

THE NEED TO PRESERVE OUR ROADS

Roads are vital to life: work, recreation, commerce/shipping of goods and services, safety, aesthetics for communities. They are also in need of maintenance beginning the first year after placement for the remainder of its life.

Unfortunately . . .

- Simply stated, there is more wear and tear on existing roads than ever before. In the U.S., more than 3 trillion annual miles are driven, and over the last 13 years the new capacity of roads has not grown as fast as the number of drivers and miles driven. Our existing roads are taking on more and more work and abuse every day;
- Cracks are inevitable. They are going to happen, and with the increasing traffic we can expect more cracks;
- Funding has not kept pace with the demand of work, and more needs to be done to protect our infrastructure;
- Rough roads cost drivers and taxpayers significant money. It starts as a crack and a bump in the road, but evolves to cupping, lipping and a full-blown pothole. We drive over them every day, and what happens next? Drivers pay for tire balances, alignments, worn tires, shocks, springs and more. One wheel balance and an alignment can cost over \$200, and a full set of tires can be \$1,000; and
- A survey by TRIP (a national transportation research group) reported an average driver pays \$377 per year due to deteriorating roads.

Drivers want a good road, and bad roads cost drivers money. They look to departments of transportation to keep the roads smooth and keep costs low.

So what can be done? More crack sealing.

Reference: <https://www.artba.org/about/faq/>



CRACK SEALING ADDS LIFE, QUALITY TO PAVEMENTS



The best solution to keep drivers happy on good roads is to apply preservation treatments, and the best preservation treatment is going to be crack sealing.

Crack sealing is the lowest-cost preservation treatment. The four-year average cost is 26 cents per sq yd, while the next cheapest treatment—single chip seal, or spray seal—is four times more expensive. Crack sealing also has the highest benefit-cost ratio. As any good investor would do, you invest in crack sealing because it provides the highest benefit for the lowest cost, therefore maximizing your investment.

Without crack sealing, 75% of cracks form into potholes in less than three years. With crack sealing, only 1% of sealed cracks develop into potholes in

less than three years.¹ A sealed crack also provides better sustained smoothness over a five-year period versus an unsealed crack as measured by the International Roughness Index.

In a nutshell, crack sealing is the best surface treatment to:

- Extend the service life of pavement;
- Save money; and
- Extend a smooth, safe, enjoyable driving experience.

¹ Belangie, Michael C. and Anderson, Douglas I. May 1985. *Crack Sealing Methods and Materials For Flexible Pavements*. Utah Department of Transportation. Salt Lake City, Utah. Report FHWA/UT-85/1.

WHY CRACK SEAL?



Everyone likes driving on brand new roads. Unfortunately, pavement cracks are unavoidable.

The high costs of extensive road repairs, however, are avoidable by crack sealing. Crack sealing is the best surface treatment to extend the life of pavement, save money, and offer your constituents a smooth, safe and enjoyable driving experience.

Did you know?

- Cracks and other signs of road deterioration accelerate vehicle deterioration and depreciation, as well as increase needed maintenance, fuel consumption and tire wear;
- More extensive road repairs than crack sealing,

such as fixing potholes, are also much more expensive. For example, paver-placed surface sealing costs \$4.70 per sq yd—much higher than the \$0.26 per sq yd cost of hot mix asphalt (HMA) crack sealing;

- Crack sealing also has a higher benefit-to-cost ratio than any other treatment for flexible pavements. HMA crack sealing has a benefit-cost ratio of 0.46, compared to the 0.09 ratio of double microsurfacing; and
- To maximize our roads' service life spans and get the highest benefit with the lowest cost, crack sealing should be done early and often. This will delay the need for more significant and expensive pavement treatments.

SAVE COSTS WITH CRACK SEALING

Treatment	4-Year Avg. Cost (\$/yd ²)
Paver-placed Surface Seal	\$4.70
HMA Mill and Overlay	\$4.34
HMA Overlay	\$3.59
Double Microsurfacing	\$2.35
Ultra-thin Overlay	\$2.29
Double Chip Seal	\$2.27
Single Chip Seal	\$1.31
HMA Crack Seal	\$0.26

This table is based on independent data from the Michigan Department of Transportation.¹ Crack sealing is the lowest-cost pavement preservation treatment, with the next lowest (single chip seal, or spray seal) treatment four times more expensive.

- Without crack sealing, 75% of cracks turn into potholes in three years or less;
- However, only 1% of sealed cracks become potholes in the same amount of time; and
- Fewer potholes result in less pothole patching and related expenditures.

¹ Ram, Prashant, and Peshkin, David. April 2013. Cost Effectiveness of the MDOT Preventive Maintenance Program. RC-1579. Michigan Department of Transportation. Lansing, Mich.

