bioseal

penetrate / protect / preserve

A Bio-Based Solution

for *Preserving Asphalt*

and helping roads and other paved surfaces last longer

In the U.S., we've reached a critical fork in the road.

Our highway system rated a grade of D minus in the most recent "Report Card for America's Infrastructure," published in 2009 by the **American Society of Civil Engineers.** That's down from a D in the 2005 ASCE report card.

Why? ASCE says:

- Increasing traffic (vehicle miles are up 80% from 1980, while lane miles increased by just 4%)
- Rising cost of materials (including the price of oil, from which asphalt is derived)
- Static tax revenue
- Budget shortfalls that have put federal, state and local governments further behind in maintaining roads

Plus … there's the issue of **declining asphalt quality** – a result of advanced oil refining technology.

Today's refineries extract valuable resins and oils that fetch high dollar to produce plastics, synthetic rubbers, perfumes and cosmetics.

This loss of resins and oils decreases asphalt's glue-like ability to hold aggregate together. As a result, **asphalt pavement doesn't last as long as it used to –** 15 to 20 years or more. In February 1995, however, *Roads and Bridges* magazine reported, **"The average service life of an Ohio road is 8.2 years."** This statistic comes from an Ohio Department of Transportation study.

What's the solution for improving our roads?

Many experts favor **asphalt preservation or rejuvenation**.

At the Transportation Systems 2000 (TS2K) Workshop in San Antonio, Texas, Robert E. Boyer, Ph.D., P.E., senior district engineer of the Asphalt Institute, said:

> *"Using a rejuvenator on new construction does not seem to be logical at first glance. However, it has been established that the greatest change in composition of an asphalt binder takes place during the manufacture of the hot mix asphalt (HMA).* ***Applying a rejuvenator to a new surface a few weeks after it has been laid does several things to the pavement.*** *Besides restoring the original asphalt properties that were lost in the HMA manufacture, the chemical* ***assists in sealing the pavement as well as in improving the durability of the surface course."*** (His full report is linked to the home page of www.biorestor.com, under "Asphalt Institute says….")

More recently, the **American Association of State Highway and Transportation Officials (AASHTO)** stated in its 2009 report "Rough Roads Ahead: Fix Them Now or Pay for It Later":

> ***"Good roads cost less.*** *That is why* ***pavement preservation is such an important part of asset management.*** *The* ***goal is to extend the service life of roads before they need major rehabilitation or replacement****. Maintaining a road in good condition is easier and less expensive than repairing one in poor condition. Costs per lane mile for reconstruction after 25 years can be more than three times the cost of preservation treatments over the same 25 years and can extend the expected service life of the road for another 18 years."*

Allen D. Biehler, president of AASHTO and Pennsylvania DOT secretary, adds, "We as transportation stewards of the system have no choice but to drive home the message that **maintaining an acceptable condition for our highways — *preserving the system* — is vital to our country's future."**

At an estimated value of $1.75 trillion, our system of roads and highways is a key to driving our economy forward as it enables efficient movement of goods and people.

AASHTO drives home the dollars *and commonsense* of asphalt preservation: **Every dollar spent to preserve and maintain a road** *when it's still in good condition* **saves $6-14** in prevented reconstruction costs.

As Ben Franklin said, *"An ounce of prevention is worth a pound of cure."*

Introducing Biorestor®: A Bio-Based Solution

BioBased Spray Systems, LLC of Sidney, Ohio, has developed an asphalt rejuvenator/sealer, called Biorestor®. This patented formulation has been **proven to extend the lifespan of asphalt**.

When applied at the right time – soon after a road is paved *and* when it is still in good condition – Biorestor (pronounced *BYE-o-rih-STORE*) is **formulated to restore the durability and flexibility of asphalt that is lost through the hot mix process and oxidation** – the wearing effects of sun, rain and traffic**.** As it preserves and extends the life of asphalt on roads and other paved surfaces, **it saves the cost of expensive road repairs.**

Biorestor is unique among asphalt preservation products. It is **made of 100% natural, agricultural products** – specifically, soybean oil. It **adds a polymer to the asphalt binder to create a more oxidation-resistant material**, adding to a pavement's lifespan.

How Biorestor Works

Costing about 10% of the cost of paving, Biorestor treatments can be applied every three to five years to indefinitely extend pavement life.

- Biorestor is sprayed on pavement. On contact, it seals and penetrates asphalt. Biorestor penetrates deep into pavement, so no sand is needed.
- It cures in as little as 20 to 30 minutes, minimizing the time roads, parking lots or runways have to be closed.
- Biorestor is mildly opaque. Line striping shows right through after treatment.

- Biorestor adds agricultural oils and polymers to the top half inch of asphalt pavement. It improves penetration, viscosity, stability and flexibility, restoring asphalt to as near its original performance condition.
- It prevents raveling and cracking, as it protects against the harmful oxidizing effects of water, the sun's ultraviolet rays and traffic.
- Biorestor seals asphalt surfaces, preventing moisture from penetrating and creating potholes as it freezes and thaws. It also reduces construction joint failure.
- Biorestor delivers maximum benefit and cost savings when applied as soon as possible after paving. That's because oxidation begins the moment asphalt is laid. Research shows that 40 to 60% of oxidation damage occurs in the first two to four years.
- However, the longer preservation treatment with Biorestor is delayed, the greater the chance a road will deteriorate beyond the point that preservation will be effective – and when expensive repair will be required.
- Biorestor causes little or no change in friction value.
- Biorestor postpones or completely eliminates the need for chip seal applications that can cause chipped paint or cracked windshields.

