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SPECIAL REPORT

NEW USES

SPONSORED BY: THE SOYBEAN CHECKOFF AND QUALISOY

SOY MILESTONES

INNOVATIVE, VALUE-ADDED NEW USES FOR SOY HAVE COME A LONG WAY IN THE LAST TWO DECADES.



Celebrating 10 years of biodiesel.

Additionally, soybean oil's clarity gives soy ink bright colors, a longer usage life than traditional ink and an ink that offers less rub-off from newsprint. As a result, today more than one-third of all daily newspapers and over 90% of all newspapers use soy-based ink.

Future applications of soy ink include sheet-fed inks, heat-set inks, cold-set inks, business-form inks and flexographic ink. Checkoff-sponsored research is also continuing on the use of soy ink for toner cartridges and for ballpoint pens.

10 YEARS AT YELLOWSTONE

Last summer, Yellowstone National Park marked its 10th anniversary of successfully using soy biodiesel and other soy-based bio-products in the park. Since 1990, the soybean checkoff has sponsored research, development and promotion of soy biodiesel, and Yellowstone represented the first national park to test the new technology.

The park boasts over 300 pieces of machinery operating on soy biodiesel – the centerpieces being the park's well-known yellow tour buses and a 1995 Dodge pickup that has been running on 100% biodiesel for over 10 years and 181,000 miles.

This is an important accomplishment, because at an elevation of 6,241 ft., the mountainous region surrounding the park experiences extreme weather throughout the year. The long-standing use of soy biodiesel in the harsh climates of Yellowstone and the adjacent Grand Teton National Park show that renewable fuel can be as effective as conventional diesel fuel, even in cold climates.

Jim Evanoff, environmental manager with Yellowstone National Park, says, "The key to successful use of biodiesel is working with a knowledgeable fuel supplier who

can ensure fuel quality and successfully manage blends to deal with the region's weather extremes." Biodiesel blends vary from B2 (2% biodiesel, 98% petroleum) to B100.

At a special Department of Energy Clean Cities Workshop held last summer in Jackson, WY, a news conference recognized the successful use of soy biodiesel and other biobased products in Yellowstone, Grand Teton and other national parks. USB director and Lyons, NE, soybean farmer Chuck Myers says, "Yellowstone and Grand Teton Park are perfect examples of well-tested, practical uses for soy biodiesel blends year-round."

Also showcased at the event were soy products with which the Grand Teton park staff has taken on an "early adopter" role. Products being used include soy cleaners, lubricants, solvents and hydraulic fluids.

FIVE DECADES OF EXPORTS TO JAPAN

In 2006, the U.S. soybean industry commemorated 50 years of soy exports to Japan via a partnership created in 1956 called the Japanese American Soybean Institute.

When the trade relationship began five decades ago, total U.S. soy

exports to Japan were 19.6 million bushels. By 2005, those totals soared to 114.6 million bushels, with an additional 17.4 million bushels of soybean meal, for a total of 132 million bushels.

Today, soybean exported to Japan are popular for cooking oil, as a high protein animal feed, and are also widely consumed in a variety of traditional Japanese foods.

Overall, U.S. soy exporters capped off 2006 with combined soybean and soybean meal exports reaching 1.2 billion bushels – the highest amount ever, representing 41% of U.S. production. China was again the top export market, with much of the soybean meal exports used for the burgeoning aquaculture market.

2007 AND BEYOND

The road ahead appears to be positive for the soy industry, especially with potential for biodiesel. One economic analysis projects biodiesel's continued growth will add \$24 billion dollars to the U.S. economy by 2015. The study also shows that foreign oil dependence is expected to decrease by keeping \$13.6 billion in the U.S. that would have otherwise been spent abroad.

Continued campaigns by the soybean industry are helping biodiesel find favor with consumers as well as helping encourage availability of biofuels. As one example, last September the Iowa Soybean Association (ISA) partnered with the Iowa Speedway in Newton, IA, to sponsor the Soy Biodiesel 250.