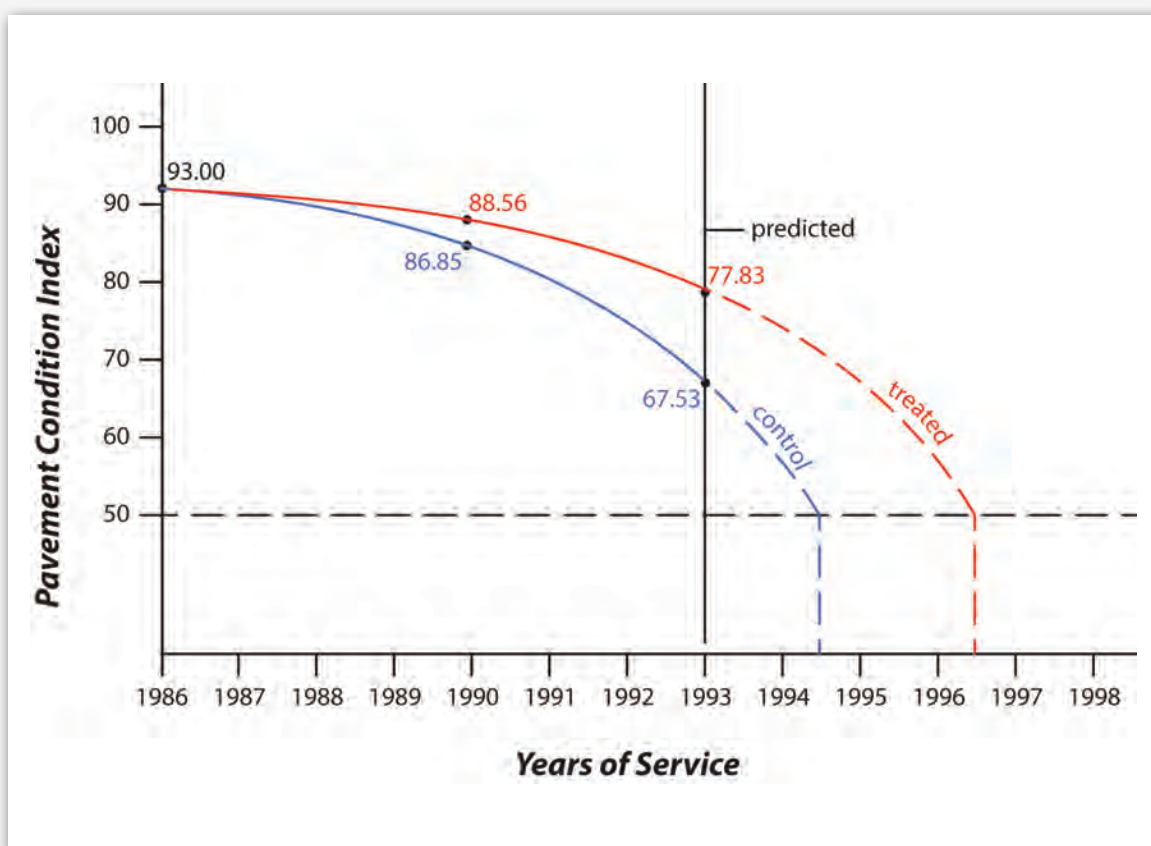
PROVEN PERFORMANCE

As the lowest-cost pavement preservation treatment, crack sealing is the best solution to extend the service life of pavement.

Additionally, crack sealing has some of the highest benefit-to-cost ratios of pavement treatments. A dollar spent on crack sealing returns more benefit than a dollar spent on other treatments.

Crack sealing has proven performance success metrics. According to data from the Federal Highway Administration (FHWA), crack sealing:

- Extends sealant service life by 7+ years;
- Extends pavement service life by 2-10 years;
- May reduce pavement cracking by 100% with an annual program, when compared to no treatment;
- Reduces interconnected cracking and subgrade moisture;
- Extends pavement smoothness for five years;
- Reduces pavement raveling, especially around the edges of cracks.



With crack seal, a 10-point PCI (Pavement Condition Index) can be sustained for seven years versus an untreated crack. Above is an actual performance curve, showing that crack sealing can result in extended pavement service life. (Ponniah & Kennepahl, 1996; Shahin & Walther, 1990)

Data from the National Center for Asphalt Technology (NCAT) has found that crack sealing makes other surface treatments significantly more effective. For example, chip sealing (also known as spray sealing) alone had as much or more cracking than an untreated road after two years. However, crack sealing plus a single layer chip seal resulted in a 100% reduction in cracking compared to no treatment after two years.

