Bridge Preservation:

Thin epoxy overlays and anti-skid surfacing
Structurally Deficient Bridges

Source: US DOT, 2008

Graphic by Juan Thomassie, USA TODAY
Estimate to eliminate all bridge deficiencies:

$9.4 \text{ billion per year for 20 years}

Source: American Society of Civil Engineers, 2005
Through systematic, long-term management systems, states can produce stable conditions for the entire inventory of bridges for the lowest life-cycle cost. The goal is to find the right balance between fixing immediate problems, conducting preventive maintenance, and periodically replacing a reasonable number of old bridges to keep the health of its bridge population stable.

Source: AASHTO, 2008
Today, when funding is restricted and maintenance needs are increasing, preventive maintenance is even more important.
Pavement Preservation - Impediments

One major impediment to widespread implementation of preservation programs by transportation agencies is lack of knowledge on ... how to apply the right preservation action at the right time to the right pavement or the right bridge.

Source: FHWA, 2008
Experience has shown that when properly applied, preventive maintenance is a cost-effective way of extending the service life of highway facilities and therefore is eligible for Federal-aid funding.

These (treatments) include roadway activities such as joint repair, seal coats, pavement patching, thin overlays, shoulder repair, restoration of drainage systems, and bridge activities such as crack sealing, joint repair, seismic retrofit, scour countermeasures, and painting.

Source: FHWA, 2004
Benefits of Pavement Preservation program

A cost-effective means of meeting pavement performance goals by:

• improving the condition of the pavement
• delaying the rate of deterioration
• delaying the need for major rehabilitation
• giving higher customer satisfaction
• ability to make better, more informed decisions
• more appropriate use of maintenance techniques
• improving overall pavement conditions over time
• increasing safety
• reducing overall maintenance costs
High Friction Surfacing for thin epoxy overlays
High Friction Surfacing for thin epoxy overlays

Two component epoxy

High PSV bauxite or granite aggregate available in various colors
Performance Characteristics

Roadways with 3,500+ commercial vehicles per lane per day

- Approaches to and across major intersections
- Inclines of 5% to 10%
- Bends not subject to speed limits, with radius of 100-250 meters
High Friction Surfacing

- Extremely Durable Wearing Surface
  - Skid resistance value $\geq 70$
  - Initial texture depth $\geq 1.4$ mm
- Flexible, skid resistant and waterproof
- Fuel, Oil & De-Icer Resistant
- Provides Hazard Awareness
- Improves Braking Distance
- Reduces Hydroplaning
- Low Maintenance
High Friction Surfacing for thin epoxy overlays

The epoxy overlay is a deck protection system that has been successfully used for 27 years on conventionally reinforced concrete bridge decks. The epoxy overlay has been shown to prevent the infusion of ... chloride ions and can be expected to provide a skid resistance wearing and protected system for decks for 15 to 30 years depending on traffic volume. The epoxy overlay should perform just as well on post-tensioned segmental concrete bridge decks.

Source: FHWA & Virginia DOT, 2006
Bridge deck overlay
Wisconsin

Before
Installation

After
Bridge deck overlay
Massachusetts

Before

Installation

After
# Thin Epoxy Overlay: Typical Life-Cycle Costs ($/sq. yd.)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>15 year life</th>
<th>30 year life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grinding</td>
<td>$ 6</td>
<td>$ 6</td>
</tr>
<tr>
<td>Shot blast</td>
<td>$ 6</td>
<td>$ 6</td>
</tr>
<tr>
<td>Protection</td>
<td>$ 21</td>
<td>$ 21</td>
</tr>
<tr>
<td>Skid</td>
<td>$ 0</td>
<td>$ 0</td>
</tr>
<tr>
<td>Initial</td>
<td>$ 33</td>
<td>$ 33</td>
</tr>
<tr>
<td><strong>Life-cycle</strong></td>
<td><strong>$ 60</strong></td>
<td><strong>$ 33</strong></td>
</tr>
</tbody>
</table>

Source: FHWA, Virginia DOT, 2006
Evaluation of a High Friction Pavement Surface Treatment

It appears from this (Florida) study that the use of this high friction surface treatment may be a practical countermeasure for improving safety at locations that are prone to run-off-road crashes, such as sharp curves and interchange ramps.

Savolainen, Reddy, Pinapaka, Santos, and Datta
TRB Paper 2009
## Great Britain - Injury Accident Reduction Studies

<table>
<thead>
<tr>
<th>Location</th>
<th>All Accidents</th>
<th>Wet Road Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humberside</td>
<td>- 62 %</td>
<td>- 77 %</td>
</tr>
<tr>
<td>Greater Manchester</td>
<td>- 57%</td>
<td>N/A</td>
</tr>
<tr>
<td>London – study A</td>
<td>-30%</td>
<td>- 47%</td>
</tr>
<tr>
<td>London – study B</td>
<td>- 31%</td>
<td>-64%</td>
</tr>
<tr>
<td>Transport Research Laboratory – M4 study</td>
<td>- 45%</td>
<td>-63%</td>
</tr>
<tr>
<td>Transport Research Laboratory – skid sites</td>
<td>N/A</td>
<td>- 70%</td>
</tr>
<tr>
<td>Cornwall</td>
<td>- 63%</td>
<td>- 71%</td>
</tr>
<tr>
<td>Bedfordshire</td>
<td>- 45%</td>
<td>- 28%</td>
</tr>
<tr>
<td>Nottinghamshire</td>
<td>- 25%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Road Surface Treatments*, County Surveyors Society, England, 1990
Summary of British anti-skid accident reduction studies

<table>
<thead>
<tr>
<th>Percentage reduction</th>
<th>All accidents</th>
<th>Wet weather accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- 45%</td>
<td>- 60%</td>
</tr>
<tr>
<td>Range of change</td>
<td>25 - 62%</td>
<td>28 - 77%</td>
</tr>
</tbody>
</table>

9 studies

Road Surface Treatments, County Surveyors Society, England, 1990
Skid resistance – accident reduction

- **New York State DOT**
  
  (Improvement of skid resistance at specific sites) results in reductions of 50% for wet road accidents and 20% for total accidents.

NY DOT, Safety.transportation.org/htmlguides/RORcrashes/description_of_strat.htm, 1999
The purpose of this research was to identify types of surface treatments that effectively prevent the ingress of chloride ions into concrete bridge decks and to investigate the properties of each type. A literature review and a nationwide questionnaire survey of 20 state Departments of Transportation were performed. The findings suggest that epoxy-based surface treatments should be specified for concrete bridge decks when both a chloride barrier and improved skid resistance are desired.
HFS: installation

Mask off the work area
HFS: installation

Parts A & B are combined and mixed
HFS: installation

Resin is spread over the surface
HFS: installation

Stone is broadcast or spread using a dry squeegee.
HFS: installation

Masking is removed before resin fully sets
HFS: installation

When resin set, excess stone is swept off and can be reused.
HFS: installation

Finished product
Crafco Products

- **High Friction Surfacing**
  - Thin epoxy overlay for deck protection and anti-skid

- **Geo Composites**
  - For stress relief and waterproofing

- **Patching Products**
  - For concrete and asphalt, cold or hot applied

- **Sealants**
  - For cracks, joints and waterproofing and adhesives

- **Equipment**
  - Melters, patchers, routers
Crafco – the Bridge Preservation People

Let us demonstrate these industry-leading materials for you

Thin overlay  Geocomposite  Patching
For support in your Bridge Preservation program:

• Contact Crafco Inc. at (800) 528-8242

• Check our website at: www.crafco.com

• Contact your local Crafco representative