paverx

ASPHALT REJUVENATOR

Pavement Preservation Technology

"Oil prices seep into asphalt costs, detour road work ... Repair projects are a blow to budgets"

"The mix used to resurface roads consists of gravel and sand held together with a binder called liquid asphalt, which is made from crude oil. As oil prices rise, so does the cost of asphalt," says Don Wessel of Poten & Partners, a consulting firm that publishes Asphalt Weekly Monitor. "Prices are the highest I've seen in many, many, many years," he says. "The concern is that they will go up considerably."[1]

USA TODAY

paverx ASPHALT REJUVENATOR

Pavement Preservation Through Asphalt Rejuvenation

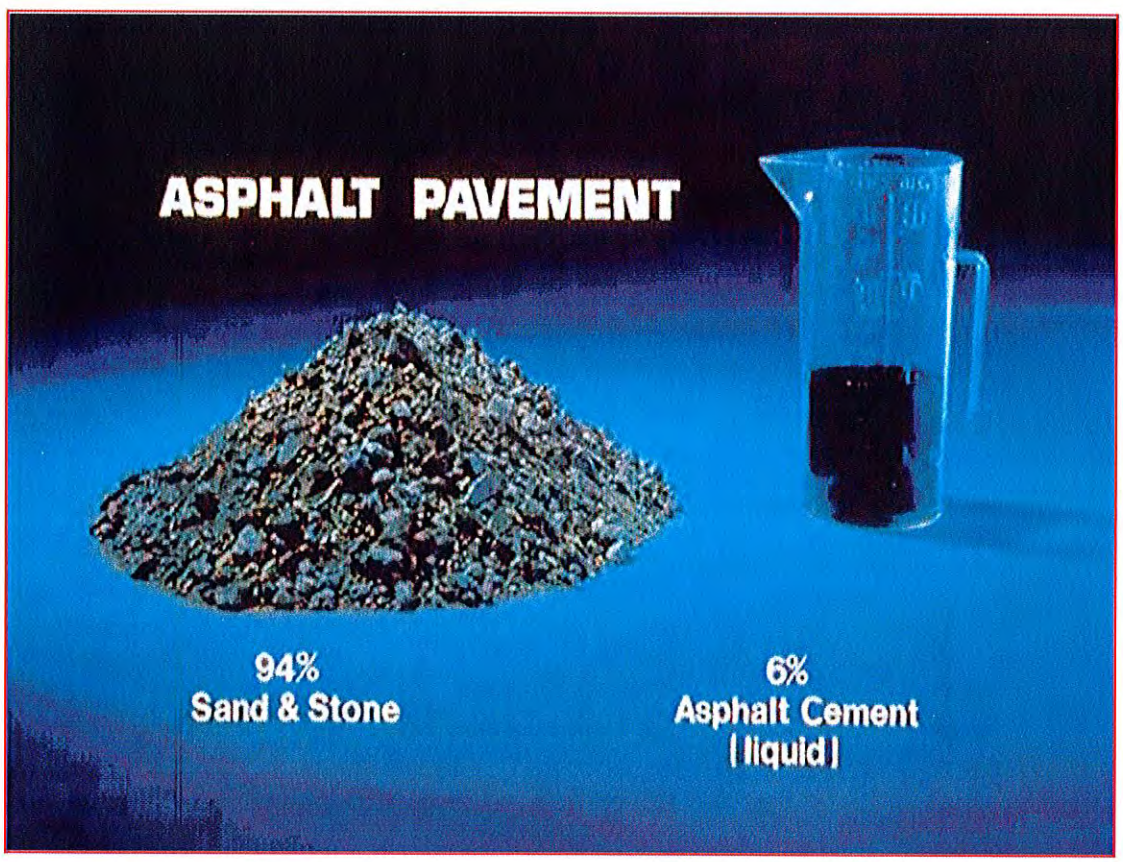
A scientific approach to reducing pavement maintenance costs...

A Scientific Approach

Why Does My Asphalt Deteriorate?

For structurally sound, well designed pavement, the major deterrent to long life is our environment. The oxygen in our air, the ultraviolent radiation from the sun and water from rain and runoff constantly stress the integrity of asphalt pavements.

Simply, asphalt is composed of stone and asphalt cement, a glue or binder that holds it together. It is made in a very hot tumbler where the binder is applied to the stone. This mix is then transported by truck to the site where it is placed and compacted. It is compacted to a point that leaves small voids of about four percent. This "honeycomb" design provides the flexibility and allows the binder to migrate as the surface settles due to age and traffic. This openness allows the environmental elements to enter the pavement and destructive aging takes its toll.



The Aging Process of Asphalt

Asphalt binder is composed of organic molecules that react with oxygen. This reaction is called oxidation. Oxidation changes the molecular composition of the binder causing it to harden. Asphalt binder is composed of two petroleum fractions, asphaltenes and maltenes. This hardening is the conversion of maltenes to asphaltenes. Asphaltenes, the hard brittle component, serve as the bodying agent of the asphalt. It is insoluble and not affected by oxidation. Maltenes, the oily resinous component, is the balance of the mixture which is the glue that holds the mix together. Oxidation upsets the balance of Asphaltenes and Maltenes causing the binder to become stiff and lose its ability to hold the aggregate in place. **Simply, oxidation destroys the glue that holds the pavement together.**

In practice, the oxidation process begins before the asphalt is placed. At the hot mix plant, the asphalt cement is added to hot aggregate, tumbled for complete coverage and maintained at an elevated temperature of 275 – 300 degrees F. The asphalt cement covering the stone is so thin that the oxidation reaction occurs at a fast rate. This is called Short Term Aging.

