THE UNIVERSITY OF TEXAS AT AUSTIN ✦ COCKRELL SCHOOL OF ENGINEERING
TEXAS PAVEMENT PRESERVATION CENTER
TxDOT Newsletter
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Pavement Preservation Strategies using Chipseal and FiberMat Workshop

FiberMat® Machine

Past and Upcoming Events

TPPC Microsurfacing Courses

Microsurfacing training courses will be offered by the TPPC. The course is designed for engineers and inspectors and is entitled "Guidelines on the use of Microsurfacing." The course recapitulates the pavement preservation concepts, specifically with reference to microsurfacing. It focuses on proper mix design selection and application of microsurfacing. TxDOT's experience with microsurfacing is also discussed. This course also includes discussion on the use and applications of cape seals.

TPPC Seal Coat Training Courses

Seal Coat training courses will continue to be offered by the TPPC. The course designed for inspectors, entitled "Seal Coat Inspection and Applications," focuses on proper inspection methods and the equipment used during chip seal construction. The other, "Seal Coat Planning and Design," instructs engineers on planning, designing, and constructing chip seals.

For more information on the Seal Coat and Microsurfacing courses, please contact Dr. Yetkin Yildirim, P.E. at yetkin@mail.utexas.edu or (512) 232-3084.

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Our Mission

The mission of the TPPC, in joint collaboration with the Center for Transportation Research (CTR) of the University of Texas at Austin and the Texas Transportation Institute (TTI) of Texas A&M University, is to promote the use of pavement preservation strategies to provide the highest level of service to the traveling public at the lowest cost. The executive sponsor for the TPPC is the Texas Department of Transportation (TxDOT).

Contact Us

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Beech Trail's FiberMat experience

A presentation by Tony Vazquez, Bexar County Public Works

Test section introduction

Bexar County includes the area that surrounds San Antonio and has over 1200 center lane miles of streets. The county is responsible for maintaining only the unincorporated areas. Bexar County chose one road in their jurisdiction and applied FiberMat and chip seal at different locations of the road in order to make a comparison between the performance of FiberMat and regular chip seal. Conditions of the road were recorded before application and eight months after application. The road selected as a test section is Beech Trail Drive which is 5,795 ft long, 40 ft in width, and takes up a total of 25,756 sq yards with 7,098 ADT. The road is located in a residential area and carries few heavy vehicles with the exceptions of school buses and trash trucks occasionally passing by.

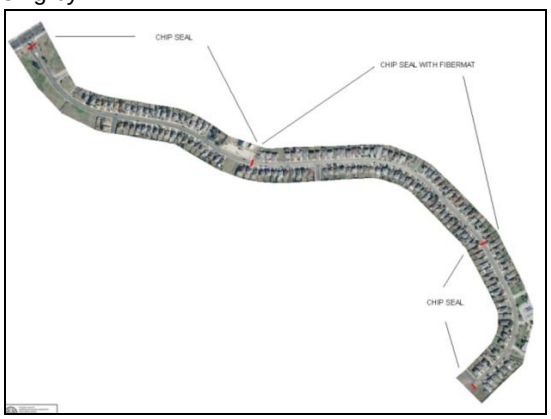


Figure 1. Bird's eye view of Beech Trail Drive

Before chip seal was applied, Bexar County prepared the road – they leveled the ruts, sealed the crack, spot-repaired the road and then finally applied chip seal.

Weather conditions on the day of chip seal and FiberMat application is summarized as:

- wind speed: 3 mph East;
- ambient temperature: 83 F;
- ground temperature: 96.8 F.

At the time of application it was partly cloudy. A thunder storm had hit the area before the demonstration, so the ground was still wet before the chip seal was applied.

Materials used for the chip seal included asphalt emulsion CRS-2P with a rate of 0.30 gallon/yd^2 (2 @ 0.15 gallon/yd^2); aggregate used is trap rock with a grade of 5 and a rock rate of 15.5 lbs.

