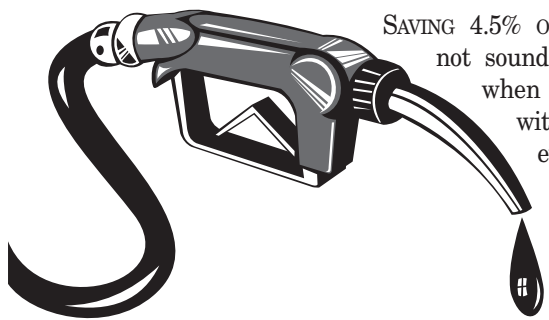




CENTERLINE

PAVEMENT DESIGN

Smooth Pavement Savings Have Same Effect as Taking 10 Million Cars off the Road



SAVING 4.5% ON ANYTHING MAY not sound like much, but when you're dealing with large numbers, even the smallest percentage can translate to a pretty substantial figure.



Some researchers claim potential reductions in fuel consumption of up to 10% with rehabilitation of the roughest surfaces

That's certainly the case when you consider the amount of vehicle fuel that Americans burn on an annual basis.

In the U.S., we drive an average of 3 trillion miles per year, and consume 175 billion gallons of vehicle fuel doing it. Reduce that consumption rate by just 4.5%, and suddenly you're talking about an annual savings of more than 7 billion gallons of gasoline. It's the environmental equivalent of taking 10 million cars off the road each year.

Smoothness is the Most Significant Factor

The relationship between various pavement characteristics and fuel economy is a topic that has been explored for at least 30 years. There are three pavement traits most commonly evaluated for their capacity to influence fuel economy: tire/pavement rolling resistance, pavement stiffness and pavement smoothness.

1. Tire/pavement rolling resistance describes the loss of a vehicle's energy caused by contact between the tires and the pavement. The loss of vehicle energy due to contact with the road is small compared to other forces such as wind resistance, and bears little effect on fuel efficiency. A reduction of 5-7% in rolling resistance, for example, boosts fuel efficiency by less than 1%.
2. Pavement stiffness is an indicator of pavement strength. Stiffer pavements can reduce fuel consumption by .005% to .5% depending on vehicle type. Overall fuel consumption savings are minimal at best.
3. Pavement smoothness affects rolling resistance by reducing friction between the tire and the pavement. A study at the WesTrack test track in Nevada showed potential

fuel consumption savings of up to 4.5% with just slightly smoother pavements, and even higher savings rates when comparing extremes (the roughest pavements compared to the smoothest ones). Some researchers claim potential reductions in fuel consumption of up to 10% with rehabilitation of the roughest pavement surfaces.

Smooth Pavements Save in More Ways Than One

Smooth pavements save money in several ways, but they also save other critical resources.

- Along with reduced fuel consumption, drivers who travel on smoother roads spend less on vehicle maintenance. Driving on rough roads costs American motorists an average of \$23 billion per year in additional vehicle operating expenses.
- Smoother roads last longer. With less "tire bounce" inherent with rougher pavements, a smooth pavement surface endures a much slower rate of deterioration. Studies show that improving smoothness by just 25% can lengthen the lifespan of a pavement by as much as 10%. This saves taxpayer dollars that would other-

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Smooth Pavement Savings – Continued

wise be spent for more frequent road repair, and also conserves the natural resources consumed by more frequent rehabilitation or reconstruction.

- With less fuel consumed on smoother roads, there are consequently fewer emissions released into the atmosphere. The 4.5% reduction in fuel consumption made possible by smoother pavements produces the same effect as taking 10 million cars off the road each year.

Asphalt is Smoother

Several attempts have been made to compare the difference in fuel consumption rates between asphalt and concrete driving surfaces. Because 94% of U.S. roads are paved with asphalt, it is extremely difficult to draw a valid comparative conclusion while holding all other influential factors (like traffic flow, terrain, smoothness, wind, temperature, tire inflation, driver behavior, and others) equal. Attempts to do so have shown little variation between the two surfaces in terms of the influence of the paving material itself on fuel consumption.

What is clear from the comparative attempts, however, is support for the conclusion of

the WesTrack project: fuel consumption is influenced by pavement roughness (or smoothness). Smoother pavements – without a doubt – save more fuel.