Oxidative hardening that occurs after the asphalt is placed is called Long Term Aging. It occurs slowly throughout the life of the pavement. The first visible sign of oxidative damage is when the color of the asphalt starts to lighten turning from black to gray. By the time the color of the asphalt is a very light gray or white, significant aging damage has occurred.

Measuring the Aging Process

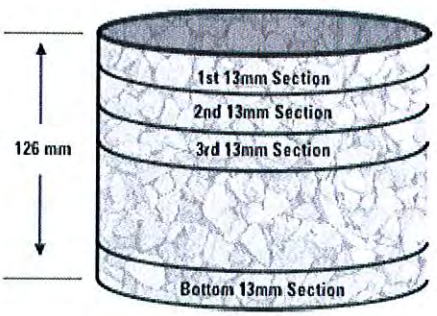
We Need to Change the Way We Think About Protecting Asphalt

Substantial chemical degradation occurs as a result of oxidative aging. The root cause for much of the raveling and cracking of pavements is asphalt oxidation.

This core represents the shear rheometry on an Arizona highway with a four-year-old pavement. The bottom section of the core—about 1/2-inch thick—was found to have about the same performance grade (PG) as the original asphalt; in other words, virtually no aging had occurred. But the top 1/2 inch of the core had aged 3.5 PG grades.

Presenting at the Minnesota Pavement Conference (Feb 15, 2007), Gayle King, noted pavement chemist stated that "We found that the asphalt binder at the top wasn't just getting harder, it was also getting more brittle—so brittle that it couldn't flow at lower pavement temperatures to relieve stresses. In other words, its m-value—its ability to flow in response to stress—had been reduced. That changes the way we need to think about protecting asphalt," King said.

He recommended that we **target oxidation as the enemy.** "Preventing oxidation in a new pavement will prolong its life. Reversing oxidation in an old pavement—i.e., increasing its m-value—will rejuvenate it."[2]



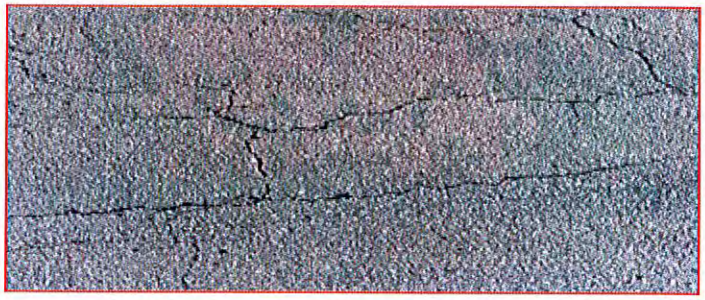
How Do We Measure the Effects of Embrittlement and Aging?

The viscosity of the binder is measured. To get at this information, the top 3/8 inch of the core is removed for analysis. The aggregate is separated from the binder and the viscosity or thickness of the binder is measured by a viscosometer. Viscosity is a measure of the resistance of a fluid which is being deformed by either shear stress or tensile stress. In everyday terms (and for fluids only), viscosity is "thickness". Thus, water is "thin", having a lower viscosity, while honey is "thick", having a higher viscosity. Put simply, the less viscous the fluid is, the greater its ease of movement (fluidity). The results are reported in centipoise.

Signs of Asphalt Aging

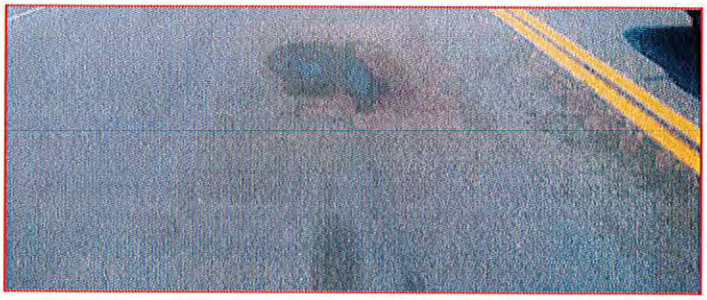
Cracking

As the binder hardens, the top surface of the asphalt becomes brittle. When traffic pass over it and the lower levels flex, the top develops hairline cracks. This top down cracking is directly related to binder oxidation and signals an immediate need for rejuvenation.



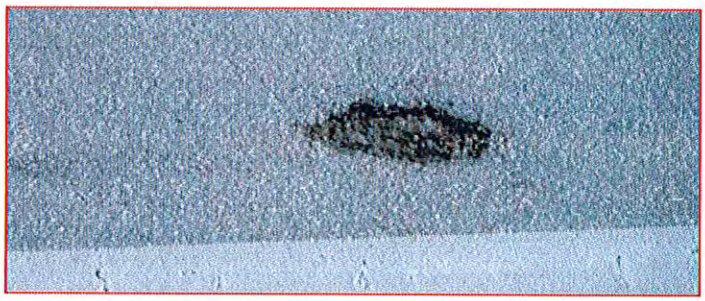
Moisture Penetration

As the pavement ages, it becomes more susceptible to water damage. After a rain, the asphalt surfaces stay wet longer than the surrounding areas.



