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Biobased Products Enhance Economic and Environmental Performance

Introduction

Many significant economic opportunities exist for Ohio companies to adapt existing manufacturing processes to produce and/or use biobased materials and capture new markets for biobased products. Ohio companies can achieve additional environmental cost benefits by using these materials to reduce their operating costs and their environmental, safety and health costs. Use of biobased products often results in dramatic improvements in both environmental impact and worker exposure and safety.

Many industries can benefit from the use of biobased products. Some examples include:

- metal casting industry;
- metal finishing;
- molded plastic products;
- fabric industry;
- construction and renovation;
- food processing;
- agricultural production and processing;
- chemical production and processing;
- energy production and transportation;
- office, school and home maintenance, and many others.

This fact sheet is a starting point to help you identify opportunities and advantages associated with biobased products.

What are biobased products? ¹

Biobased products have plant and animal materials as their main ingredients. They are made from a renewable resource and, with some exceptions, generally do not contain synthetics, toxins or environmentally damaging substances. By using biobased products, you can reduce reliance on petroleum, promote good stewardship of our natural and farming resources and reduce or eliminate the use of toxic substances in the environment.

Examples of biobased products include:

- paper and paper-like products;
- composite wood extrusions and other construction materials;
- cleaning and solvent chemicals;
- lubricants, paints, inks, adhesives and other coatings;
- alternative fuels;
- textiles, non-wovens and vapor barriers;
- wood furniture and wood by-products;
- soil preparations;
- insecticides and fertilizers;
- foods, beverages and food supplements;
- leather goods; and
- hormones and enzymes.

What are the benefits of using biobased products?

- Renewable raw materials - properly managed (grown, harvested and processed) materials can be a sustainable source of products and energy.
- Lower toxicity - biological materials generally are less toxic and are inherently biodegradable.
- Economically advantageous - biobased products can be grown and processed close to their point of use. Non-renewable resources must be extracted and shipped from wherever they are found (many times this is hundreds or thousands of miles from their point of use).
- Job creation - biobased products offer opportunities for both production and processing of locally produced materials.

What common materials can biobased material replace?

- Resins
- Polymers
- Coatings
- Lubricants
- Solvents
- Cleaners
- Green Building Materials
- Manufacturing Raw Materials
- Fuels

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Biobased product case studies

Pride Metal Casting - Cincinnati, Ohio (Protein-based foundry resin)

Challenge

Like many manufacturers, Pride Cast Metals faces the ongoing challenge of running a competitive business — keeping costs down without sacrificing quality or performance levels. Pride Cast Metals casts gas pump swivels from a zinc alloy (ZA12). However, because zinc alloys have a much lower pouring temperature (900°F), the cores were not exposed to high enough temperatures for the sand binder to thermally degrade adequately. In order to remove the still solid cores, a foundry worker had to manually drill them out from each casting. This was a slow process, which resulted in lowered production rates and increased production costs.

Solution

Pride Cast looked to Hormel Foods' GMBOND® Sand Binder as a solution because it degrades at lower temperatures than traditional petroleum-based binders, making core removal much easier. GMBOND® is an animal protein-based core sand binder, and significantly reduces VOC emissions from the core making process and the pouring, cooling and shakeout operations. Because GMBOND® is a protein-based binder, there is also greater opportunity for sand reclamation and reuse.

During evaluations of GMBOND® cores, Pride Cast Metals found that removal of spent cores was much improved and required no drilling. Using pre-molded GMBOND® Sand Binder cores, Pride Cast Metals has been able to reduce the core costs by 24 percent and reassign personnel from drilling out cores to other tasks.

In a case study published by GMBOND®, Dirk Byerman, foundry superintendent at Pride Cast Metals stated, "We have been very pleased with the performance and cost of the GMBOND® cores and are considering it for several other applications in the foundry."²

Environmentally friendly sand binders offer equal if not better performance than petroleum-based products with fewer environmental and health risks. Foundries can reduce costs associated with shakeout, sand reclamation and emission compliance to improve their bottom line. With protein-based binders, core sand retention is virtually eliminated and reclamation, disposal and landfill costs are dramatically reduced. Testing by the Casting Emission Reduction Program (CERP), an independent applied research program, has proven that GMBOND® reduces emissions by more than 90 percent.

