing, can be reduced by as much as 75 percent per project. The resistance factor (r-Factor) can reach as much as R-20, almost twice as much as standard housing. Further, each building constructed from Agriboard uses less electricity and produces fewer emissions than a normal building of comparable size. The high R-Factor of Agriboard traps warm or cool air inside, and due to the solid core nature of the walls, allows very little to escape. The HVAC system in an Agriboard building works less and can often be significantly smaller than a normal building's HVAC system. Neither of the Agriboard buildings on Fort Hood have HVAC units, and their temperatures stay at a comfortable level for workers year-round. Fort Hood uses Agriboard panels not only for its environmental benefits, but also for its 2-hour fire rating, mold and termite resistance, and its wind and blast resistance.

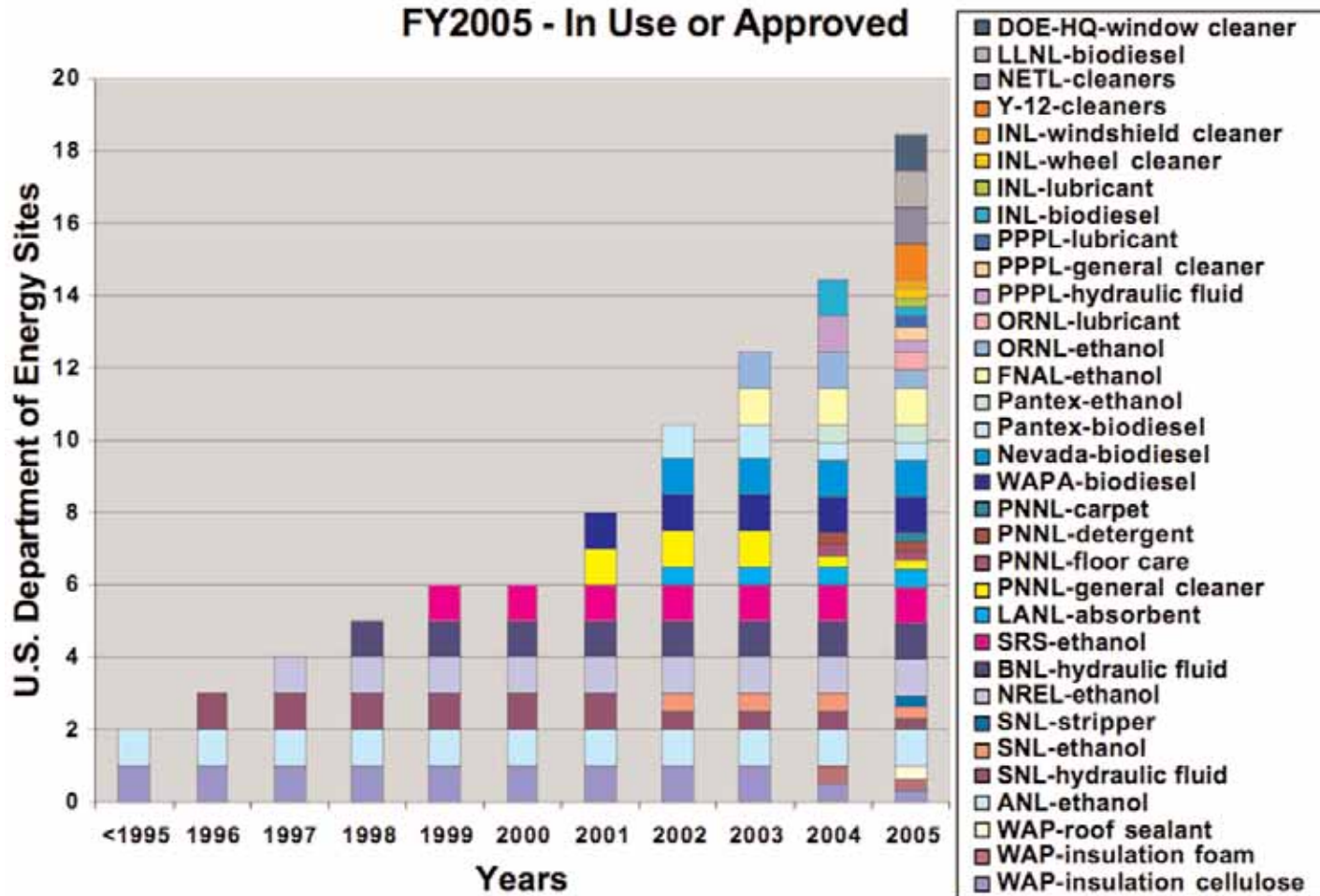
Currently, there are fewer than 50 Agriboard buildings in the state of Texas. Fort Hood is the only military installation in the state to have

utilized Agriboard technology. Currently, Fort Hood has two Agriboard buildings, and plans are almost complete for a 100,000 square foot warehouse facility.