John Askew, president of the ISA board of directors says, "Our spon-

sorship of the Soy Biodiesel 250 is a great opportunity to promote the use of biodiesel."

With two new plant openings in 2006, Iowa is the nation's top producer of biodiesel, and the state's soy biodiesel production capacity is on track to increase 10-fold over the next few years to more than 300 million gallons per year.

To further promote the benefits of biodiesel, ISA also partnered with the American Lung Association of Iowa to sponsor an essay contest for sixth, seventh and eighth grade students. The students wrote 250-word essays that answered the question, "How does biodiesel improve the environment?"

Similarly, the Nebraska Soybean Board partners with FFA students in its state to portray the positive message of soy biodiesel to school districts and help convince them to use 20% soy biodiesel in their school bus fleets. ●

THE WAR ON TRANS FAT

Another significant milestone that will likely increase future use and value of soy products is the continued war on trans fat. Throughout 2006, restaurants like Kentucky Fried Chicken announced that they were making the switch away from trans fat to cooking with healthier, low-linolenic soybean oil. Kellogg Company made a similar decision in 2005. The year culminated in December with New York City becoming the first city in the nation to ban trans fat at all restaurants.

Low-lin soy oil requires little or no hydrogenation – the process that creates trans fats – so the use of oil derived from these soybean varieties reduces or eliminates trans fats in food products.

The soybean checkoff continues working with partners to ensure that the soybean industry can provide sufficient supply of low-lin soybeans to meet the growing demand of the food industry. In 2007, estimates are for more than 2.5 million acres planted to low-lin soybeans. ■

The year 2007 marks several significant accomplishments for new uses of soybeans – commemorating the anniversary of several products and celebrating the bright future for many more.

Through extensive research – much of it supported by soybean checkoff funding – over 40 different categories of soy-based products ranging from beauty lotions to plastics, adhesives and biodiesel are now available to consumers.

Soy-based products have earned acclaim in the marketplace for their environmental attributes, cost-effec-

tiveness and energy efficient appeal.

During the past year, several manufacturers introduced 22 new, industrial soy-based products to the market – indicating there are still many soy innovations yet to be tapped. (See the complete list of these products on page 27).

Todd Allen, United Soybean Board's (USB) New Uses Committee Chair and a soybean farmer from West Memphis, AR, calls the development of these new industrial soy-based products for the market "vital to building new demand for soybeans."

Here, we take a look back at the milestones already achieved with new uses for soy and then glance at the potential ahead.

SOY INK TURNS 20

Since 1987 the soybean checkoff has offered research support for the development of soy ink in the U.S. Twenty years later, soy ink is one of the industry's best success stories. Initially, rising petroleum prices in the 1970s brought awareness of soy ink, and the environmental friendliness of the product. And continued high petroleum prices have kept it popular.

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NEW USES COVER PHOTO: KATE ROYER



Ten years and 181,000 miles on 100% biodiesel.

TEMPTING CONSUMER TASTES

SOYFOOD COOKING CONTESTS AND RECIPE IDEAS TEMPT CONSUMERS' TASTE BUDS.



Soyfoods are becoming commonplace at the grocery store – from soy milk and soy snacks to tofu burgers. But how do you encourage consumers – especially young people – who have never tried soyfoods before to take their first bite?

The South Dakota Soybean Research and Promotion Council created a soyfoods cooking contest for college students to help encourage the use of soy. This year the contest will mark its ninth year and usually includes participation from students at South Dakota State University, the University of South Dakota and Mitchell Technical Institute's Culinary Academy.

"The contest has been a great means of promoting soyfoods and having students develop imaginative ways to use soy in the diet," says Betty Fyler with the South Dakota Soybean Research and Promotion Council.

Fyler adds that the contest not only exposes students to the attributes of soyfoods, but it also edu-

cates the public about soy's health and nutritional aspects. During the cook-off contest, students prepare their recipes for the judges, while on-site chefs prepare the same recipes for the public to sample.