Because smoothness has such capacity to reduce demand for resources, its consideration should play an important role in pavement management

In Oregon and around the country, Department of Transportation data shows that asphalt pavements are built initially smoother than concrete. And when properly maintained and managed they maintain their smoothness edge over time. In states where the smoothness specifications differ between asphalt and concrete paving surfaces, the requirements for asphalt surfaces are higher in every case.

Managing Pavements for Optimum Smoothness

Because smoothness has such capacity to reduce the demand

for economic resources and fuel and other natural resources, its consideration should be part of an agency's pavement management system, and play an important (if not dominant) role in the decision making process.

Asphalt pavements are best suited to provide optimum smoothness for a number of reasons. First, they are routinely built smoother at the outset than other pavements. Second, thin asphalt treatments (thin lift overlays) can be used as a preventive maintenance treatment while improving smoothness simultaneously. Third, with the perpetual pavement concept, milling and filling the pavement surface at 15-20 year intervals completely restores the pavement to like-new smoothness.

The pavement management options that are unique to asphalt allow the pavement manager

to optimize pavement smoothness, condition and economy over the life of the roadway. These options also prevent the pavement from deteriorating to the point it has poor smoothness and requires major rehabilitation or replacement to restore its condition to an acceptable level.

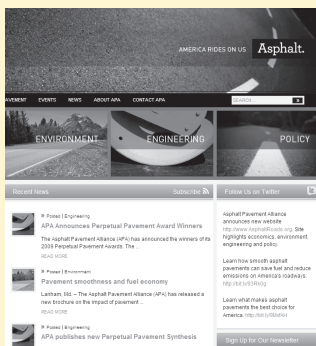
In Summary

Smooth pavements save fuel, reduce vehicle maintenance costs, require less frequent major rehabilitation, and conserve natural resources. By reducing fuel consumption, smoother pavements also reduce vehicle emissions that would otherwise be released into the atmosphere.

By starting with a good design and employing appropriate pavement management, asphalt pavements can provide significant returns – both economically and environmentally – for years to follow. ▲



BITS & PIECES



The Asphalt Pavement Alliance recently launched a new website at www.asphaltroads.org. The site includes useful information targeted to a wide range of audiences, from DOT engineers to top-level policy makers, elected officials and the general public.

The site is organized into general subject areas of Economics, Environment, Engineering and Policy.

“The new site makes it as easy for a DOT engineer to download the APA's lifecycle cost software as it does for an environmentalist to learn about asphalt's green track record,” said **Bob Glenn** of Lakeside Industries and co-chair of the team that created the site. “The site houses all the publications and materials the APA has produced this year, including a policy

white paper, a synthesis document on perpetual pavements, a brochure on fuel savings from smooth roads, and a flyer promoting the use of LCCAExpress software,” he added.

The Asphalt Pavement Alliance is a coalition of the Asphalt Institute, the National Asphalt Pavement Association, and the State Asphalt Pavement Associations.

The Asphalt Pavement Association of Oregon, Inc., (APAO) is dedicated to promoting the use of asphalt concrete by developing customer driven programs to enhance quality and excellence in all aspects of asphalt technology. We believe that the key to growth and prosperity in the industry is continuous quality improvement obtained through active association membership, positive customer relationships, education, and training.

MEMBERS

For quality asphalt projects, call one of our members.

Regular Members: Baker Rock Resources; Bayview Transit Mix, Inc.; Brix Paving Co.; CEMEX USA; Central Oregon Pavers, Inc.; Copeland Paving, Inc.; Eagle-Eisner; Eugene Sand & Gravel, Inc.; Granite Construction; H & H Paving Co.; Hal's Construction; Harney Rock & Paving Co.; High Desert Aggregate & Paving, Inc.; Hooker Creek Asphalt & Paving LLC; Humbert Asphalt; J F Shea Construction, Inc.; K.F. Jacobsen & Co., Inc.; Kerr Contractors; Klamath Pacific Cos.; Knife River - Coast Division; Knife River - Klamath Falls Division; Knife River - Northwest Division; Knife River - Roseburg Division; Knife River - Southern Oregon Division; Kodiak Pacific Construction Co.; Lakeside Industries; Laskey-Clifton; Mt. Hood Asphalt Products; North Santiam Paving Co.; Oregon Mainline Paving, LLC; Pacific Paving, Inc.; Pioneer Asphalt, Inc.; Porter W. Yett Co.; Portland Road & Driveway; Road & Driveway Co.; Robco, Inc.; Rogers Asphalt Paving Co.; Roy L. Houck Construction; S-C Paving Co.; Salem Road & Driveway Co.; South County Asphalt, LLC; TFT Construction; Tidewater Contractors, Inc.; Vancouver Paving Co.; Wildish Sand & Gravel Co.