Contaminant Degradation

Asphalt surfaces on roads and in parking lots are susceptible to damage from oil and gas leaked by parked cars. Airport ramps are damaged by aircraft refueling operations. These areas show up as dark spots that soon ravel, lose aggregate and become pot holes.



Color Change

The color of the pavement changes from black to gray and then white. Sometimes it is difficult to distinguish asphalt from concrete at a distance.

Raveling Loss of Aggregate

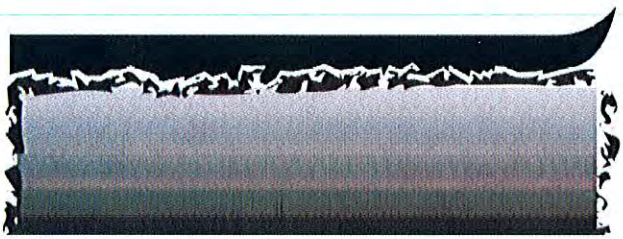
Once the binder looses it glue like qualities, the pavement begins to ravel. Raveling is a loss of aggregate. This distress is evident in the last stages of the life of the pavement and rejuvenation should be planned immediately.

Sealcoating vs. Asphalt Rejuvenation

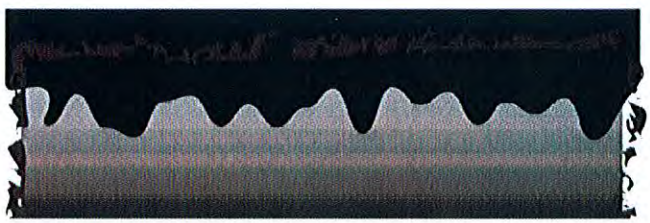
How is Traditional Sealcoating different than Paverx?

Paverx is a guaranteed investment for saving your pavements. Unlike traditional sealcoat, it is both a rejuvenator and penetrating sealer. The benefit is that the underlying asphalt is sealed and repaired on a molecular level which is proven to increase its life by many years. Unlike Sealcoats, **Paverx** is Guaranteed not to chip, crack, flake, pit or peel.

Traditional Sealcoat



Paverx Rejuvenator



Because traditional sealcoats do not repair the oxidative damage that causes cracking, they are a cheap fix by covering up the problem. However, their application makes the condition worse by forming a non-elastic coating on the surface. This coating expands and contracts at a rate different from the pavement during heat/cool cycles resulting in chicken wire cracking. To repair that distress, more sealer is applied and the results only worsen.

"Alligator Cracking" caused by seal coating.

"Spider Web Cracking" caused by seal coating.

> "If a rejuvenator is to successfully resurrect an aged facility, it must be able to penetrate the pavement and to a limited depth improve or restore the maltenes to asphaltenes balance" [4]
>
> Robert E. Boyer, Ph.D., P.E.
> Senior Districe Engineer
> Asphalt Institute

Benefits of Paverx as an Asphalt Rejuvenator Sealer

Paverx Restores Pavement Balance

Paverx Restores Asphalt Flexibilty & Halts The Aging Process

Paverx was formulated with breakthrough technology. Using state of the art Gas Chromatography and Infrared Spectrometry, our scientist researched and found the best match of closed ring compounds that ignite the rejuvenation process. Unlike our competitors who use creosote as a rejuvenating oil, **Paverx**'s new technology uses "Hyper-cracked" fractions of coal tar oils. Unlike any other product, our rejuvenating oils are twice refined to remove all impurities and concentrate a very narrow range of the most active rejuvenating molecules.

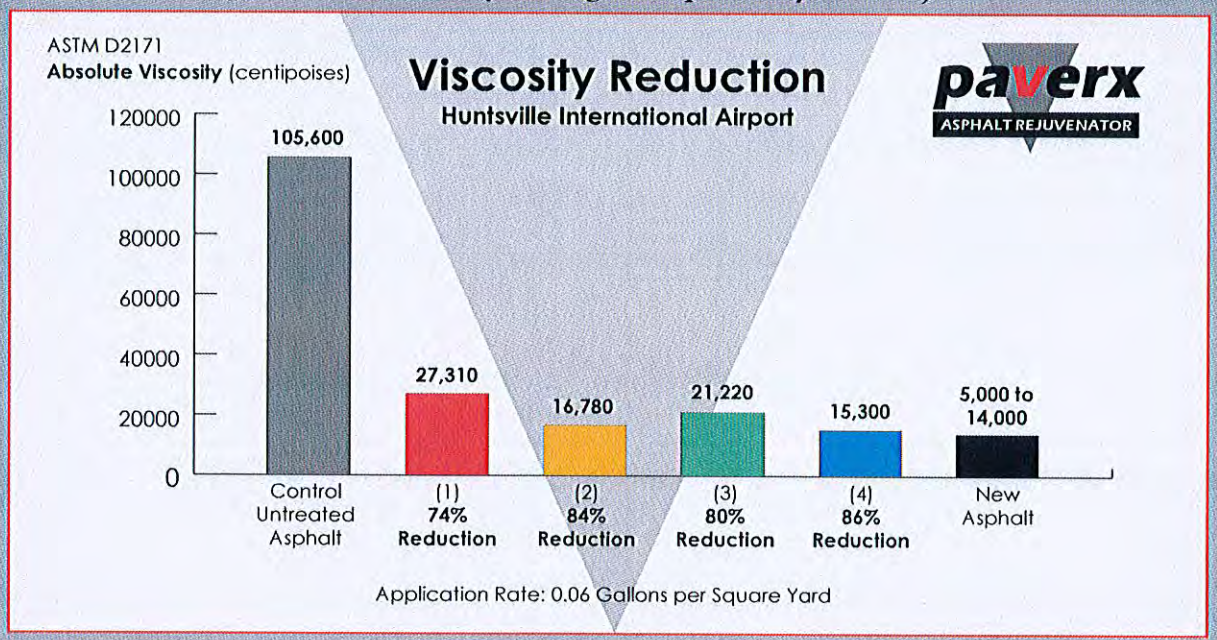
This unique concentration of rejuvenating oils stops the oxidation process and changes the molecular composition of the binder. This new "Super Binder" stops top down cracking and heals hairline spider cracks. Further oxidation is slowed to less than two per cent in 5 years. Water penetration is halted and raveling stopped. Armed with Petro-Shield, the **Paverx** treated surface is now impervious to the damage caused by gasoline, diesel fuel, jet fuel, JP4, JP8 and Hydrol.