Fyler says that physicians, nutrition and health professionals and others from the community are invited to the event to learn about soyfoods and try the recipes. "Many of these individuals know soyfoods are healthy, but they haven't tasted them in

recipes," she says.

Cash prizes are awarded in the South Dakota contest for winning recipes in different meal categories, including the "most creative use of soy." Last year's winning recipes included: a banana bread made with soy peanut butter, sweet and sour meatballs made with tofu and a creamy vegetable salad that included soymilk, edamame and roasted soy nuts.

AFTER THE CONTEST, the winning recipes are promoted through the media which provides another opportunity to get consumers interested in soyfoods. "We try to adapt family favorites slightly with soy ingredients to make them more healthy and nutritious without changing the taste," Fyler says.

To take soy to even younger consumers, the South Dakota Soybean Research and Promotion Council also sponsors special \$15 premiums to the state's 4-H youth who compete in the special foods competition and include a soy ingredient in their recipe. The premium is offered for 4-H'ers giving illustrated talks

SOY RANKS HEALTHY WITH CONSUMERS

Today's consumers recognize the health benefits of soyfoods, according to a national survey funded by the soybean checkoff. In 2006, the survey revealed:

- **FOUR IN FIVE CONSUMERS** perceive soy products as healthy, which is significantly higher than in past years.
- **FIFTY-THREE PERCENT** of consumers surveyed agree that soy products can play a role in reducing obesity. Consumers continue to acknowledge soybean oil and olive oil as the two healthiest oils.
- **CONSUMERS ARE TAKING** soyfood benefits to heart by incorporating them into their diets. Thirty percent of Americans consume soyfoods or soy beverages once a month or more.
- **FOR THE THIRD YEAR** in a row, consumers reported the most familiarity with soymilk, soybean oil, soy veggie burgers and plain tofu. ■

that promote soy as well.

Nine-year-old Kiera Leddy of Milbank, SD, made a soy smoothie for the competition. It was the first time she and her family tried soymilk and they concluded, "It tastes pretty good and it's good for you," says Kiera's mom Krecia.

The premium money for including soy in the recipe is what piqued the Ledys' interest in trying soy, and Krecia says now that they've tried it they have purchased other soyfoods as well.

CONTESTS AND RECIPE

promotions like these helped boost the use of soyfoods over the last several years, says Linda Funk with the Soyfoods Council. The council is continually in touch with national media outlets and chefs, foodservice and retailers to increase the awareness and use of soyfood products through similar recipe promotions.

Funk says much of the success in getting consumers to try soy is by working with chefs to get soyfoods on menus so people are more familiar with them and through clever seasonal themes – such as Christmas cookie recipes featuring soy, or Valentine treats

such as chocolate soy brownies.

Adapting a favorite recipe to include soy can be as easy as substituting one-fourth cup of soy flour for every cup of flour in cookies and quick breads, or using one-



half peanut butter and one-half soy-nut butter for recipes calling for peanut butter. "Soymilk is ubiquitous," Funk adds.

Overall, big strides have been made in bringing soyfood products to the marketplace. She says, "I see a lot more soy being written about in women's magazines, and I see soy products becoming more available because consumers are asking for them."

A variety of soy recipes can be found at www.the-soyfoodcouncil.com or

www.soybean.org. A 150-page soyfoods cookbook is also available through The Soyfoods Council. In addition to recipes from professional chefs to state soybean associations, it describes 14 soyfood ingredients now in the marketplace – from tofu and tempeh to soymilk, flour and dried flakes. Order the cookbook by calling 866-431-9814. ●

SOFTER SIDE OF SOY

Soy is also gaining consumer attention by showing its softer side – think t-shirts and teddy bears. That's right, soy-based fabrics are bringing consumers these eco-friendly products.