(insert in text box within the "How Biorestor Works" section)

Biorestor Plugs 'the Hole'

Most asphalt jobs require a compaction test with a 95% pass rate. A 95% test means that in a square meter of pavement there's a collective area about the size of an 8½-by-11-inch piece of paper (about 5%), which is essentially a hole that allows water to pour in. Now, picture a 1,000-square-meter parking lot with 1,000 8½-by-11-inch pieces of paper laid out, one for every square meter. This represents a lot of holes. And that gives you a pretty clear picture of how easily water can penetrate an asphalt surface – plus, a good vision for the value of sealing asphalt from Day One to plug the holes and prevent the potholing and other damage water can cause.

Sealing pavement against water is one of the key roles of Biorestor.

Environmental/Health Advantages of Biorestor

Made from 100% agricultural oils, **Biorestor is safe for the environment**. It is **petroleum-free**.

Biorestor has **earned the United States Department of Agriculture's BioPreferred™ status**, a federally-managed program that promotes purchase of renewable, sustainable, bio-based products.

In contrast to Biorestor, many commonly used surface sealers and rejuvenators are petroleum or coal tar derived. These products have been classified as carcinogenic and contain a class of chemicals, polycyclic aromatic hydrocarbons (PAHs), which can pollute the atmosphere and water, according to a report released in 2009 in *Environmental Health News* (http://www.environmentalhealthnews.org/ehs/newscience/coal-tar-sealcoats-release-pahs).

Overall, the practice of asphalt preservation reduces the use of oil and oil-based products, such as asphalt, as it prevents or delays the need for highway rehabilitation and reconstruction. The Foundation for Pavement Preservation reports that highway preservation uses up to 80% fewer resources than highway rehabilitation and reconstruction programs.

Biorestor Passes the Test

In the laboratory and on the road, **testing has proved that Biorestor extends the lifespan of asphalt** pavement by restoring flexibility lost in the hot mix process and reducing the effects of oxidation and age hardening.

In the Laboratory

In 2004, Bowser-Morner, Inc., a private laboratory in Dayton, Ohio, tested specimens cured under laboratory controlled conditions to accelerate aging to an assumed age of five years. Compared to untreated specimens the Biorestor-treated specimens showed:

29% improved penetration value of the treated binder (ASTM D-5)
45% improved viscosity value of the treated binder (ASTM D-2170)
17% improved Marshall stability value of compacted mix (ASTM D-6927-06)

Bowser-Morner reported, "This series of tests demonstrated that (Biorestor) reduced the effects of oxidation and age hardening of asphalt binders by reducing the rate of hardening of the binder resulting in an extended life of a pavement." (The full report can be read at www.biorestor.com, under "Our Product/Testing" tabs.)

On the Road

ASTM D6433-03 and MicroPAVER™ Pavement Management System Test

Conducted in late 2011 by JG3 Consulting, LLC, of Heath, Ohio, this study compared sections of a Darke County, Ohio, road that were paved on the same day in 2004 – one treated with Biorestor, the other not:

- The Biorestor-treated section scored a Pavement Condition Index ranking of 75 – *good* condition. That's a loss of 3.5 condition points a year

- The non-treated section scored a 64 – a *fair* rating – or a loss of 5.1 points a year

The report concluded: "(T)he section treated with Biorestor is at a much slower rate of deterioration vs. the section that was not treated." Specifically, **Biorestor slowed the rate of deterioration by 40%.**

The inspector's report further concludes: "Based on my experience with asphalt based surface types, rates of deterioration and the ASTM inspection methodology, it is clearly evident that the product Biorestor inhibits the oxidation process while providing for increased flexibility and a longer lifespan of pavements treated after paving."

ASTM E-965 Pavement Macrotexture Depth Test

Conducted in October 2011 by Bowser-Morner, this testing found that **sections of Ohio State Road 119 treated with Biorestor experienced 11-21% less loss of aggregate** than untreated sections of the road. The treated and untreated sections had been paved in September 2010, and Biorestor was applied to the treated sections on October 7, 2010.

ASTM E-274 Lockwheel Friction Test

Conducted in 2003 by the Transportation Research Center, Inc., of East Liberty, Ohio, this testing compared the friction values of two treated sections of road with an untreated, control section. The Biorestor-treated sections maintained safe friction values.

Grip Tester – Runway Friction Test

This test, conducted in ????, compared friction values of Biorestor-treated sections and untreated sections of a runway at Tyndall Air Force Base in Florida. The friction values of the treated sections fell within safe ranges.

For more information…

To learn more about BioSeal and Biorestor and for more detailed information on the test results, please visit www.biosealusa.com