Case Study:

In 2005, Huntsville Madison County Airport applied Paverx to its runways and taxiways in accordance with FAA specification EB44A. The application occurred in late fall during very cold and damp weather, the worse possible conditions for the application of any treatment.

Airport engineers removed core samples of the pavement before application. The pavement was oxidized as confirmed by these core tests. The untreated asphalt had an absolute viscosity of 105, 600 or about 10 times harder than that of new asphalt.

Paverx was applied at a rate of 0.06 Gallons per square yard. Three days after application, the pavement was sampled by taking cores from random locations. Paverx reduced the absolute viscosity of the binder by an average of 81% from the original viscosity. (Refer to the Appendix for the results of the independent laboratory testing as required by the FAA)



Benefits of Paverx

Paverx Sustains Pavement Over Time

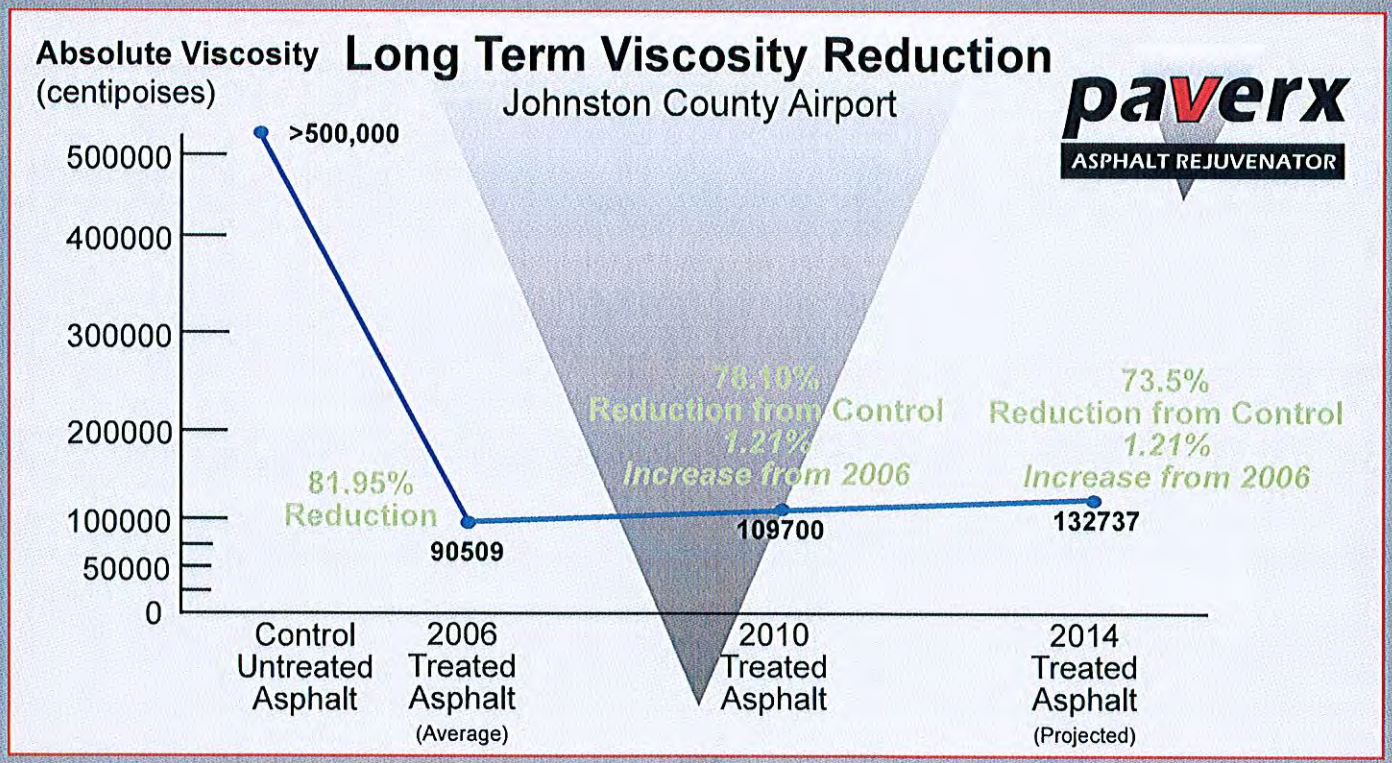
The Rejuvenating Effects of Paverx Last for Many Years