Soysilk Pals are stuffed animals made from 100% Soysilk brand fiber – an all-natural textile made from soybean byproducts created during the tofu manufacturing process. Known for its soft feel similar to cashmere, Soysilk was first offered as a luxury yarn by South West Trading Company in 2001. Today, company representatives say the Soysilk Pals plush line is the first of many ventures for Soysilk brand products in the consumer market.

"I love the idea that we can create luxurious, earth-friendly products from soy, which is a renewable resource," says Jonelle Raffino, co-founder of South West Trading Company and designer of the Soysilk Pals line. Three plush critters are available: Tofu Bear, Soynia Bunny and Edamame Bear, with more animals in development. For more information, visit www.tofubear.com or call 866-794-1818.

Eco-friendly soybean fabric is also being used in a new collection of men's briefs and T-shirts from the New York-based company 2(x)ist.

Of the soy collection, which debuted in stores this fall, Jason Scarlatti, design director for 2(x)ist, says, "The whole world seems to be going soy... We wanted to be on the pulse of what's going on."

The company says the 2(x)ist soy underwear is "slinkily soft" and nicely styled – they sell it with the tagline "More luxurious than cashmere, breathes like cotton." For more information, visit www.2xist.com. ■

VALUE FOR VEHICLES

FORD MOTOR COMPANY PIONEERS EFFORT TO INCLUDE HIGHER CONCENTRATIONS OF SOY-BASED FOAMS IN VEHICLE SEAT CUSHIONS.



USING A SOY-BASED FOAM COULD SAVE THE AUTO INDUSTRY UP TO \$26 MILLION.

Soybeans could have a prominent role in vehicles of the future – and it's not just through biodiesel. Ford Motor Company is researching expanded use of soy-based flexible foams in their automobiles. Polyurethane foams are the primary component of vehicle seat cushions, seat backs, armrests and head restraints.

While many in the auto industry are experimenting with replacing 5% of the standard petroleum-based polyol with a soy-derived material to create the foam used in vehicles, Ford researchers have formulated the chemistry to replace 40% of the standard polyol with soy-based polyol. And they are doing it without compromising the durability, stiffness or performance of the foam, while using a product that is earth-friendly.

ENVIRONMENTAL IMPACT

Debbie Mielewski, technical leader for Ford's Materials Research & Advanced Engineering Department, reports that an average of 30 lbs. of petroleum-based foam is used in each vehicle produced. That adds up to 3 billion pounds of petroleum-based foam

per year in the U.S. market, and 9 billion pounds worldwide.

Because of the volume, Mielewski says there's great incentive for auto manufacturers to consider and research other renewable, more environmentally friendly materials to produce the foam. "A soy-based foam conserves natural resources and reduces our environmental footprint," she says.

Initial projections estimate that using a soy-based foam at high volumes could save the auto industry up to \$26 million. Soy polyols have only one-quarter the level of total environmental impact of petroleum-based ingredients, according to the National Institute of Standards and Technology.

RESEARCH TO REALITY

Ford's breakthrough research in developing the higher concentration soy-based polyurethane foams has received checkoff funding from the United Soybean Board (USB) for the past three years. Now that the concept is reality, Ford is working with other organizations and suppliers to quickly bring these innovative technologies to the mainstream. Several companies have

already expressed interest in licensing them.

The actual foam is created by combining the 40/60 blend of soy- and petro-based polyol with an isocyanate cross-linking agent and nine other additives in precise combinations.

Through extensive testing of high and low soy percentages, Ford researchers found that a 40-50% soy substitution produced a product with properties most similar to the 100% petroleum-based polyol foam used for automotive seating applications.

Presently, Ford has applied for two patents, one for high-content soy foam formulations and the other for a novel, low-odor process to synthesize the soy polyols.

