Overview of Available Biobased Commercial Materials and Services

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About AURI

- AURI helps develop new uses for agricultural commodities

- AURI was created by the MN Legislature, and its mission is to foster long-term economic benefit through value-added agricultural products.

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AURI Focus Areas

Biobased Products

Coproducts

Food

Renewable Energy

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AURI Client Services

- Applied Research
- Technical Assistance
- Commercialization
- AURI Connects

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AURI Client Services

- Research
  - Through practical, applied research, AURI identifies emerging opportunities to add value to agriculture products.
- AURI Connects
  - With a broad range of networks, AURI supports ongoing, purposeful connection of resources and partners along the value chain.
- Commercialization Services
  - Economic feasibility assessments
  - Product mix formulation
  - Counsel on scaling up production size
  - Product and process development
  - Product evaluation and testing

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Statewide Economic Impact

$310.6 Million

Contribution to Economy by AURI-assisted projects

$168.8 Million

Economic Contribution of Capital Investments

$89.9 Million

Estimated New Capital Investment to Date

605

Estimated # of Jobs Created and Retained

$141.8 Million

Economic Contribution of Annual Operations

$139.3 Million

Estimated Potential Future Capital Investment

606

Estimated # of Future Jobs Created and Retained

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AURI Biobased Facilities and Capabilities

- **Analytical Chemistry Lab**
  - Chromatography
  - Spectroscopy
  - Wet chemical analysis
  - Physical characterization

- **Biobased Products Lab**
  - Chemical processing of straw, stover and other biomass materials
  - Extraction and characterization of oils and high-value components from oilseed meal and other feedstocks
  - Transesterification and esterification reactions for demonstration of biodiesel processing
  - Small-scale fermentation and digestion processes for production of fuels
  - Distillation and evaporation for process development

- **Coproducts Utilization Laboratory**
  - Grinding
  - Milling
  - Blending
  - Pelleting
  - Drying (mechanical and thermal)
  - Product characterization
  - Particle size analysis
  - Decortication
  - Oil filtration
  - Dehulling
  - Aspiration
  - Sieve Separation

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Examples* of Biobased Solutions

- Just Bio Fiber / Hempcrete
- Fibonacci, LLC / HempWood
- BioComposites Group / Terrafibre
- Demilec / HeatLok Soy
- RoofMaxx
- CORTEC
- Renewable Coating Solutions, LLC / BioSealcoat®
- BioSpan / RePlay

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Just Bio Fiber—Hempcrete Blocks

- Reinforced Structural building block made from hemp hurd, lime, natural minerals and water
- Strong vertical load bearing strength
- Highly fire resistant – 2 hr rating
- High R-value
- Sequesters carbon throughout life cycle
- Contributes to LEED and/or WELL credits
- Naturally regulates internal temperature and humidity (very breathable) while retaining heat due to high thermal mass
- Performed a variety of product tests to meet building codes

JustBioFiber
Structural Solutions


Declare.

Super Structural R-Value Modular Construction Block (SSR Block)
Just BioFiber Structural Solutions

Final Assembly: Calgary, AB, Canada
Life Expectancy: 100 Years
End of Life Options: Take Back Program, Salvageable/Reusable in its Entirety, Recyclable (100%)

Ingredients:

Hemp Hurd, Calcium Hydroxide, Calcium Carbonate, Calcium Magnesium Tetrahydroxide, Kaolin, Fibrous Glass, Styrene, Crystalline Silica

Living Building Challenge Criteria:

JBF-0001
VOC Content: N/A
Declaration Status

EXP. 01 APR 2018
VOC Emissions: N/A
■ LBC Red List Free
☐ LBC Compliant
☐ Declared

INTERNATIONAL LIVING FUTURE INSTITUTE™ declareproducts.com

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HempWood

Fibonacci cuts ribbons in $5.8M HempWood manufacturing plant in Calloway County

Hemp hardwoods, bioplastics expand crop use beyond CBD

HempWood is the most eco-friendly lumber product on the planet

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HempWood

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HempWood

Key Features

Renewable

All current and future HempWood production facilities can be used repeatedly without ecological degradation.