Agriboard is regarded as one of the most sustainable building materials in existence. Contractors who work on the installation are, more often than not, local groups who also plan and construct buildings in surrounding cities and counties. The sustainable designs and technologies that these contractors learn about on Fort Hood are beginning to be disseminated into the general public, and plans could be underway soon to see Agriboard buildings, and other similar sustainable designs, constructed in several nearby cities. In addition, because Agriboard is manufactured locally, Fort Hood's use increases the local economy each time a sustainable building is built with Agriboard. This affords Fort Hood with an increased civilian support while impressing other environmental groups and agencies with environmentally friendly design practices. For further information, contact Randy Doyle at 254-287-1099. ■

# The Pacific Northwest National Laboratory Buys Bio

**U.S. Department of Energy Use of Biobased Products  
FY2005 - In Use or Approved**



*The chart shows the biobased products PNNL, along with other DOE sites, has evaluated, tested, and adopted (the three basic steps PNNL follows when considering new products) through FY2005.*

The Pacific Northwest National Laboratory (PNNL) began its quest for biobased products long before any were designated for purchase by the U.S. Department of Agriculture. Not only would biobased products help toward the U.S. Department of Energy (DOE) goal of energy security by reducing the use of petroleum but most often biobased products offer a healthier, more environmental alternative.

PNNL's initially included information on biobased products in the training for purchasing card holders. With DOE's determination to vigorously promote the purchase of biobased products at DOE sites, in FY 2004, PNNL explored all products purchased by Facilities Operations for potential transition to biobased counterparts, evaluated four and tested three new biobased products: biodiesel for grounds equipment

(2400 gallons/year), a second generation biobased general purpose cleaner, floor wax stripper, and detergent for manual parts washers.

**Biodiesel.** After extensive evaluation, PNNL determined that biodiesel would be ideal for its grounds equipment and began to seek a source at a reasonable price. Because PNNL is in a fairly remote location, the closest distributor was a 4-hour drive away, which would

increase the cost. PNNL was able to interest our local diesel supplier to carry biodiesel at a fairly reasonable price, but was unable to place a contract because that would have been sole sourcing.

In FY 2006, PNNL teamed with the supplier to offer alternative fuels (biodiesel and ethanol) at a local service station. In addition, PNNL began piloting the use of 10 percent biodiesel/90 percent low sulfur diesel in the backup heating system in one building.

#### **Cleaning products.**

PNNL's purchase of biobased products began in FY 2001 with the transition to a biobased general purpose cleaner (see the fall 2001 edition of Closing the Circle News for details on that transition). PNNL subsequently evaluated the second generation of general purpose cleaner and a floor wax stripper; both products met DOE standards and performance requirements. PNNL needed to evaluate and test a second generation general purpose cleaner because many of the custodial staff felt the first biobased product selected did not meet their professional standards. Although two custodial staff had been included in the initial testing phase, it turns out longer and more extensive testing was needed.



The test results for the biobased detergent for parts washers were mixed and seemed dependent more on attitude of the user rather than actual performance of the product.

**Carpet.** In FY 2005, PNNL evaluated the potential for specifying commercial carpet containing both biobased as well as recycled content. PNNL received funding from both the United Soybean Board and the manufacturer to pilot carpet with biobased backing and recycled facing in a conference room. To date, the carpet meets traditional carpet specs

and PNNL performance and cleaning requirements. The main plus was the cost was roughly the same as PNNL normally pays for high end commercial nylon carpet, and, instead of the traditional off gassing from vinyl backing, staff had the pleasant aroma of soybeans — and that for only a few days.

In conjunction with the pilot, PNNL developed a “You Are Walking on Soybeans” poster to inform staff about the carpet underfoot. The poster hangs with the Biobased Products poster, so staff is aware of the numerous other products available with biobased content. “U.S. Department of Energy Buys Bio for Energy Security” brochures are available in the conference room with information on biobased products other DOE sites are piloting. The goal is to inspire PNNL staff to think of the products they specify and consider evaluating the possibility of specifying biobased content.