By using pre-made cores molded with GMBOND® sand binder, Pride Cast Metals was able to:

- achieve significantly lower costs per casting;
- significantly reduce the time spent manually removing cores, thereby increasing the number of castings processed;
- maintain good surface finish; and
- **reduce the amount of toxic emissions released during the casting process.**

*GM Powertrain Division, Saginaw, MI*³

The GMBOND® Process was implemented at a General Motors foundry with the backing of CERP and funding from the U.S. Department of Defense. GM management and engineering were

interested in exploring new binder technologies that would help ensure the competitiveness of the industry.

GM Powertrain Saginaw Malleable Iron Plant is using a core making process with GMBOND®-coated sand. The initial GMBOND® project demonstrated greater than 90 percent emission reductions and significant cost savings.

United States Postal Service (USPS) (Soy-based solvent)

"Mastic Removal Made Easy: BEAN-e-doo® Does It All for U.S. Postal Service Including Saving Big Dollars"

When USPS discovered, tested and began using the mastic remover with the catchy name, BEAN-e-doo®, its primary reasons were that it was safe to use and it worked very well.

But it has also turned into a big money saver. In a case profile of the USPS published by the United Soybean Board, the USPS's Jim Hennessey states, "This product removes mastic, which often contains asbestos. If it didn't work, we'd have to contract with outside remediation firms that specialize in removing materials containing asbestos. The cost for us to do it is 60 cents a square foot. The cost for an outside contractor to do it is \$1.76 per square foot—that's a savings of almost 300 percent."⁴

Based on several months of analysis, BEAN-e-doo® gained approval for Class Three asbestos removal (which means USPS employees can use the product without a respirator) because it is biodegradable, contains no volatile organic compounds, has a mild odor and is user-friendly.

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What incentives and programs are available for exploring manufacturing or use of biobased products?

Ohio BioProducts Innovation Center
The Ohio BioProducts Innovation Center (OBIC), a Third Frontier Wright Center of Innovation, helps link academia and industry in the development of renewable specialty chemicals, polymers/plastics and advanced materials. www.ohio3rdfrontier.org

Through its connections to the vast resources of The Ohio State University, Battelle Memorial Institute, national laboratories and industry partners, OBIC can provide numerous services including those listed below.

- Access a comprehensive set of capabilities across the bioproducts supply chain, including genetics and biotechnology.
- Partner with world leaders in agricultural processing, manufacturing and research, including feed-stock production and bioprocessing.
- Use extensive capabilities in the broad field of chemistry, including combinatorial, computational and green chemistry.
- Operate ongoing bioproducts R&D programs for several target applications, including biobased polymers (including films and packaging); industrial bioproducts; waxes, paints, coatings and adhesives; agricultural chemicals; and cleaners/detergents.
- Use vast resources in advanced materials engineering and can provide accurate analyses of technical, economic and environmental aspects integral to

the successful commercialization of bioproducts technology.

- Provide access to services and programs that focus on commercialization and economic development.
- Link academia and industry collaborators along the bioproducts supply chain, including extension outreach, education and networking.

Federal Green Purchasing

The U.S. Department of Agriculture (USDA) established a *Federal Biobased Products Purchasing Program* on January 11, 2005. Under the program, USDA has designated biobased products for Federal preferential procurement, and issued guidance for establishing affirmative procurement programs for buying biobased products.

USDA designated the first list of biobased products on March 16, 2006. The final rule designated the following biobased content products:

- mobile equipment hydraulic fluid;
- diesel fuel additives;
- penetrating lubricants;
- roof coatings;
- water tank coatings (effective 11/20/07); and
- bedding/bed linens/towels (effective 11/20/07).