Result comparison

Road conditions are shown in the following figures to illustrate the difference between road conditions before application and eight months after application.

For typical chip seal application:

Before treatment

Eight months later

From the figure above, it is clear that the road condition is improved after chip sealing. However, for regular chip seal treatment, a small amount of cracks showed up on the road within eight months of application.

Result comparison between before and beyond FibetMat Starting Point (S):

Before treatment

Eight months later

On the left half of the photo, the road section without FiberMat shows some major cracks. On the right half of the photo the section of road with FiberMat displayed better performance and no major cracks showed up on the surface.

Result comparison between before and beyond FiberMat Section End (S):

Before treatment

Eight months later

Chip sealing and Pavement Preservation

A presentation by Yetkin Yildirim, Texas Pavement Preservation Center

Traditionally, a road is maintained only when serious problems are observed and the corresponding maintenance activities are reactive and/or corrective. However, an effective pavement preservation strategy requires reactions to take place as soon as the road's problems start to emerge in order to preserve the structural integrity of the roads.

The concept of pavement preservation

The concept of pavement preservation started about 20 years ago and was greatly promoted in the U.S by the federal government during the last decade.

In order to apply a pavement preservation strategy successfully, the structure of the road should be maintained under good condition: effective drainage; strong foundation; acceptable thickness of pavement. Those are the prerequisites of applying a pavement preservation strategy.

The life of the pavement can be divided into three periods as shown in Figure 2. After the road is built with the right material, right method and by the right personnel, the road starts out in excellent condition. At the end of the first period only minor cracks will occur on the road surface.

However if the cracking is not stopped during this period, water will find its way into the pavement and separate asphalt particles and aggregate particles. The pavement then starts to show some structural problems and the road condition will deteriorate dramatically.

Some experts believe that the cracks that occur at the first stage are acceptable and sometimes even helpful in releasing the stress in the pavement. However, if they are not sealed properly, they will cause severe problems in the second period.

The end of the second period is indicated by the appearance of potholes, cracking and major visible problems. The end of the second period is normally regarded as the end of the service life of a road and when traditional corrective maintenance will come into play.

In the third period, serious distresses can be found on the road and the road is in such poor condition that it can no longer serve the public.

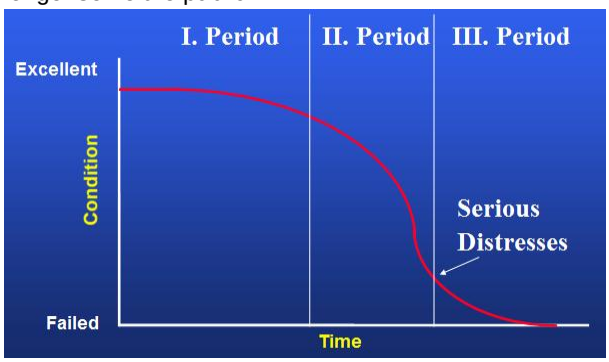


Figure 2. Road condition over time

Most of the pavement preservation strategies require maintenance activities at the end of the first period in order to seal the minor cracks and prevent the water from

coming into the pavement and potentially harm the sub-base structure. However, if the maintenance takes place at the end of the second period, the maintenance cost will be much more expensive.

Cost associated with preventive maintenance

According to this research study, it's four to five times more expensive to fix the road at the end of second period than to fix it early, at the end of the first period. Most importantly, even if treatments are applied at the end of the second period, the pavement will not return to excellent condition.

Preventive maintenance is a repetitive process that requires constant maintenance and keeps the road under acceptable condition. If the constant maintenance of the road whenever minor problems occur can be achieved, the performance condition of the road will be improved significantly.

The treatment methods used for preventive maintenance are different from those used for reactive maintenance because the distress types are different for these two periods. By applying cost-effective treatment at the right time, the pavement can be restored almost to its original condition.

Pavement distresses

- Cracking: minor cracks and top-down cracks;
- Minor rutting problems: caused by densification.
- Friction properties: coefficient of friction is vital to maintain safety to the road users.