The development of these new processes is expected to bode well for future use of soy-based products. Todd Allen, chair of USB's New Uses Committee, says, "When the first soy foams are introduced on Ford vehicles, the use of soy polyols will snowball to other industries such as agricultural equipment, recreational vehicles, office furniture cushioning and other automotive components." ●

NEAT TO KNOW

- FORD MOTOR COMPANY'S research of possible applications for soybean products dates back to its early years. For instance, the Model T once contained 60 lbs. of soybeans in its paint and molded plastic parts.
- FORD SHOWCASED ITS industry-leading work with soy foams in 2003 on the Model U concept vehicle, which featured soy-based seat cushions as well as a soy-based resin composite tailgate. ■

FROM THE FARM FOR THE FARM

SOYBEANS COME FULL CIRCLE WITH PRODUCTS DESIGNED FOR AGRICULTURAL USE.

Soybeans leave the farm as a little beige bean, but many are finding their way back to the farm in the form of soy-based products developed through checkoff-funded research efforts.

One recent example is Ag-Tite, developed by Edge Inc. in conjunction with Biobased Systems. The new soy-based sealant is designed to fill cracks and openings to safely insulate hog pens, poultry houses and livestock barns.

When applied, the black, 3-lb./cu. ft.-density spray-applied polyurethane sealant gives rise to 1-2 in. of quick-curing, insulating foam. The energy-efficient insulation in turn helps reduce on-farm costs of heating these buildings. Similar soy-based foam products are being used in the construction industry.

Also for buildings, Green Products, LLC manufactures Environmental Liquid Membrane System (ELMS) Agriseal 1, a soy-based waterproofing sealant for roofing ap-

plications. The sealant provides benefits, including low volatile organic compound levels and ultraviolet resistance. It's 100% stain, mildew and mold-resistant and is environmentally friendly.

FOR TRACTORS, TOO

Another instance where soy returns to its farm roots is in the form of soy resins used to create tractor hoods and panels. Through partnership with the checkoff, Ashland Chemical has introduced five new lines of soy resins under the Envirez name. They're being incorporated into applications for new models of both John Deere and Case New Holland.

Biodiesel is also fueling farm vehicles – including Kubota tractors. This fall Kubota Tractor Corporation approved the use of B5 biodiesel fuels in specified Kubota diesel-powered products.

"Kubota is committed to envi-

ronmentally sound practices and the support of renewable, ag-based products used in fuels – as we continually work at increasing energy efficiencies within our industry," says Tetsuji "Mike" Tomita, President, Kubota Tractor Corporation.

In addition, the checkoff has funded research projects for the development of biobased lubricants to be used in ag, industrial and construction equipment. One example is the development of a biohydrostatic fluid which is a low-viscosity, universal tractor fluid that offers improved cold temperature performance and is compounded with detergent, dispersant, anti-wear, anti-rust and anti-foam inhibitors.

DETERRING DUST

Dust suppressants created with soy-based products are being used in ag and outdoor applications, too. They're popular because they are safe, price-competitive and use minimal water.

Dustkill, Inc. has developed three formulas for three different types of terrain. Examples include Roadkill made from 100% soy oil as a dust suppressant for golf courses and rail yards; and Dustknocker, which is typically used on industrial haul roads and long stretches of country roads. Arenapro is another novel formulation by Dustkill used primarily in indoor livestock arenas. ●

THANK YOU, ANIMAL AG

Livestock and poultry are America's number one soybean meal customer. In recognition and support of the economic importance of animal agriculture, last fall the soybean checkoff launched a new Web site, www.animalag.org.

The site focuses on quantifying the importance of livestock and poultry to the soybean industry and provides state-specific data about the economic impact of animal ag. Information about animal welfare, environmental regulations, partnerships with other ag groups and animal ag facts are also provided. ■



SOY SOLUTIONS

PRODUCTS ARE COMING TO THE RESCUE FOR A VARIETY OF INDUSTRIAL CHALLENGES.