Sustainable

Our farming techniques are designed to keep up with demand and meet the needs of large scale orders regularly.

Price Competitive

Several factors determine the final sales price, but our goal is to be price competitive with US domestic oak by 2020.

Carb 2 Compliant

We use Carb 2 Compliant bonding agents to turn hemp fibers into a viable wood substitute.

Fast Growth Rate

It only takes 6 months to mature our industrial hemp plants for lumber production.

20% Stronger

HempWood products made by Fibonacci, LLC are 20% stronger than oak.

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HempWood

Product Specs:

- Density: 60 lbs/ft 3
- Hardness: 2,600 Janka
- Stability: 20% Greater than Solid Oak
- MC: 10-14%
- No Added Formaldehyde

Uses:

- Flooring
- Furniture
- Counter Tops
- Wood Walls
- Picture Frames

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Terrafibre—Erosion Control Blanket

BIOCOMPOSITES GROUP

Rolled erosion control blankets provide temporary soil erosion protection until vegetation assumes this function. Typically these mats are made from straw and/or coconut fibres with a non-biodegradable polypropylene netting. Terrafibre blankets are made from Canadian hemp fibres, are 100% biodegradable and are created without the use of polypropylene netting. The Scrim Backing consists of 100% recycled material with a minimum 40% being post consumer content. String reinforcement is made of 100% biodegradable rayon with three openings per linear inch.

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Terrafibre—Erosion Control Blanket

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HEATLOK SOY—Soy-Based Foam Insulation

HEATLOK SOY® | 200+

HIGH R

DEMILEC

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HEATLOK SOY—Soy-Based Foam Insulation

TECHNICAL DATA SHEET

Heatlok Soy® 200 Plus is a two component, closed cell, spray applied, rigid polyurethane foam system. This product uses recycled plastic materials, rapidly renewable soy oils, and the blowing agent has zero ozone depleting potential. Heatlok Soy 200 Plus complies with the intent of the International Code Council's residential and commercial building codes and is commonly used as a thermal insulation, air barrier, vapor retarder and water resistive barrier in above grade, below grade, interior and exterior applications.

PHYSICAL PROPERTIES			
ASTM D 1622	Density	2.1 lb/ft³	33.6 kg/m³
ASTM C 518	Initial Thermal Resistance (R-value @ 1 inch) See ESR for additional R-value information	7.4 ft²h°F/BTU	1.3 Km²/W
ASTM E 283	Air Leakage @ 75 Pa @ 1"	< 0.02 L/sm²	
ASTM E 2178	Air Permeance @ 75 Pa @ 1"	< 0.02 L/sm²	
ASTM E 2357	System Air Leakage Rating, After Wind Conditioning @ ΔP = 75Pa	< 0.0022 L/sm²	
ASTM E 2357	Penetrations Check; Continuity at Penetrations; @ reference air leakage	Pass	
ASTM E 96	Water Vapor Permeance @ 1.42" Qualifies as a Class II vapor barrier per IBC Section 202	< 1 perm	< 57.2 ng/Pa•s•m²
ASTM D 1621	Compressive Strength	28.7 psi	198 kPa
ASTM D 1623	Tensile Strength	46.2 psi	319 kPa
ASTM D 2126	Dimensional Stability @ 158°F (70°C) 97% R.H. (168 hrs, sample without any substrate)	(% volume change) -1.37 / -0.42 / +0.27	
CA 01350	VOC Emissions Standard	Compliant	
ASTM C 1338	Fungi Resistance	No fungal growth	
ASTM D 2856	Closed Cell Content	- 90%	