The Huntsville Madison County Airport Case Study, makes it clear that **Paverx** dramatically reduces the viscosity in asphalt resulting in effective restoration and revitalization. However, the Huntsville Case Study only displays a fraction of **Paverx**'s true Cost savings. **Paverx** has proven that it sustains these dramatic results over long periods of time. Independent laboratory testing proves that **Paverx** has the ability to lower the binder viscosity much longer than the industry's standard. Four years after application, the viscosity of the binder (a measure of the effectiveness of the treatment) changed by less two percent.

Case Study:

In 2006, the State of North Carolina chose Paverx to be used to rejuvenate the asphalt pavements at Johnston County Airport. Core samples were taken before the application as Control Samples to measure the effectiveness of the treatment. The samples revealed that the asphalt to be treated was a "worse case" scenario, The initial viscosity of the binder was in excess of 500,000, a level that is off the high end of the scale. Three days following a single application of Paverx at a rate of 0.065 Gallons per Square Yard, new core samples were taken. Laboratory analysis found that the viscosity had been reduced to 90,500 CP (average). Paverx reduced the viscosity more than 80%.

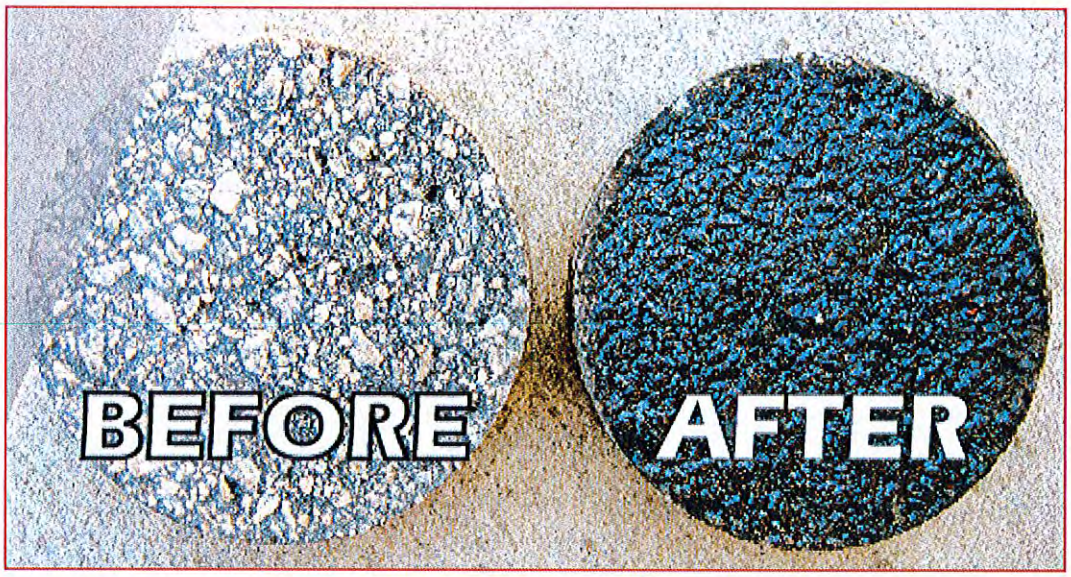
In June 2010, random samples were taken and submitted for the measurement of absolute viscosity. After four years , the viscosity remained low at 109,700 CP. That equates to an increase of less than 2% over fours years. These results prove that rejuvenation with Paverx is long lasting and effective. (See the Appendix for the Laboratory results)