Transition to new products is neither quick nor easy, but, with environmentally preferable products in general and biobased products in this case, the long-term benefits have made the effort worthwhile—either in cost reduction, improved environmental health, or both. ■

# Pentagon Biobased Products Showcase: Enhance the Mission; Protect the Environment

On September 12 and 13, 2006, the Department of Defense (DoD) demonstrated commitment to environmental stewardship by hosting a biobased products showcase and educational event at the Pentagon. With the name “Enhance the Mission; Protect the Environment,” the focus of the showcase was facilitating information sharing among the biobased product industry and those in the Department who specify, buy, and/or use commercial or industrial products in DoD operations. Guest speakers included Deputy Secretary of Defense Gordon England, Secretary of Agriculture Mike Johanns, Senators Tom Harkin and Richard Lugar, and Congresswoman Marcy Kaptur. In addition, there were 46 government and industry displays of biobased products and initiatives over the 2-day period. Attendees were able to participate in educational sessions to learn about the performance and availability of biobased products.

The event supported DoD’s Green Procurement Program as well as FSRIA section 9002. As Deputy Secretary England noted, the use of biobased products not only helps meet mission needs of the Department, but also protects the environment. Biobased products provide a sound alternative in a variety of DoD operations and applications and support energy security by replacing non-renewable fossil energy-based products derived



from imported oil and natural gas supports. Mr. England summed it up in his remarks, “Our strategy also supports our long-term national security interest by protecting and preserving the environment for future generations so they, too, can enjoy life, liberty and the pursuit of happiness to the fullest here in America.”

As the single largest Federal purchaser of goods and services, DoD is committed to increasing the procurement and use of products with energy and environmental attributes. DoD has increased its green purchasing 75 percent from \$57 million in 2002 to \$100 million in 2005. Mr. England stressed the Department has “...a lot of

market clout, and the decisions we make affect markets... so that gives us an opportunity, but also places on the department a responsibility in this area to set the standards and to lead the way for the Federal government.”

DoD will continue to make “great strides in the biobased products effort, and as the [USDA] program moves forward...”

A 17 August 2006 memo from the Under Secretary of Defense for Acquisition, Technology and Logistics, Mr. Kenneth Krieg, reaffirmed DoD’s commitment to expand the use of biobased products and the Department’s Green

Procurement Program. The memo strongly encourages DoD activities to purchase and use biobased alternative products and to initiate projects that further demonstrate the value and utility of these materials in DoD applications. In addition, DoD is to consider related products based on renewable materials, including biofuels and alternative energy, biodegradable materials including compostable food packaging, and wood products which originate from sustainably managed forests.

The expanded use of biobased products makes good sense for both the DoD and our Nation. The biobased product initiative and DoD’s Green Procurement Program will receive the full support of the Department. ■

# Biobased Products from National Industries for the Blind

By Scott Woodruff, National Industries for the Blind

National Industries for the Blind (NIB) and its affiliated non-profit agencies are committed to providing janitorial and other products that meet and exceed the environmental standards expected by today's Federal government customers. Today, a number of biobased products are available under the SKILCRAFT brand name for sale to Federal customers through the Javits-Wagner-O'Day (JWOD) program. This Congressionally endorsed program enables the production of products by non-profit agencies around America that employ persons who visually impaired, that meet and exceed the customer's quality standards, and are available at competitive prices. The biobased products currently fall into the following categories: Food Service Disposables, Absorbents, Chemical Cleaners & Degreasers, and Personal Care Cleaners.

## Biobased Food Service Disposables

Innovative partnerships between NIB-associated agencies and nationally recognized manufacturing partners resulted in the production of a variety of SKILCRAFT biobased, disposable food service products. Specifically, one NIB-affiliated agency has developed a compostable, biodegradable, and biobased set of disposable flatware items, and another affiliated agency worked with one of the world's leading

manufacturers of paper products to develop a hot drink cup that exceeds ASTM testing standards for compostability.

The flatware is manufactured with a 50 percent wheat based raw material, with the reduction in plastic content increasing the flatware's compostability. The actual flatware NSNs available includes a fork, a spoon, a knife and also a set of all three.

The hot drink cup is manufactured under a patented process that results in a cup that is not only compostable and biodegradable, but also the coating on the inside of the cup is a biobased vegetable substance that with stands up to 400 degrees Fahrenheit. The cup is available in both a coated and uncoated version. The 16 ounce uncoated version is currently sold to the Navy for shipboard use. The coated versions of these cups are available in 10 ounce, 12 ounce, and 16 ounce sizes.