FIRE TEST RESULTS		
ASTM E 84	Surface Burning Characteristics, 4" thick Flame Spread Index Smoke Developed	Class I 20 400
NFPA 286	Ignition Barrier – Compliant with 2009, 2012, 2015 & 2018 IBC and IRC, and ICC-ES AC-377 Appendix X, for use in attics and crawl spaces without a prescriptive ignition barrier, thermal barrier or intumescent coating.	Pass
NFPA 286	Thermal Barrier – Compliant with the 2009, 2012, 2015 & 2018 IBC and IRC, as an interior finish without a 15 minute thermal barrier with DC-315 at 18 mils wet film thickness, 12 mils dry film thickness, or Blazelok™ TBX at 18 mils wet film thickness, 12 mils dry film thickness.	Pass
ASTM D 1929	Ignition Properties (spontaneous ignition temperature)	932°F (500°C)

RECYCLED & RENEWABLE CONTENT	
Polyols Containing Recycled and Renewable Content	- 40%
Renewable Content	13.5%

REACTIVITY PROFILE			
Cream Time	Gel Time	Tack Free Time	End of Rise
0 – 1 seconds	2 – 4 seconds	3 – 5 seconds	4 – 6 seconds

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HEATLOK SOY—Soy-Based Foam Insulation

LIQUID COMPONENT PROPERTIES*		
PROPERTY	A-PMDI ISOCYANATE	HEATLOK SOY 200 PLUS RESIN
Color	Brown	Blue-Green
Viscosity @ 77°F (25°C)	180 – 220 cps	350 – 550 cps
Specific Gravity	1.24	1.18 – 1.21
Shelf Life of unopened drum properly stored	12 months	6 months
Storage Temperature	50 – 100°F (10 – 38°C)	< 70°F (21°C)
Mixing Ratio (volume)	1:1	1:1

*See SDS for more information.

RECOMMENDED PROCESSING CONDITIONS*		
Initial Primary Heater Setpoint Temperature	110°F	43°C
Initial Hose Heat Setpoint Temperature	110°F	43°C
Initial Processing Setpoint Pressure	1200 psi	8274 kPa
Substrate Temperature	Summer > 50°F Winter > 20°F	Summer > 10°C Winter > -7°C
Moisture Content of Substrate	≤ 19%	≤ 19%
Moisture Content of Concrete	Concrete must be cured, dry and free of dust and form release agents.	

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HEATLOK SOY—Soy-Based Foam Insulation

LEED FOR NEW CONSTRUCTION IMPACT

The following is intended to serve as an outline for contribution to the overall LEED certification of a project when using Heatlok® Soy 200 Plus spray polyurethane foam insulation manufactured by Demilec. Demilec's Building Science Department can be consulted regarding questions with the inclusion of this product in a project seeking LEED certification.

LEED for New Construction is designed primarily for new commercial office buildings, but may be applicable to other building types. Any structure defined as commercial by the applicable building code is eligible for certification as LEED for New Construction buildings.

The following credits will be addressed: EA1, MR4, MR6, IEQ4.1, IEQ7.1

EA Credit 1: Optimized Energy Performance (1-19 points)

INTENT: To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

REQUIREMENTS: Select 1 of the 3 compliance path options. Project teams documenting achievement using any of the 3 options are assumed to be in compliance with EA Prerequisite 2: Minimum Energy Performance.

RECOMMENDED OPTION: Whole Building Energy simulation (1-19 points)
Demonstrate a percentage improvement in the proposed building performance rating compared with the baseline building performance rating. Calculate the baseline building performance according to Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda) using a computer simulation model for the whole building project. The minimum energy cost savings percentage for each point threshold is as follows:

NEW BUILDINGS	EXISTING BUILDING RENOVATIONS	POINTS
12%	8%	1
14%	10%	2
16%	12%	3
18%	14%	4
20%	16%	5
22%	18%	6
24%	20%	7
26%	22%	8
28%	24%	9
30%	26%	10
32%	28%	11
34%	30%	12
36%	32%	13
38%	34%	14
40%	36%	15
42%	38%	16
44%	40%	17
46%	42%	18
48%	44%	19

Heatlok Soy 200 Plus spray polyurethane foam insulation will contribute to a more effective building envelope. The air seal created when using this product will tighten up the envelope allowing the HVAC system to more efficiently heat and cool the occupied space of the building.

