ODOT 424

“SmoothSeal”

A tried and true road resurfacing technique for the City of Englewood, Ohio

Presented by Eric A. Smith, City Manager
February 6, 2008

Ohio Asphalt Paving Conference
QUESTION:

• What is your community’s largest public works investment?

• What is the main source of citizen complaints/concerns?

• How is a community’s administrative performance judged by the public?

ANSWER:  STREETS!
Englewood’s Historical Method of Pavement Preservation

Over 20 Years of Slurry Seal

Positive aspects:

• Good product circa $2.00 plus per square yard
• No curb loss
• Little manhole consumption
• Wearing course
• Sets quickly – 4 hours
• Moderately pleasing appearance and public acceptance
• No grinding
Slurry Seal

Less than positive aspects:

• Emphasizes irregularities & imperfections
• No structural strength
• Frequent re-dos – 5 to 6 years
  ➢ cost
  ➢ public inconvenience
• Susceptible to spalling in shaded areas
• Usually requires extensive prep for alligatored areas and stress cracks
  ➢ Roberts Recipe for crack sealing
Our Current Method since 2002

“SmoothSeal”

Introduced at a Fred F. Frecker, P.E., Executive Director, Flexible Pavements of Ohio Revival in 2001 in Cincinnati, but polymer-modified asphalt binders have been a big part of our City’s life for a decade.
What is “Smoothseal”? 

ODOT Item 424: Fine Graded Polymer Asphalt Concrete

Heavily Polymer modified SAND asphalt – 8.5% binder

100% Crushed Coarse Aggregate – 6.4% Polymer binder
## Mix Gradation

<table>
<thead>
<tr>
<th>Sieve</th>
<th>Type A (1,2)</th>
<th>Type B (1,3,4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ inch (12.5 mm)</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>3/8 inch (9.5 mm)</td>
<td>100</td>
<td>95 to 100</td>
</tr>
<tr>
<td>No. 4 (4.75 mm)</td>
<td>95 to 100</td>
<td>85 to 95</td>
</tr>
<tr>
<td>No. 8 (2.36 mm)</td>
<td>90 to 100</td>
<td>53 to 63</td>
</tr>
<tr>
<td>No. 16 (1.18 mm)</td>
<td>80 to 100</td>
<td>37 to 47</td>
</tr>
<tr>
<td>No. 30 (600 µm)</td>
<td>60 to 90</td>
<td>25 to 35</td>
</tr>
<tr>
<td>No. 50 (300 µm)</td>
<td>30 to 65</td>
<td>9 to 19</td>
</tr>
<tr>
<td>No. 100 (150 µm)</td>
<td>10 to 30</td>
<td></td>
</tr>
<tr>
<td>No. 200 (75 µm)</td>
<td>3 to 10</td>
<td>3 to 8</td>
</tr>
</tbody>
</table>
Two ways to modify standard PG 64-22 binder (to upgrade) to PGM 76-22 performance

- Inject 5% SBR Latex solids (by weight) to post blend
- Use pre-blend SBS modifier (3-5%) to achieve a PGM 76-22 performance rating

Either of the above are acceptable methods of ODOT 424 binder modification
Type A Smoothseal in place

Englewood’s field experience: no apparent visual difference between Type A and Type B
Is “Smoothseal” the answer to Englewood’s 21st Century needs?

A qualified “yes” – here’s why: 424 offers

1. A “new” street with ¾” interwearing course and a superb appearance – a PR plus
2. Excellent riding qualities
3. Curb loss is minimal
4. Structural strength benefits
5. Corrects minor street deficiencies
424 offers  (continued)

6. Little or no loose aggregate
7. Skid resistance is very good
   - perhaps surprising – several citizen questions
8. Much less preparation necessary – dollars saved
9. Potentially longer lasting by a factor of 2, 3 or ?
   - less resurfacing frequency
   - less maintenance
   - less inconvenience to the public
10. Prevents “spalling” of shaded areas
11. Englewood’s seven-year experience – Smoothseal performs as advertised
QUALITY AWARD
FOR ASPHALT PAVING

LOCAL ROAD OR STREET - PREVENTIVE MAINTENANCE
Presented to

CITY OF ENGLEWOOD

For achieving the Highest Quality in Asphalt Paving as exhibited by Superior Workmanship and Riding Quality