## Biobased Absorbents

SKILCRAFT absorbents are 100 percent cotton and wool content products. They are the most versatile, effective, and economical absorbent product on the market. The cotton absorbents meet National Fire Protection Association (NFPA) Standard 99 for static decay and are ideal for absorbing and protecting against spills, leaks and drips from hazardous liquids such as oils, fuels, coolants, solvents, diesel and other



liquid hydrocarbons. The "Woolzorb" products absorb heavy oils, grease, coolants, solvents and water. Nineteen different NSNs in various sizes and configurations are currently available.

## Biobased Chemical Cleaners and Degreasers and Personal Care Products

SKILCRAFT biobased cleaners and degreasers are currently under development in conjunction with a national brand chemical manufacturing partner. The specific biobased SKILCRAFT products will be in full compliance with USDA's biobased content guidelines. The array of products to be offered under the SKILCRAFT biobased cleaners and degreasers will include a glass and hard surface cleaner, a graffiti remover, and bath and tile cleaner, an industrial degreaser and a multi-purpose cleaner and degreaser. A number of these biobased formulas also carry a Green Seal GS37 certification as environmentally preferred products. Additionally, SKILCRAFT will offer two different biobased, waterless hand cleaners. One will contain pumice and one will be without pumice. All of these SKILCRAFT biobased cleaners are commercially available and are expected to be available as JWOD authorized products with NSNs by late 2006.

For further information, contact Scott Woodruff at [swoodruff@nib.com](mailto:swoodruff@nib.com) or 703-310-0326. ■



**SKILCRAFT**®

# DuPont's Biobased Polymers

Several years ago, DuPont introduced a new polymer platform, Sorona®, based on 1,3-propanediol (PDO). Sorona® is DuPont's tradename for a family of poly (trimethylene terephthalate) polymers (PTT) made from 1,3-propanediol (PDO) and terephthalic acid (TPA). Traditionally, both of these ingredients were produced from petrochemicals. DuPont developed a way to produce the PDO using a patented biology-based fermentation process and corn sugar. This bio-derived propanediol replaces the traditional petrochemical material. Looking to bring this new product to market, DuPont found a partner in Tate & Lyle, a company with strong scientific and research capability and a mission to become "consistently first in renewable ingredients." Tate & Lyle has excellence in fermentation technology and, together, the two companies have patented several innovations in the commercialization of bio-derived propanediol. The first commercial plant to produce bio-derived propanediol is scheduled to startup in the 4th quarter of 2006, with a designed capacity of 100 million pounds/year.

Bio-derived propanediol has a number of uses, either by itself or as an ingredient in the production of many useful materials.

Susterra™ propanediol is our industrial grade glycol used for industrial formulations and applications where non-petroleum based ingredients are desired. Benefits of Susterra™ propanediol for industrial end uses include less environmental footprint, low toxicity, and good biodegradability. Susterra™ propanediol can help you achieve environmentally friendly products and solutions derived from sustainable and

renewable resources in end uses such as deicing fluids, anti-freeze, and heat transfer fluids.

Zemea™ propanediol is colorless and highly pure and is used for formulations where non-petroleum based ingredients are desired. Benefits of Zemea™ propanediol include its purity, lack of irritation and sensitization, and environmentally friendly nature. Zemea™ propanediol can replace products such as propylene glycol and butylene glycol, in a wide range of cosmetic and personal care and liquid detergent formulations.

Bio-derived propanediol is also the key ingredient in DuPont™ Sorona® polymer. Sorona® is currently being sold for use as a fiber in textiles, apparel, and carpeting. In fabrics, Sorona® contributes exceptional softness and drape. In swimwear, Sorona® offers resistance to fading from the harsh effects of both UV rays and chlorine. Activewear benefits from the comfort stretch and recovery and resistance to fading. Sorona® can be blended with other natural or synthetic fibers.

In carpeting, Sorona® offers softness along with durability, crush resistance and resilience. Carpets made with Sorona® are permanently stain resistant. Since the stain resistance is an inherent, built-in feature of the fiber, it won't wash or wear off. Mohawk produces Smartstrand™ made with DuPont™ Sorona® carpeting; it is available in a wide variety of styles and colors from Mohawk retailers including Home Depot.