Nothing is random and everything happens with a cause. So before we try to fix the problem, the reasons for the problems need to be determined first.

Increased Safety

Pavement preservation strategy can maintain a better road surface with fewer ruts and raveling and minimize the disruptions during maintenance. Thus, it can provide a safer surface and better ride quality to the public. In addition, the road can open to traffic very soon after the maintenance is done which is less disruptive to traffic than reactive maintenance.

Seal coat

Pavement preservation treatments include cracking sealing, fog sealing, chip sealing, micro-surfacing, slurry seal, thin asphalt overlay, and recycling.

Seal coat is generally a single application of asphaltic material covered with aggregate as shown in Figure 3. Seal coats are applied to existing pavements to extend the life-cycle of pavements. Seal coats are not intended as permanent pavement surfaces and are expected to last approximately five to seven years; service life varies depending on traffic volumes, weather, etc.

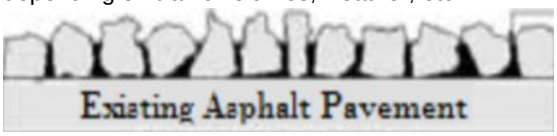


Figure 3. Schematic diagram for seal coat application

Seal coat can be applied to deal with cracks, raveling, aged or oxidized pavement, lack of skid resistance, and to provide a uniform surface appearance. It acts as a protective layer on the pavement. Seal coat cannot increase the strength of existing pavement, nor increase the load-bearing capacity, nor smooth out rough pavement, nor bridge major cracks, nor eliminate the need for structural maintenance.

Introduction to FiberMat

A presentation by Nelson Wesenberg, Colas Solutions Inc.

The problems facing the pavement industry today are that the pavements begin to deteriorate from the day they are put to use which causes water to penetrate into the sub-base and weaken the structure. Surface treatments and overlays available to the industry can temporarily waterproof the pavement but are vulnerable to cracks.

Chip seal is a kind of surface treatment method that works well to seal the road. However, it does have one inherent problem – no structural body to prevent the cracks from forming. So the cracks continue to come back after the roads are sealed. To make things worse, lots of road agents are facing decreased funding which makes maintaining roadways to satisfactory condition even more difficult.

The solution to the dilemma is to include new techniques into the day-to-day practice of road builders, contractors and road agencies. The FiberMat process has been developed to deal with this situation.

By modifying existing well-known chip-seal technology, FiberMat adds a layer of glass fiber between two layers of emulsion, and thus forms a recyclable geotextile on the road surface. FiberMat includes the ability of asphalt emulsions to waterproof the surface and the ability of glass fiber strands to withstand stresses and provide enhanced tensile properties. FiberMat cannot completely stop the cracking from forming; however, it can delay the occurrence of cracking on the road surface.

FiberMat emulsion uses modified CRS-1p or CRS-2p, which is modified by a polymer that gives the product more flexibility and ability to resist strain and stresses that take place on the road. It uses a typical aggregate for chip seal that conforms to local specifications. It is finished by rolling and sweeping the road to complete the treatment. The surface can normally be opened to traffic within 15 minutes.

As a general rule of thumb, for every inch of HMA, it takes one year for a crack to return. FiberMat can extend this period. The cost of FiberMat differs by locations. Generally speaking, in the United States, FiberMat is 30%-35% more expensive than quality chip-seal.

Example projects

Terry Asphalt Project
State of Michigan cored on 5-17-10

Figure 4. FiberMat slows down the cracks

The core sample taken from a test section shows that FiberMat can delay crack formation.