Refer to the chart above for an outline of available points. Example: An increased efficiency of 12% above the baseline building performance will earn 1 point toward this credit for new construction, while a 48% increase over the baseline performance will earn 19 points (project specific).

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ROOF MAXX

A powerful, all-natural roof shingle sealer-rejuvenator derived from soybean oil

Earth-friendly. Roof Maxx is a renewably sourced, bio-based alternative to roof replacement or the application of traditional roof sealants. It is 100% safe for people, pets, property, and the environment.

Affordable. A single treatment costs an average of $1,500–up to 90 percent less than a roof replacement.

Effective. Roof Maxx can help extend a roof's life by up to 15 years.

USDA CERTIFIED BIOBASED PRODUCT
PRODUCT 86%

FIVE TESTS. ONE RESULT. SIGNIFICANTLY IMPROVED

The Ohio State University conducted testing on Roof Maxx and found that:

Roof Maxx restored the flexibility of 17-year old roof shingles, successfully passing the same materials testing required for new roof shingles.

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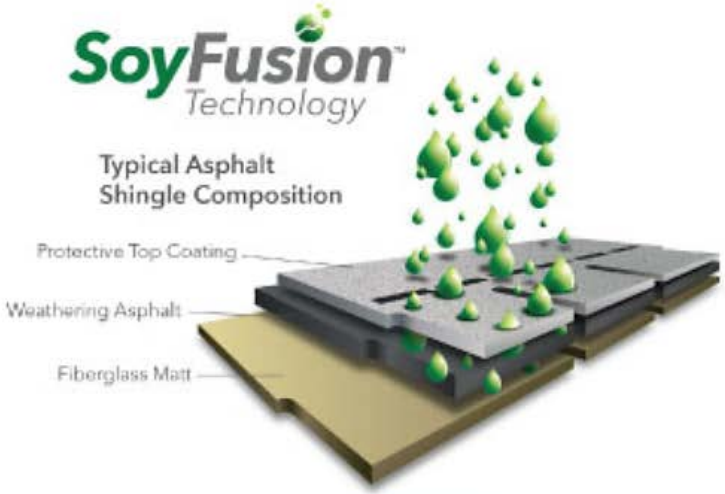
ROOF MAXX

Roof Maxx's primary component is soybean oil methyl esters. Soy-Fusion Technology allows millions of microbeads of oil to penetrate the shingle, restoring its flexibility and pliability and enhancing adhesion of the protective mineral granules.



MINNESOTA SOYBEAN

OHIO SOYBEAN COUNCIL

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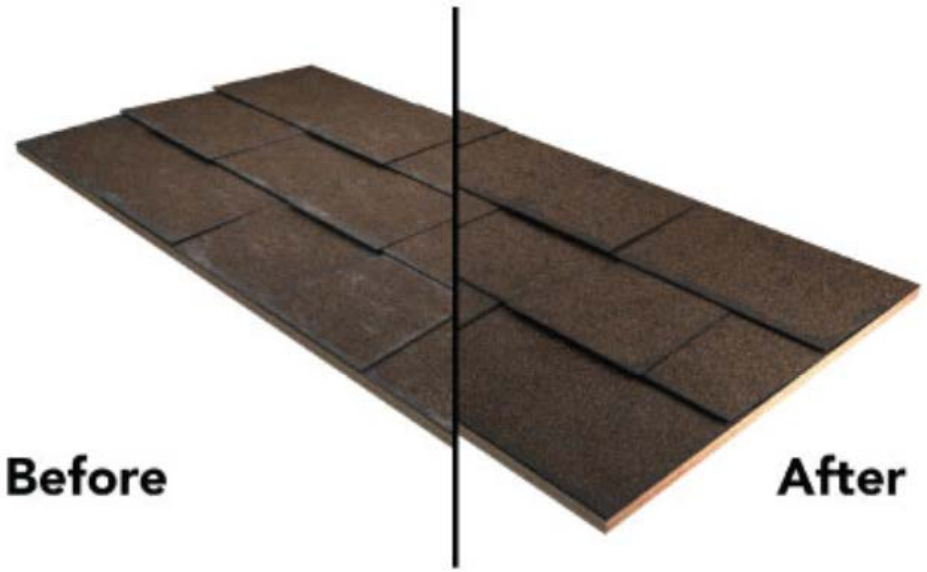
ROOF MAXX



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CORTEC

Admixtures

MCI admixtures work independently of chlorides, protect even when cracks occur, and can actually delay set time for better workability.