OVERLA BOULEVARD

PAVING CONTRACTOR:
BARRETT PAVING MATERIALS, INC.
MIDWEST CENTRAL REGION
Englewood’s 2002 “SmoothSeal” Program

- 83,200 square yards for 14 residential streets
- Engineer’s estimate was $228,800 (or)
- $2.75 per square yard
Three Bids were Received

- John R. Jurgensen - $276,938.50
- Barrett Paving - $246,011.50
- SE Johnson - $217,145.00*

*Cost per square yard = $2.61
SE Johnson Bid Breakdown:

1. Transitional Profile *Milling & Cleaning $23,000
2. 3499 tons ODOT 854 Type A ($55.00/ton) 192,445
3. 850 gallons ODOT 407 Tack Coat ($2.00) 1,700

$217,145.00

*Millings were high quality and recycled into an asphalt roadway and walking path at a local park.
Application:

• ¾ to 1” thick overlay
• ¼ inch above the curb to promote drainage
• Can be “feathered” at drive aprons
• Slurry “overspray” stays in place
  
  Grind along curb face only
REMINDER:
- Engineer’s estimate was $228,800
  (or)
- $2.75 per square yard

Actual cost: $217,145.00

(or)

$2.61 per square yard
Does any job ever go completely right?

A “lump in the gravy” tale of Type A vs. Type B
First a basic comparison

• Type A - sand mix with 8.5% binder
• Type B - crushed coarse aggregate with 6.4% binder
First third of resurfacing was Type A

- Problem with set up
- Paving required careful attention to detail
- Adjustment of mix made at the plant
- No one has an answer for Type A woes
Remainder of project switched to Type B

- Municipal Park parking lot experiment
- Larger aggregate seemed to process much better – no set-up issues – 1 hour
- Visual results much the same as Type A
- Job went very well with Type B
- Special thanks to Larry Norris, Operations Manager of SE Johnson and Cliff Ursich, P.E. of Flexible Pavements
Conclusion

• Type B, SBS (or SBR) works best for us

• Very pleased with results – Englewood budgeted $225,000 for 2003, $275,000 for 2004 and $303,000 for 2005. $280,000 for 2006 and $220,100 in 2007.

• For 2008, $300,000 is budgeted.

• Only unknown – longevity

    Life expectancy up to 25 plus years reported elsewhere

• Some manhole risers required
This street in Shaker Heights is the Poster Child for Smoothseal. It has thrived after 27 years!

Shelburne Rd., Shaker Heights
Winner of the 2000 Master Craftsman Award!
Paved in 1973, Smoothseal has withstood long-term exposure without deteriorating during wet or damp conditions for over 27 years.
In 2007, John R. Jurgenson Co. installed 30,450 tons of this exact material on Interstate 675 in Beavercreek. Project Manager Jim Crawford was impressed. Cost: $68.69/ton.
If Smoothseal is applied at \( \frac{3}{4} \) inch for Interstate traffic, what will it do for a residential street?
Has anyone seen my keys?
Grinding prep work, Manhole riser in place.
Smoothseal’s appearance is extraordinary! A rich, finely textured showpiece that grabs public approval.
Immediately following the summer application
-A comparison of roads with and without the application
Existing slurry sealed asphalt pavement. No material compatibility issues. Smoothseal overlays slurry without any adhesion problems.
Five years later

January 18, 2008

Overla Boulevard – West view
Browning Avenue (left)
Smoothsealed in 2007.
Overla Boulevard – East View

“Bleaching” developed, but no structural issues.
Typical appearance after five years service.

Appearance and texture as smooth as the top of a pool table.
Durable around manholes after 5+ years
Five years later
January 18, 2008

Centennial Park Tennis Courts
Seven years later

January 18, 2008

Derringer Drive – South View – Paved in 2002
Derringer Drive – North View – Paved in 2002
Dime beside hairline stress crack.
Smoothseal surface remains intact with few structural flaws after seven years of weathering.
Derringer Drive – curb line: roll-back curb with slurry overspray. Smoothseal overlay.
An example of “Spalling” caused by moisture retention in constantly shaded areas. Smoothseal’s polymer content reduces or eliminates the issue.
Approximately 85% of Englewood’s residential streets have been Smoothsealed to date.
**BID PROPOSAL**