Looking for a safer cleaning product? How about an earth-friendly alternative for heating your home? Consumers are finding the solution to several of these challenges in newly developed soy-based products. Here are some examples:

THE CLEANING BEAN

With several health concerns associated with cleaning products, today many manufacturers are replacing petroleum with soy in solvents for general-purpose cleaners, parts cleaners, graffiti removers, adhesive removers, paint strippers, ink cleaners and other applications.

The "green" products are healthier for the people using them, not to mention the environment. The soy-based solvents break down immediately and eventually degrade into water, mineral salts and other components, and cause few hazardous issues.

Through checkoff funding, soy cleaning products have been developed for everything from house and carpet cleaning to outdoor projects for cleaning decks, driveways and grills.

BETTER THAN WD40

When it comes to lubricating mechanical parts, WD40 has been a long-time favorite. But now, Glysol PenTrate offers a soy alternative to the petroleum lubricant. Developed by Workcell Systems Inc. with support from the checkoff, the soy-based lubricant offers the same properties and performance of WD40, except that it's free of petroleum and other distillates.

During more than a year of field tests, Glysol PenTrate produced 50% (and in some applications up to 100%) greater lubricity than petroleum-based counterparts. Since the soy-based product is naturally hydrophobic, it displaces water

from metal surfaces and, being slow to evaporate, leaves a thin film coating that resists rust and corrosion.

Most importantly, Glysol PenTrate is non-toxic for the environment and represents a renewable resource – thus reducing dependence on domestic and foreign petroleum sources. Should the product be released into the environment, it completely biodegrades in fewer than 60 days compared with petroleum, which can persist for decades.

HIGHWAY HELPER

Soy is also helping to repair roads. Developed by BioSpan Technologies of Washington, MO, soy-based polymers are key ingredients in an asphalt millings product called Activate.

Activate blends with reclaimed asphalt pavement (RAP) in a cold mix, strengthening all aspects of road construction in a biobased manner. And because it isn't a temperature-sensitive paving material, workers can fix potholes and pave roadways year-round with ease.

HEATING ALTERNATIVE

More home and commercial heating options are becoming available thanks to soybeans as well. Bioheat is a soy-based heating oil developed by the checkoff-funded National Biodiesel Board (NBB). Bioheat fuel is made from biodiesel and generic heating oil.

It's cleaner burning than traditional heating oils, with studies showing that Bioheat reduces nitrogen oxide emissions by 20% and sulfur oxide emissions by up to 83% when using a 20% Bioheat blend. And, there is less smoke and odor from Bioheat than from conventional heating oil. Bioheat will help reduce the need for more than 300 million gallons of petroleum-based fuel each year. ●

22 THAT ARE NEW

In 2006, 22 new soy-based products were introduced to the market. By category they include:

PLASTICS

VIKOL 1 & 2 – polyols for polyurethane foams and coatings

Green BMC – 100% soy resin used for automotive molding

Envirez 1807 – thermoset polyester for vacuum bag process for fan shrouds

Envirez 1807 – soy-based resin for building materials

Envirez 5000 – low profile thermoset sheet molding compound for new model tractor hoods and covers

Envirez 6934 – infusion resin being molded into small parts for over-the-road trucks

Envirez – soy-based resin for small utility trailers

BiOH Polyols – soy polyol for multiple plastic applications

SoyMatrix – soy polyurethane designed for pultrusion applications

LUBRICANTS

Naturelube 700 – soy-based lubricant for metal protection

COATINGS/PRINTING INKS/ADHESIVES

Agri-Sperse – soy-based pigment for water-based and solvent coatings

Agri-Color – soy-based colorant system for water-based paints

Agri-Solv – soy paint and glue stripper

ELMS Platinum – soy-linseed high performance roof coating

SPECIALTY PRODUCTS

EOS – soy oil for cleaning polluted groundwater

Amaizeing – soy/corn oil-based solvent and stripper

Biorenewables Industrial Degreaser

Tri-Base Multi Purpose Cleaner – soy-based parts cleaner

Biorenewables Waterless Hand Cleaner

Graffiti Remover SAC

Soy Verde – soy-based solvent