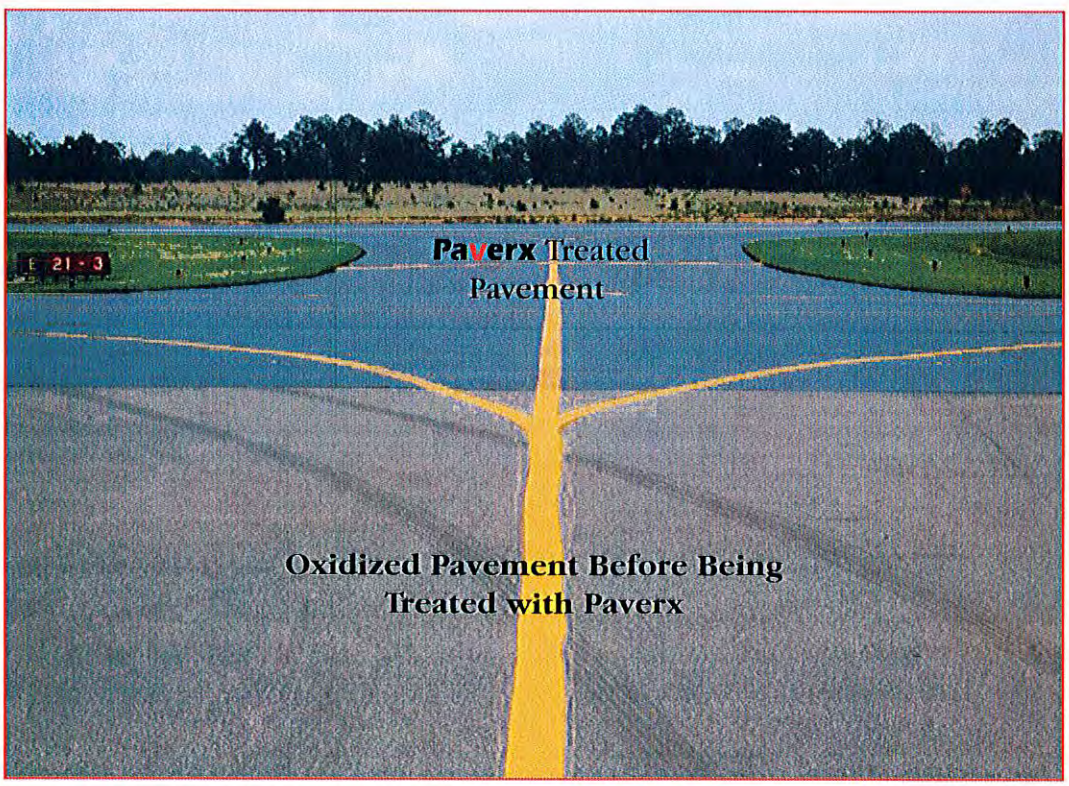


Paverx Beautifies Pavement Appearance

Paverx Beautifies Existing Asphalt; Renews Appearance

The core sample on the left was taken from an eight year old taxiway. It shows the effects of oxidation and aging. All of the original asphalt cement is worn off the stone and the binder has receded so there is stone loss. The sample on the right was treated with **Paverx** at a rate of 0.85 fl. oz. per square foot. It's original appearance is restored and the damaging effects of weather sealed out for many, many years.





Paverx saves money by transforming oxidized and weathered pavement into revitalized, well protected, rich looking asphalt without the need for repaving.

GUARANTEED FOR FIVE YEARS
Not To Crack, Chip, Peel or Fade.

Benefits of Paverx

Paverx Reduces Pavement Maintenance

Field Tests Prove
Paverx Stops Surface Cracking

Paverx restores the flexibility of asphalt pavements by infusing the binder with supercharged oily resinous molecules of coal tar fractions that restores the balance of Maltenes and Asphaltenes. By rejuvenating and softening the hard brittle oxidized binder, surface cracking is stopped. Small hairline cracks self- heal with traffic. The surface may also be kneaded with a rubber tire roller to speed the process.

By stopping top down cracking, less water enters the base course and base erosion from infiltration is eliminated. This sealing, healing process reduces the potential for additional cracking, raveling and stripping.

(Base course reflective cracking must be sealed by traditional hot pour crack fillers. Paverx only addresses the problem of top down surface cracking.)

"These pictures were taken on June 1, 2010 and really do not do full justice to the dramatic differences in the road at this time. The one mile section of road that was treated with Paverx has additional cracking of approximately 1,000 lineal feet, while the remaining 6 miles has an additional 15 to 20 thousand lineal feet per mile. It proves that Paverx will extend the life of the asphalt roads"

Dennis R. Thomas
Grundy County, Iowa

Paverx Prevents Damage Caused By Fuel

Fuel leaked onto pavement breaks down the maltene component in asphalt causing an increased rate of deterioration. **Paverx** is fuel resistant. This means **Paverx** not only repairs damage to asphalt caused by fuel but seals and protects asphalt to prevent future damage.

Paverx Excels During Snow and Ice Season

Unlike traditional seal coats, **Paverx** makes pavement more resistant to damage by snowplows. Because slurry and chip seals only cover the top layer of asphalt and do not reach below the surface, their effectiveness as an asphalt revitalizer is destroyed during snow season. Snowplows scrape top layers of asphalt effectively removing any asphalt surface treatment along with snow and ice. **Paverx** penetrates into the deep layers of asphalt allowing it to maintain its effectiveness throughout snowplow season.

Although the primary purpose of **Paverx** is to restore, revitalize and reinforce asphalt, it also aids as an anti-icing agent. As part of the revitalaztion process, **Paverx** restores the traditional black color to asphalt allowing it to absorb more sunlight and thus slow the development of ice on roads and bridges. Denco Corp. in Iowa restores bridges with **Paverx** during the winter to restore color and prevent excessive icing.

When to Use Paverx?

When to Apply Paverx

Rescue Old Pavements

Paverx can rejuvenate even the oldest most brittle asphalt restoring its luster, lowering its viscosity and reducing its potential for cracking. Asphalt that has base course damage, severe reflective cracking, pot holes, stripping and raveling due to petroleum damage should be repaired before treatment. Old pavements can be patched, routed and crack sealed before **Paverx** is applied. After the repairs are completed, allow 20 to 30 days for the new asphalt to cure. Once **Paverx** is applied, the repairs will blend in and the area will have a uniform appearance. (See Lansing Airport in the Photo Gallery)

Application Rate: .065 to .075 Gallons per S.Y.