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For member contact information, visit www.apao.org and click the membership tab.

CENTERLINE is published four times a year by:
Asphalt Pavement Association of Oregon
5240 Gaffin Road SE, Salem, OR 97301
Ph (503) 363-3858 Fax (503) 363-5571

President: **Jason White**
Vice President: **Matt Seehawer**
Secretary/Treasurer: **Mark Bauer**
Executive Director and Editor: **Jim Huddleston**

Conference Focuses on Sustainability

THE 16TH ANNUAL OREGON ASPHALT Conference and 40th Annual Paving Awards were presented in Eugene on February 23. The conference theme was *Quality Sustainable Asphalt Today and Tomorrow*.

The one-day conference was packed with information over the course of seven sessions, including:

- *Sustainable Asphalt, Now and Tomorrow:* **Mike Kvach**, vice-president of product development for the National Asphalt Pavement Association, covered advancements in sustainable asphalt design and construction techniques.
- *Mix Design Lessons from the 2009 Season:* **Gary Thompson**, P.E. and training director for the Asphalt Pavement Association of Oregon, discussed the challenges, tips and techniques involved in implementing 80-gyraton Level 3 mix design.
- *Warm Mix in Oregon - Lessons Learned from 2009 Season:* A panel including **Mike Kvach**, **Dave Vogt** of Hooker Creek, **Matt Rodriguez** of the City of

Eugene and **Larry Ilg** of ODOT looked back on the "Oregon Experience" of 2009, when warm mix placement grew to 150,000 tons from only 200 tons the year prior.

- *Construction and Federal Funding Outlook for 2010:* **Doug Tindall**, ODOT deputy director, provided up-to-the-minute details on projects, timelines and dollar amounts the agency is outlining in anticipation of more stimulus-type funding from Congress as part of a federal jobs bill.
- *ODOT's Proposed New IRI Specification:* **Elizabeth Hunt**, P.E. of ODOT Pavements, covered plans for implementation of an improved smoothness specification in 2010 based on the International Ride Index.
- *Measuring Roadway Profiles - State of the Practice:* **Duane Covert**, president of Road Trac, Inc. shared expertise gained from his work with DOTs and contractors in four western states.
- *A Contractor's Experience Paving to Washington's IRI*

Specification: **Dave Bell**, P.E. and quality control manager for Lakeside Industries, relays his experience working with the Washington DOT to revise its IRI specification.

The Conference concluded with a banquet and presentation of 22 paving awards (winners listed by category below). These awards provide a great opportunity to showcase your company, your employees, and your most outstanding projects. The call for nominations is issued in late summer/early fall of each year - watch your mailbox! ▲



Cathy Nelson of ODOT presents award to Jeff Hurd of Hooker Creek

State Highway - High Volume

First: I-5: N Grants Pass - Jump Off Joe Section
Contractor: Oregon Mainline Paving
Agency: ODOT, Region 3, District 8

Second: I-405: Fremont Bridge to Marquam Bridge
Contractor: Knife River - Western
Agency: ODOT, Region 1, Crew 1802

State Highway - Low Volume

First: US 97: OR 31 Hwy Junction - Crescent
Contractor: Hooker Creek
Agency: ODOT, Region 4, District 10

Second: US 26: Salmon River Bridge - East Lolo Pass Road
Contractor: Jim Turin & Sons
Agency: ODOT, Region 1, District 2C

Third: OR 140: Modoc Billy Creek - Fish Hole Creek
Contractor: Roy L. Houck Construction
Agency: ODOT, Region 4, District 11

Special Project

First: Knutson Driveway - Agness
Contractor: Knife River - Coast

Second: Ben Johnson Driveway
Contractor: H&H Paving

Third: Collier State Park Campground
Contractor: Knife River - Klamath Falls
Agency: Oregon Parks & Rec Dept.