FIBERMAT® TYPE A – FIELD TEST
Groth Road in Murray, New York

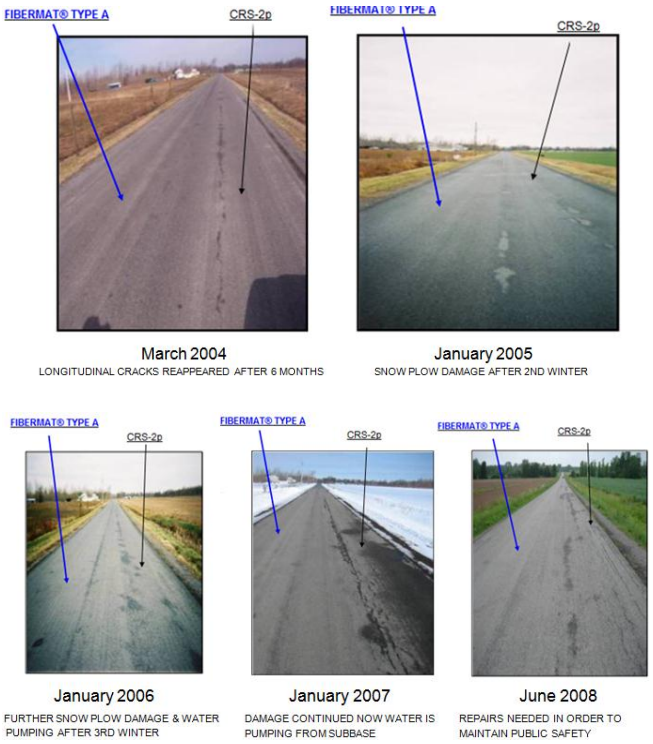


Figure 5. Road performance comparison between FiberMat (left half of road) and regular asphalt emulsion (right half of road)

Figure 5 shows that a distinct difference between FiberMat road performance and regular asphalt emulsion road performance can be observed over time.
FiberMat has been successfully applied in many districts in Texas, such as the City of Marshall, the City of Groveton, Bexar County, and the City of Austin.

Conclusion

In summary, FiberMat can improve public safety and at the same time is an innovative and cost effective solution to solve the problem of pavement cracking. By reinforcing sealcoats with fiberglass strands, it greatly inhibits pavement cracking. The construction process of FiberMat is fast and thus will reduce the lane closure time and minimize traffic disruption. The maintained road can be reopened to traffic quickly compared to alternative products. The fast construction speed also means reduced labor and equipment costs for construction.

FiberMat will improve surface friction characteristics of the road and provide the public a safer driving condition, in good and bad weather. It can waterproof the surface and prevent damage to the sub-base. It can also be applied as a stress absorbing membrane interlayer (SAMI), and then covered with HMA as a final treatment.

Emulsions for Pavement Preservation

A presentation by Tony Vazquez, Bexar County Public Works

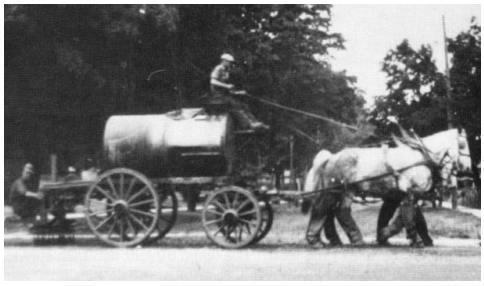
Texas does more pavement preservations than most other states. Most pavement preservations were done with emulsions in the past and this practice is still quite common. This presentation focuses on discussing the practices that the industry used as a whole and how TxDOT impacted the industry directly over the years.

Emulsion has been used widely in the industry to make chip seal, slurry seal, micro-surfacing, fog seal, and so on. The most commonly used emulsion materials for chip seals are: CRS-2, CRS-2P, HFRS-2; HFRS-2P; CHFRS-2; CHFRS-2P; CPS-1P (cooling weather) and for slurry seal and micro-surfacing are SS-1H; CSS-1H, CSS-1P, CQS-1H; CQS-1HLM.