Preventative Maintenance

Paverx should be applied at the first sign of aging. When the asphalt starts to turn gray, it is an ideal time to arrest the oxidation and extend the life of your investment. Apply at the first signs of cracking, stripping, raveling, or petroleum damage.

Application Rate: .055 to .065 Gallons per S.Y

Corrective Maintenance - HMA Overlay

Paverx may be used to soften and prepare old pavement prior to resurfacing. Application of **Paverx** will reduce the reoccurrence of some reflective cracking and is often used in the place of fabric. If the underlying surface is sound and the overlay is for increased strength, **Paverx** may be applied 2 to 3 days before resurfacing. This application will cause the existing pavement to soften and promote the bond between the old and new surfaces.

Application Rate: .045 to .055 Gallons per S.Y

New Asphalt

The application of **Paverx** to new asphalt guarantees protection of your investment for many years. Asphalt degradation begains early. The greatest change in compostion of an asphalt binder takes palce during the manufacturing of the Hot Mix Asphalt (HMA). **Paverx** should be applied to new asphalt to seal out the effects of oxidative damage, water infiltration and petroleum damage.

Application Rate: .05 to .055 Gallons per S.Y

"Applying a rejuvenator to a new surface a few weeks after it has been laid does several things to the pavement. Besides restoring the original asphalt properties that were lost in the HMA manufacture, the chemical assists in sealing the pavement as well as in improving the durability of the surface course." (3)

Robert E. Boyer, Ph.D., P.E.
Senior District Engineer
Asphalt Institute

How to Apply Paverx

Paverx may be easily applied using an asphalt distributor.

Spray onto surface at computer controlled rates of 0.05 to 0.075 gallons per square yard.

Protect Area from traffic while drying - 8 to 24 hours. High Traffic Areas may be treated with Black Beauty and reopened to traffic in just hours.

Tests should be conducted to determine the amount of material required to achieve the desired viscosity reduction.

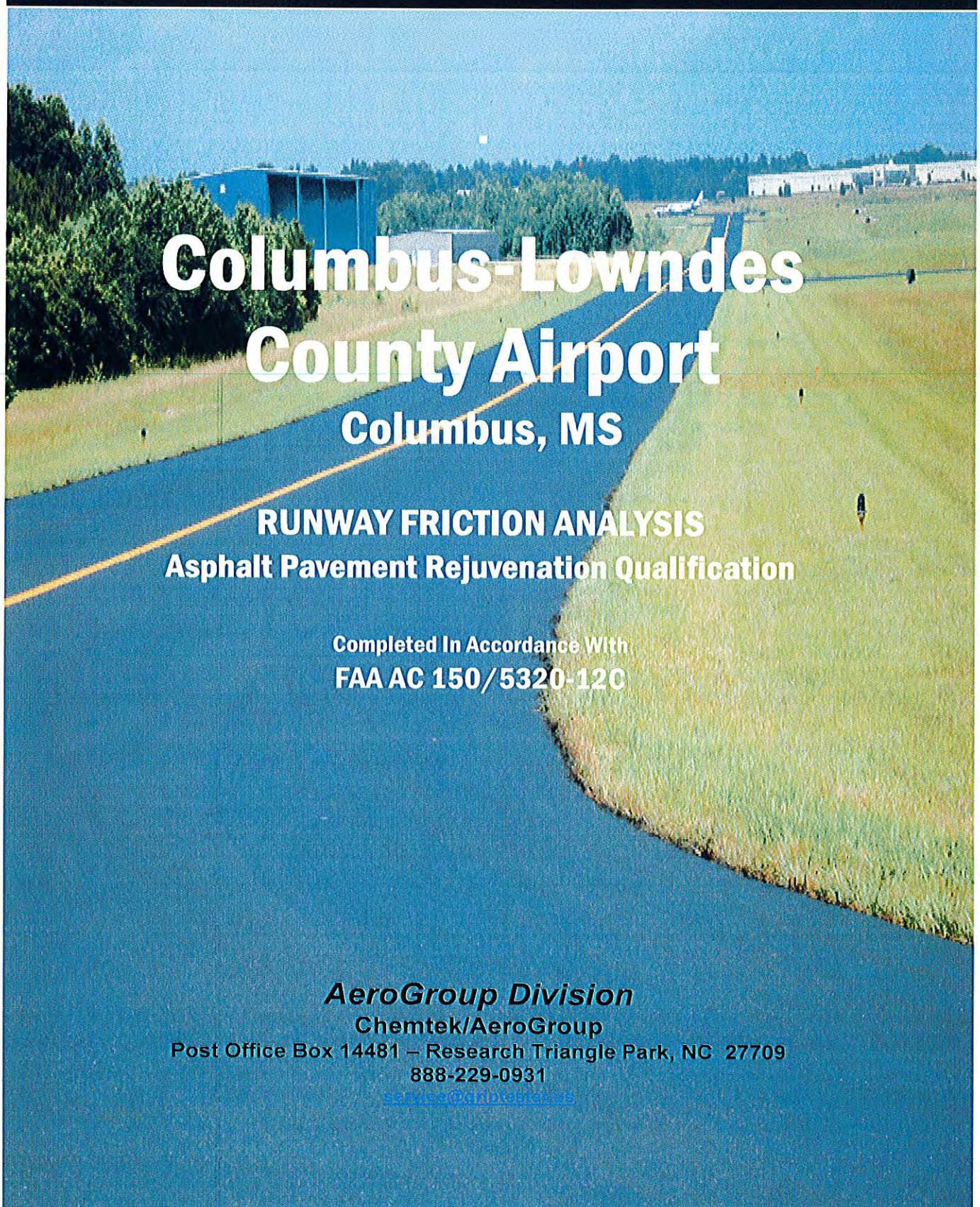
Applying Traditional Seal Coat vs. Applying Paverx

Traditional seal coats are typically applied using a sprayer system. While this does ensure complete coverage on top of the pavement, coverage is often uneven. It also further demonstrates the inability of traditional seal coats to penetrate the surface of the asphalt.