Crack sealing positively affects microsurfacing as well. When the treatments are combined, roads experience 60% less cracking after two years, compared to untreated roads.

Crack sealing is also better for the environment than new construction, rehabilitation and most other pavement preservation treatments. Crack treatment requires less energy (British Thermal Units per sq yd per year) than nearly all other treatments. For example, chip sealing uses between 1,170 and 2,340

BTUs, while crack sealing uses between 290 and 870 BTUs. Crack treatment also emits fewer pounds of carbon dioxide per sq yd per year than other treatments—between 0.05 and 0.14 lbs, compared to the 0.15 to 0.30 lbs emitted by chip sealing.



Process	BTU/sq yd/y	Lb CO ₂ /sq yd/y
Hot Mix	4,660-9,320	0.9-1.8
Hot in-place Recycling	3,870-7,740	0.7-1.4
Chip Seal	1,170-2,340	0.15-0.30
Slurry Seal	968-1,935	0.10-0.20
Crack Fill	930-1,860	0.13-0.25
Fog Seal	500	0.07
Crack Seal	290-870	0.05-0.14

Crack seal treatment requires less energy (BTU/sq yd/y) and generates less greenhouse gas emissions (Lb CO₂/sq yd/y) when compared to other treatments. This assessment is based on the entire process from raw materials to application, not just the application itself. (Chehovits & Galehouse, 2010)

HOW TO HAVE A SUCCESSFUL CRACK SEALING PROGRAM

Having an effective crack sealing program will ensure better results and contribute to furthering the practice of crack sealing nationwide. There are several elements that are important to having an effective crack sealing program:

- **Goals:** Define what you are trying to achieve. A program should achieve specific goals, such as decreasing the number of potholes or slowing their development;
- **Measurements and Metrics:** The goals for your program must be measurable in order to see results. Examples include annual reviews of the crack sealing program, in which a specification for achieving excellence can be defined; achieving 7 years of sealant service life or more; or identifying new cracks or failures;
- **Education:** In an NCHRP study, 67% of those surveyed had no formal crack sealing training—it was all on the job. With no standard training or trained inspectors, it is very difficult to get good results;
- **Attitude:** Rather than crack sealing because “this is the way we’ve always done it,” the attitude of a crack sealing program should show that you do this to make our roads better and last longer, and to make constituents happy;
- **Activities:** Crack sealing best practices should be actively used throughout the year to ensure the program’s effectiveness;
- **Inspections:** If you have poor quality, people will think that crack sealing does not work. Regular inspections, done by trained inspectors, will ensure that new crack sealing is done correctly and that sealants are performing as intended;
- **Promotion:** Some agencies promote their crack sealing program to gain support and funding. More promotion, acceptance and implementation will result in better roads; and
- **Budgeting:** Understanding how investing in crack sealing can save money in the long-term is critical to a successful crack sealing program.



TOTAL PAVED LANES AROUND THE WORLD

Country	Total Paved Lane Miles	Total Paved Lane Kilometers	Country Ranking By Total Paved Lane Miles
UNITED STATES	5,349,652	8,609,430	1
CHINA	5,028,508	8,092,599	2
INDIA	2,530,089	4,071,783	3
FRANCE	1,278,093	2,056,891	4
JAPAN	1,233,838	1,985,669	5
RUSSIA	1,152,918	1,855,441	6
SPAIN	849,011	1,366,350	7
GERMANY	801,569	1,290,000	8
ITALY	606,085	975,399	9
CANADA	516,484	831,200	10
UNITED KINGDOM	490,172	788,855	11
AUSTRALIA	442,843	712,686	12
BRAZIL	264,453	425,595	16
MEXICO	170,932	275,088	26
ARGENTINA	86,261	138,823	44
VENEZUELA	40,151	64,616	59
PERU	23,238	37,397	73
CHILE	22,517	36,237	76
NEW CALEDONIA	0	0	226
WORLD	27,667,348	44,526,280	-

About CrafcO

CrafcO is the world's largest manufacturer of innovative, proven-effective crack sealant and application equipment. CrafcO demonstrated the longest documented asphalt sealant service life of 7+ years in asphalt pavement, and 21+ years for Portland Cement Concrete. CrafcO is the world's largest producer of state-of-the-art specialized equipment to apply crack sealant, and has won a Roads & Bridges Contractor's Choice Award in each of the last four years. CrafcO has the largest number of manufacturing locations to meet supply needs in the United States and around the world. CrafcO has a growing worldwide manufacturing and distribution network. CrafcO is the pavement crack sealing leader.

Contact CrafcO to learn more and develop your Crack Sealing Pavement Maintenance Program

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