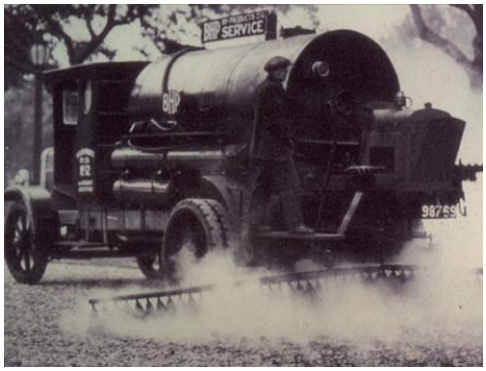
Chip seal history

The history of the development of chip seal technology can be categorized into the following four distinct phases.
Phase 1: Spread the oil by hand and then apply some type of aggregate on top of the road as cover stone.

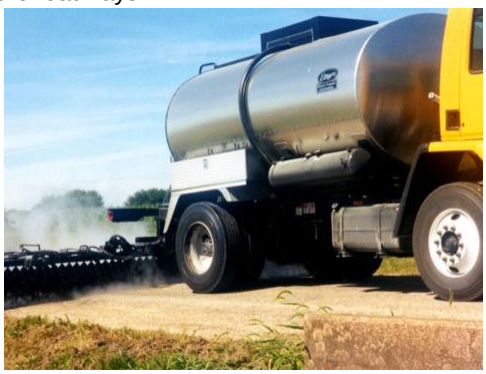
Phase 2: Horses as distributors and use of spray bar



Phase 3: Motorized trucks use spray bar to lay down the chip seal



Phase 4: Distributors used today (even double-bar distributors are used) to spread the chip seal material down the roadways



Industry and technology has evolved significantly because cities, counties, and the public mandated better industry practices that are more economically feasible and more ecologically friendly. Thus, technology with emulsion has greatly improved over the years.

Slurry system history

The history of the development of slurry seal technology can be categorized into the following three distinct phases:

Phase 1: Mix rock and oil in wheel plough to spread over the roadways

Phase 2: In the early 60s, Young brothers from Waco, TX developed a mechanical slurry seal machine that could mix all the components in a set box that could be adjusted for the rate of application. It was a revolution for the slurry seal industry and pavement preservation at that time.

Phase 3: Today's truck mounted machine is computer controlled which maximizes the productivity and the quality of work.

The future of asphalt emulsion

How to utilize the emulsion technology and pavement preservation strategy in the system depends on many factors such as funding, budgets, industry innovations, people and so on. The future of asphalt emulsion is determined by the combined effects of the above mentioned factors.

Everybody in the roadway agency can impact the amount of funding they receive by attending the legislature hearings and providing insights on what is needed for the next transportation bill.

Industry innovations are important in providing economical and eco-friendly solutions to the public. People are sources of innovative ideas. Almost all of the innovations come from people who work in the road industry and are willing to bring their ideas to more people and keep improving the industry.

Conclusions:

The true pavement preservation concept can be better implemented through the joint collaboration of the public, people working in the industry, government officials, and policy-makers. There are many factors that can impact the future of pavement preservation:

New funding streams for infrastructure are important to maintain a healthy roadway system. Some ideas are already being considered to seek more funding for the industry, such as charging the public a percentage fuel tax instead of a fixed fuel tax.

Other than that, the industry should raise its environmental awareness. For example, cutback asphalt is prohibited in many states, some even ban its production. Other environmental issues from the road industry should be further analyzed and eventually prevented.

Incentives for industry innovation are critical. People who make innovation within the industry should be rewarded to keep improving the overall performance.

Moreover, it's tough for politicians, legislatures, and commissioners who will only be in office for 4-6 years to look long term. However, true pavement preservation programs take ten years to enact. When the program is first started, it's hard to see the benefit for the next five or six years. But according to the agents who track the costs and benefits of their pavement preservation programs, seven to twelve dollars can be saved by one dollar of pavement preservation investment.

Educating the public on the idea of pavement preservation and its benefits is important. Currently, very few curriculums concentrate on pavement preservation and recycling techniques at universities. This situation should be changed because the universities are producing future engineers and they are the keys to promoting pavement preservation strategies.