2007 City of Englewood
Asphalt Overlay Project

<table>
<thead>
<tr>
<th>ITEM</th>
<th>ESTIMATED QUANTITY</th>
<th>UNITS</th>
<th>UNIT COST</th>
<th>TOTAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 2” 448 Asphalt Concrete Surface Course, Type 1 H, PG 70-22M</td>
<td>3,804.00</td>
<td>Tons</td>
<td>55.00</td>
<td>209,220.00</td>
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<tr>
<td>2. ODOT 254 Pavement Planing Including Cleaning</td>
<td>50,209.00</td>
<td>S.Y.</td>
<td>1.30</td>
<td>65,211.70</td>
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<tr>
<td>3. Item 407 Tack Cost 0.25 Gal./S.Y.</td>
<td>8,558.00</td>
<td>Gal</td>
<td>0.50</td>
<td>4,279.00</td>
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<tr>
<td>4. ODOT 712.09 Type E Paving Fabric</td>
<td>34,231.00</td>
<td>S.Y.</td>
<td>0.70</td>
<td>23,961.70</td>
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<tr>
<td>5. ODOT Item 424, Fine Graded Polymer Asphalt Concrete</td>
<td>3,100.00</td>
<td>Tons</td>
<td>71.00</td>
<td>220,100.00</td>
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<tr>
<td>6. Item 407 Tack Cost 0.15 Gal./S.Y.</td>
<td>11,130.00</td>
<td>Gal</td>
<td>0.50</td>
<td>5,565.00</td>
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**SUBTOTAL:** 528,397.40

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2007 winning bid from John R. Jurgenson Co. Jurgenson agreed to honor pricing for 2008 thus no rebidding required.
Historical pricing for Smoothseal
### ODOT Summary of Cost-Effectiveness as Measured by Lifecycle-Cost (2006)

<table>
<thead>
<tr>
<th>Pavement Type:</th>
<th>Flexible</th>
<th></th>
<th>Composite</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Fair</td>
<td>Good</td>
<td>Fair</td>
</tr>
<tr>
<td>Condition:</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Fair</td>
<td>$23.44</td>
<td>$23.44</td>
<td>$22.88</td>
<td>$22.88</td>
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<tr>
<td>Good</td>
<td>$26.61</td>
<td>$26.61</td>
<td>$30.27</td>
<td>$26.61</td>
</tr>
<tr>
<td>Traffic Level:</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Control (non-PM)</td>
<td>$23.44</td>
<td>$26.61</td>
<td>$22.88</td>
<td>$30.27</td>
</tr>
<tr>
<td>Chip Seal</td>
<td>$21.49</td>
<td>$22.97</td>
<td></td>
<td></td>
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<tr>
<td>Single Microsurfacing</td>
<td>$22.35</td>
<td>$23.47</td>
<td>$21.64</td>
<td>$23.92</td>
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<tr>
<td>Double Microsurfacing</td>
<td>$23.07</td>
<td>$24.28</td>
<td>$22.31</td>
<td>$24.73</td>
</tr>
<tr>
<td>NovaChip ®</td>
<td>$22.60</td>
<td>$26.92</td>
<td>$23.75</td>
<td>$26.92</td>
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<tr>
<td>Smoothseal</td>
<td>$21.39</td>
<td>$22.73</td>
<td>$21.03</td>
<td>$23.77</td>
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<tr>
<td>Thin HMA Overlay w/No Repairs</td>
<td>$22.68</td>
<td>$26.99</td>
<td>$21.75</td>
<td>$24.69</td>
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<tr>
<td>Thin HMA Overlay w Repairs</td>
<td>$22.24</td>
<td>$23.90</td>
<td>$24.75</td>
<td>$28.75</td>
</tr>
</tbody>
</table>

In summary, the Smoothseal treatment provided the **lowest lifecycle cost** for all pavement types, conditions and traffic levels.
Ok, how much?

The Bottom Line

One Ton at $71.00 equals $2.98 square yard*

*Does not include milling, risers or tack
CONCLUSION

Englewood’s seven-year experience and ODOT research suggests “Smoothseal” deserves consideration as a preventative maintenance alternative for low-volume all streets.

Smoothseal’s industry-rated life expectancy is twelve (12) years. Long term economic analysis concludes Smoothseal is less expensive than slurry.

With Smoothseal, road repairs like these should be a thing of the past.
RECOMMENDATIONS

- Only structurally sound streets should be candidates for thin layer hot mix asphalt
- Stick with “Type B” 424 Smoothseal to obtain greater strength and less application problems
- Apply only during warm weather preferably in excess of 65° F
Questions?

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