Surface Treatment

MCI can be applied to existing structures as a surface treatment that reduces corrosion rates.

Restoration

MCI is important for ensuring the longest possible lifespan of concrete restoration projects.

Specialty

In addition to Migrating Corrosion Inhibitors, Cortec offers products for concrete cleaning, rebar storage, and rust conversion.

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CORTEC

CORTEC CORPORATION
Environmentally Safe VpCI®/MCI® Technologies

MCI — MIGRATING CORROSION INHIBITORS FROM GREY TO GREEN
ISO/IEC-17025 LABORATORY TESTING ACCREDITED
ISO 9001 CERTIFIED QUALITY SYSTEM REGISTERED
ENVIRONMENTAL ISO 14001 CERTIFIED SYSTEM REGISTERED

Durability and Sustainable Construction

Sustainable construction has become a goal for owners across the globe. While much attention has gone to reducing cement use and minimizing power and water consumption, an often overlooked aspect is the durability and service life of the final structure. However, this is undoubtedly one of the key parameters influencing structural sustainability. By using MCI in severely corrosive environments, structures will have a stronger resistance to corrosion and therefore possess greater durability. Increased durability will mean fewer repairs, greater structural integrity, and a longer service life, all leading to greater sustainability. MCI is made from a renewable raw material, enabling users to earn certain LEED credits. It is an excellent addition to building projects around the world seeking to meet sustainability standards such as the Estidama Pearl Rating System and BREEAM.

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RCS

THE BIOSEALCOAT® DIFFERENCE

Protects Against:

Oil, gas and salt damage
AntiFreeze
Oxidation from UV light

Benefits

Stays rich black longer
No lingering tar smell
Dries fast, giving quicker access

Natural Soybean Oil

Low Odor, PAH-FREE
Reduces dependence on petroleum
Boosts demand for domestic soybeans

RCS RENEWABLE COATING SOLUTIONS

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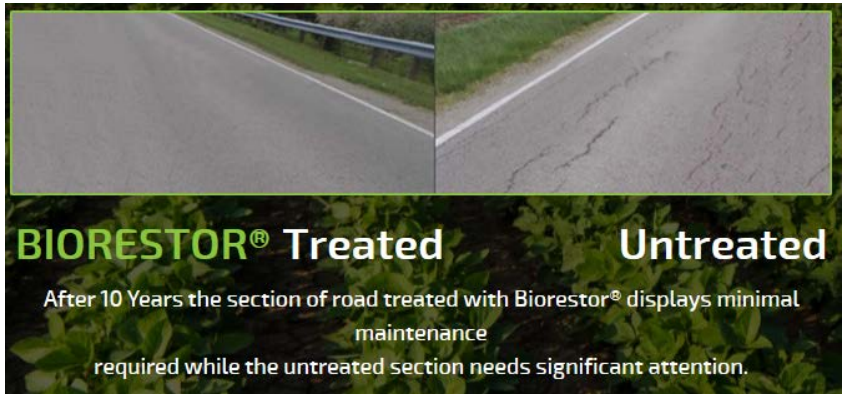
BIOBASED SPRAY SYSTEMS LLC

Local, county and state agencies are finding preservation the only financial option to improve their road systems. BIORESTOR® products from BioBased Spray Systems LLC preserve your roads with innovative techniques in an eco-friendly manner.