Commercial/Industrial

First: Portland International Airport - North Runway Extension Phase I
Contractor: Lakeside Industries
Agency: Port of Portland

Second: Hooker Creek Rental Yard
Contractor: Hooker Creek Companies

Third: Villa Candalaria Parking Lot
Contractor: H&H Paving

Smoothness

First: I-405: Fremont Bridge to Marquam Bridge
Contractor: Knife River - Western
Agency: ODOT, Region 1, Crew 1802

Second: US 97: OR 31 Hwy Junction - Crescent
Contractor: Hooker Creek
Agency: ODOT, Region 4, District 10

Third: I-5: N. Grants Pass - Jump Off Joe Sec.
Contractor: Oregon Mainline Paving
Agency: ODOT, Region 3, District 8

Urban Arterial

First: 2009 Pavement Preservation, Washington to High - Eugene
Contractor: Wildish Construction
Agency: City of Eugene

Second: SW 124th Avenue - Sherwood
Contractor: Knife River - Western
Agency: City of Tualatin

Urban Street

First: City of Albany Infrastructure Improvements
Contractor: North Santiam Paving
Agency: Balzhiser & Hubbard Engineers

Second: 40th Street - Newport, Hwy 101 - Oregon Coast Community College
Contractor: Road & Driveway
Agency: City of Newport

Third: US Dept of Veterans Affairs Southern Oregon Rehab Center
Contractor: Knife River - Southern
Agency: US Dept of Veterans Affairs

Rural Road

First: 2009 Washington County, Bald Peak Rd.
Contractor: Baker Rock Resources
Agency: Washington County

Second: Courtney Creek Drive - Hwy 228
Contractor: Wildish Construction
Agency: Linn County

Third: Blaine Road OR PFH 155-1
Contractor: High Desert Aggregate & Paving

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Asphalt Pavement
Association of Oregon

5240 Gaffin Road SE Salem, OR 97301

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IN THE FIELD

Thin-mix Overlays: Faster and More Economical



WHAT DO YOU DO WHEN A HIGH-traffic road needs surface repair, but traditional approaches aren't feasible? With average daily traffic of 25,000 vehicles per day, a lengthy closure for pavement maintenance is undesirable. That's what faced **Greg Clemmons**, the Operations Engineer with Washington County, when a stretch of Murray Boulevard in front of Nike's world headquarters needed attention.

The road exhibited signs of oxidation, showed some raveling and had minor cracking. Several treatment options were considered in addition to a thin-mix overlay, including application of a micro seal and a slurry seal.

Micro seals consist of fine aggregate combined with emulsified asphalt. A well-applied treatment typically lasts about seven years. "We tried this (treatment) years ago, and had some problems with it," Greg said. "We've heard some improvements have been made, but are watching other agencies for better results," he explained.

Slurry seals combine fine, sand-sized rock and emulsion, and are "squeegeed" onto the road. They are a popular choice for their ability to make the road look new, and can cover a large area inexpensively. They typically last five to seven years on higher volume roads like Murray. There is a 4-hour setup time for slurry seal applications, however, rendering them unfeasible for an extremely high-volume location.

Thin-mix overlays are typically comprised of 3/8-inch mix placed in a 1 to 1.25-inch lift thickness. They are appropriate for

pavements that are still in fairly good condition (pavement condition index, or PCI, of 70 or better). They are ideal as a preventive maintenance tool for areas that still possess structural integrity, but whose asphalt surface is worn or damaged. A thin lift cools quickly, however, so warm, dry weather is the best for ensuring proper compaction and optimum performance.

Greg chose to construct a thin-mix overlay – the first to be constructed in Washington County – at the Murray Boulevard site. With its fast setup time, the construction crew was able to complete the four-lane overlay in one day, closing the road one lane at a time for about 2 hours per lane. This option minimized traffic disruption and proved an even better solution economically than initially projected.

The initial cost of a thin-mix overlay is slightly higher than other thin treatments, but when averaged over its extended life

cycle (often two to three times longer than slurry or micro seals), the cost ends up being far less, saving agencies money and maximizing limited budgets.

The thin-mix overlay installation on Murray Boulevard was expected to last seven to ten years. The project has now been in place for almost ten years, and the County expects at least another five years (or more) of mileage from it. "It's in good shape other than some longitudinal cracking, and its PCI is still relatively high," Greg said.

In addition to long-term cost advantages, thin-mix overlays can improve appearance and ride quality, restore skid resistance, and add structural strength to the pavement. Washington County has applied thin mix treatments on low volume roads with similar success and projected life span increases. ▲