Federal agencies are required to develop affirmative procurement programs for purchasing the USDA-designated products. The Office of Federal Procurement Policy recommend that agencies expand their recycled content product affirmative procurement programs to include biobased products. You can find more information about USDA's Biobased Affirmative Procurement Program at www.usda.gov/procurement/biobased/APP.pdf.

For more information about the benefits of producing and using biobased products, please see the online training module at www.epa.state.oh.us/ocapp/p2/onlinep2training/onlinep2training.html or contact the Office of Compliance Assistance & Pollution Prevention at www.epa.state.oh.us/ocapp/ocapp.html or (614) 644-3469.

Vendors and directories of biobased products

**The information about the products named in this fact sheet is provided for convenience and is not an endorsement by Ohio EPA. Other similar products may result in similar benefits.*

Biobased USA
www.biobased.us/

Biobased Information System
www.biobased.org/

Eco Safety Products
www.ecosafetyproducts.com/

BioPreferred Biobased Products Catalog
www.biobased.oce.usda.gov/fb4p/Catalog.aspx

Building for Environmental and Economic Sustainability (BEES 4.0)
www.bfrl.nist.gov/oea/software/bees/

Soy Products Guide
www.soynewuses.org/ProductsGuide/Default.aspx

EcoDistribution Group biobased products
www.ecodistributiongroup.com/biobased.html

Biobased Manufacturers Listing from Iowa State University
www.biorenew.iastate.edu/resources/glossary-of-biorenewables-terms/biobased-manufacturers-in-other-states.html

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Environmentally Preferable Products

www.wbdg.org/design/env_preferable_products.php

References

¹ Biobased Manufacturers Association Web site, www.biobased.org/association/biobased.php

² GMBOND® Pride Cast Case Study, www.gmbond.com/pdfs/info/PrideCastCasestudy.pdf

³ GMBOND® CERP Case Study, www.gmbond.com/pdfs/data_eng/CERP_E.pdf

⁴ U.S. Postal Service, BEAN-e-doo® case study, www.biobased.oce.usda.gov/fb4p/files/BEAN-e-doo_Does_It_All.pdf

Implications of Biobased Fuels and Chemicals for Midwest Manufacturing

<http://bioeconomy.wi.gov/docview.asp?docid=5196&locid=72>

Joint Service Pollution Prevention and Sustainability Technical Library, Green Procurement

http://p2library.nfesc.navy.mil/gp/weblinks_section_gp.html#2

Biobased Products Best Practices Guide

www.soybiobased.org/resources/BPG.pdf

Biobased Manufacturers Association

www.biobased.org/association/overview.php

USDA Biobased Products and Bioenergy Coordination Council

www.ars.usda.gov/Bbcc/USDA_BBCC.htm

Pacific Northwest National Laboratory: Bio-based Product Research

www.pnl.gov/biobased/

National Renewable Energy Laboratory: Biomass Research, Biobased Products and Projects

www.nrel.gov/biomass/proj_biobased_products.html

Argonne National Laboratory: Chemical and Bio-process Development

www.es.anl.gov/Energy_systems/Process_Engineering/Index.html#3

Argonne National Laboratory: Separative Bioreactor

www.anl.gov/techtransfer/Available_Technologies/Biosciences/SeparativeBioreactor.html

Pride Cast Metals: Capabilities

www.pridecastmetals.com/foundry.html

USDA Technology Transfer Information Center: Biofuels

http://ttic.nal.usda.gov/nal_display/index.php?info_center=6&tax_level=1&tax_subject=318

Small Business Innovation Research: Funding Opportunities for Biofuels and Biobased Products

www.csrees.usda.gov/fo/biofuelsandbiobasedproductssbir.cfm

Argonne National Laboratory: Ethyl Lactate Solvents

www.anl.gov/techtransfer/Available_Technologies/Environmental_Research/ethylactate.html

Soy Technologies, LLC

www.soytek.com/home.html