BIORESTOR® Benefits:

- Reduces Cracking
- Increases Flexibility
- Increases Penetration (Softness)
- Decreases Viscosity (Brittleness)
- Reduces Ravel & Pot Holes
- Field Tested Since 2004



BioPreferred

USDA United States Department of Agriculture BioPreferred

USDA CERTIFIED BIOBASED PRODUCT PRODUCT 95%

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BioSpan Technologies

RePlay Agricultural Oil and Preservation Agent for Asphalt Surfaces

PATENTED BIOBASED TECHNOLOGY THAT DOESN'T HARM THE ENVIRONMENT

BioSpan

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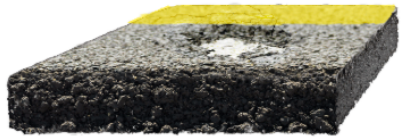
BioSpan Technologies

Preserve, don't repave, with RePlay

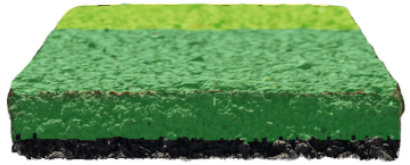
88% Biobased Agricultural Oil and Preservation Agent for Asphalt

RePlay Protects and Preserves Asphalt



WITHOUT MAINTENANCE REPAVING IS INEVITABLE

Left untreated, asphalt begins to show wear and tear soon after paving. Potholing, raveling and other structural issues are kept at bay with RePlay. Repaving is costly, inconvenient and inefficient. RePlay keeps traffic moving when used every few years.



APPLY REPLAY TO RESTORE AND PROTECT

When used on asphalt in good condition, one application of RePlay maintains asphalt for years to come. It sprays on with precision and sinks into the matrix, up to 1 ¼" deep, where it restores polymers in the binder.

TREATED ASPHALT LASTS LONGER

With the surface and the matrix below protected, asphalt's good condition is maintained for 5+ years after applying RePlay. The solution dries clear, so there's no need to restripe. RePlay saves time, labor and money.

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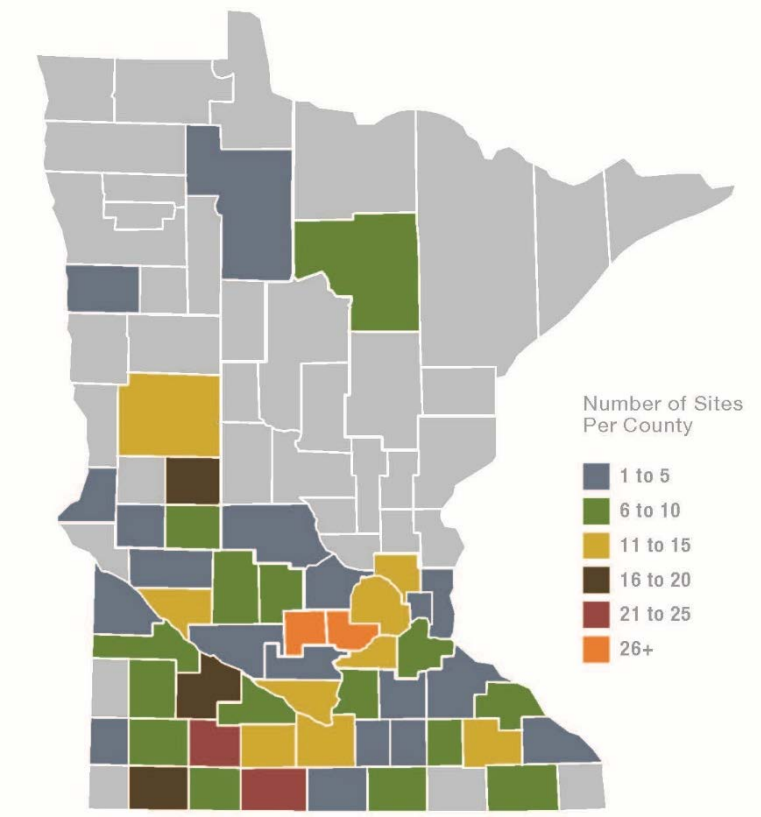
BioSpan Technologies



This map will be updated annually.

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BioSpan Technologies - RePlay

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Where to Buy Biobased Products*

For information on Biobased Materials Manufacturers, please visit AURI's website at AURI.org.

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Questions

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