Early in the process development work for these biobased materials, DuPont and Tate & Lyle used life cycle assessment (LCA) as a tool to compare the energy efficiency and

environmental profile of different manufacturing alternatives. LCA studies can also be used to benchmark the environmental footprint of both bioderived propanediol and Sorona® against their fossil-fuel based alternatives and against other competitive polymers like Nylon 6. The LCA studies considered all material and energy inputs and outputs along the value chain from planting, growing and harvesting the corn to manufacturing the biobased material. These types of studies are commonly called "cradle to gate." Similar studies were also conducted on the fossil fuel based alternative products to allow for an "apple to apple" comparison.

The LCA results show that bio-derived propanediol consumes about 40 percent less total energy than alternative fossil-fuel based PDO routes. Furthermore, as an alternative to Nylon 6, Sorona® consumes about 45 percent less non-renewable energy and emits about 50 percent less greenhouse gas emissions. One of the major applications of Sorona® will be as a fabric in carpets replacing Nylon 6. The LCA advantage of the Sorona® polymer/fiber production seems to propagate through the whole carpet life cycle comprising carpet manufacture and maintenance.

DuPont believes that the major benefits of bio-derived propanediol and Sorona® are reduced non-renewable energy consumption and reduced greenhouse gas emissions in comparison to their fossil-derived competitors. Further process engineering for biobased materials has a tremendous improvement potential in relation to the mature technology of the currently prevailing fossil-based products. For more information visit [www.sorona.dupont.com](http://www.sorona.dupont.com). ■



# Cargill Harvests Bumper Crop of Biobased Products

**A**re you sitting down? Chances are – whether you're parked on an office chair, a sofa or the edge of your bed – you're sitting on a piece of polyurethane foam, made with a petroleum-based industrial polyol. At least, that's what it always used to be made with.

This year, food and agricultural company Cargill began making a soybean-based industrial polyol for polyurethane foam manufacturers, and companies specializing in bedding, furniture and automotive foams have begun to use it in their formulations. For the foam industry, it marks the first step away from complete reliance on petrol chemicals. For Cargill, it marks a significant addition to its expanding family of eco-friendly industrial products, which range from traditional technical oils to biodegradable plastic from corn.

The raw materials for these products come from crops harvested in America's agricultural heartland—corn, soy, sunflower, linseed, and the like. The products are “green,” but they're also designed to deliver performance comparable to – and in many cases better than — their petroleum-based counterparts. Cargill manufacturers both feedstocks used

in making finished products and finished biobased products, such as lubricants, fuels, plastics, fibers, and waxes. This article focuses on the feedstocks and is drawn from information provided by Cargill and the NatureWorks® web site.

Poly(lactic acid) (PLA) is made from corn. The starch stored in corn is turned into natural plant sugars, which, in turn, are fermented into lactic acid. The lactic acid is used to create poly(lactic acid). PLA is an alternative to poly(ethylene terephthalate) and low and high density polyethylenes in films and packaging. Sold in pellets as NatureWorks PLA, it can be melted down and formed into plastic products such as fruit and vegetable containers, bottles, trays, film, and other packaging. According to NatureWorks LLC, “from cradle to resin, the production of NatureWorks PLA uses 68 percent less fossil fuel resources than traditional plastics (PET) and it is the world's first greenhouse-gas-neutral polymer” (based on the purchase of renewable energy certificates). It is compostable in industrial composting facilities.

Ingeo® is a fiber made from PLA. It can be used in a wide range of textile applications as an alternative

to synthetic fibers made from petrochemical materials. It can be used in apparel, bedding, furnishings and carpeting. The fiber, available in bright and semi-dull forms, has a melt point of 170 degrees Celsius, very low flammability, excellent UV stability and wicking and moisture management properties.

BiOH™ polyols can be used in a variety of polyurethane applications including flexible foams, rigid foams, coatings, adhesives and elastomers. They offer the same consistency and durability as their oil-based counterparts. BiOH™-based polyol for flexible foam comes in the same grades and densities to which customers are accustomed. Though made from soybeans, the formulation can actually use any number of vegetable oils, depending on cost and availability.

Cargill's Industrial Bio Products business has a number of research projects underway aimed at creating a steady stream of more biobased products in the future. The company is partnering with Federal agencies such as USDA and DOE on these projects. For further information, contact Cargill Government Solutions at [governmentsolutions@cargill.com](mailto:governmentsolutions@cargill.com) or 202-530-8169. ■

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**T**he Office of the Federal Environmental Executive thanks the U.S. General Services Administration for its generous help and support in producing this newsletter.