Paverx is applied with an asphalt distributor to ensure even and uniform coverage. By applying **Paverx** at a specified controlled rate directly to the asphalt, the chemical is able to permeate the pavement surface and deliver consistent results.

When to Use Paverx

Paverx Maintains Safe Friction



Columbus-Lowndes County Airport

Columbus, MS

RUNWAY FRICTION ANALYSIS

Asphalt Pavement Rejuvenation Qualification

Completed In Accordance With
FAA AC 150/5320-12C

AeroGroup Division
Chemtek/AeroGroup
Post Office Box 14481 – Research Triangle Park, NC 27709
888-229-0931
service@chemtek.us

Paverx Maintains Safe Friction

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APPENDICES

1.0 INTRODUCTION

The need to perform periodic runway pavement friction testing has become increasingly obvious over the years. Investigations of many aircraft overrun and run off accidents attribute inadequate friction characteristics/braking action as either a primary cause or contributory factor. The National Transportation Safety Board (NTSB) found runway conditions were a cause or factor in 115 accidents between 1983-87. In one investigation involving an aircraft skidding off a runway at a major southern airport, the NTSB concluded that "evidence of hydroplaning and poor frictional quality on the last 1500 feet of runway" was one of the primary causes of the mishap.

As early as 1960, the National Aeronautics and Space Administration (NASA) was conducting research on aircraft braking performance on dry and wet runway pavements. NASA, the Federal Aviation Administration (FAA) and the United States Air Force (USAF) later conducted studies to establish a correlation between the results of friction surveys by various types of friction measuring equipment and the braking action of aircraft tires. In August 1989, the FAA conducted a tire performance evaluation and friction equipment correlation study at NASA Wallops Flight Facility that resulted in the establishment of our current runway friction standards

In FAA Advisory Circular 150/5320-12C, Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces, the FAA states that "periodic friction surveys (should) be conducted to assure that wet runway pavement surfaces do not deteriorate below recommended minimum levels."

The Greek letter "Mu" has been traditionally assigned as the coefficient of friction. Mu numbers (friction values) measured by CFME are used to evaluate the surface friction deterioration of runway pavements.

The following FAA friction level classifications were developed from data obtained from the above-mentioned correlation study at NASA Wallops Flight Facility:

ACTION GUIDELINES

FAA Approved CFME	GripTester Friction Tester	GripTester Friction Tester
Runway Friction Survey Speed	40 MPH	60 MPH
Friction Value Grip Number	RESULTS	RESULTS
MINIMUM	43	24
MAINTENANCE PLANNING	53	36
NEW DESIGN	74	64

Source: Table 3-2, FAA Advisory Circular 150/5320-12C

The Grip Number is the friction value or Mu reported by the Findlay Irvine GripTester. This value is correlated to all FAA approved CFMEs so the more commonly known term Mu, will be throughout this report.

IMMEDIATE ACTION: Average Mu is below the MINIMUM LEVEL for 500' and the adjacent 500' segments are below the MAINTENANCE PLANNING LEVEL.
EVALUATE AND CORRECT: Average Mu is below MAINTENANCE PLANNING LEVEL for 1000'
MONITOR CLOSELY: Average Mu if less than MAINTENANCE PLANNING LEVEL for 500' but above the MINIMUM LEVEL and the adjacent 500' segments are at or above the MAINTENANCE PLANNING LEVEL.

For surfaces with Mu readings below Minimum Friction Level, corrective action should be taken immediately after determining the cause(s) of the friction deterioration. Mu readings at or below Maintenance Planning Friction Level, but above Minimum Friction Level, indicate that the pavement friction is deteriorating. An extensive evaluation of the cause(s) and extent of the friction deterioration should be conducted and appropriate corrective action should be taken.

2.0 BACKGROUND

2.1 What Does This Survey Measure

Pavement surface texture consists of two common features, microtexture and macrotexture. Microtexture refers to the fine-scale roughness of the individual aggregate particles that is not visible to the naked eye. Microtexture is important in penetrating thin water films associated with slow speed (viscous) hydroplaning. Abrasion due to repeated traffic applications eliminates these rough edges on the aggregate and prevents it from penetrating a thin film of water for adequate tire/pavement contact. Contaminants, particularly rubber accumulation due to aircraft tire spin-up at touchdown, will coat the aggregate particles and eliminate the rough microtexture. The loss of the microtexture and subsequent reduction of friction posses a safety hazard at high-speed turnoffs, taxiway turnoff and runway accelerate/stop areas.

Macrotexture refers to the overall roughness of the pavement surface as a whole. Macrotexture provides a means for drainage of bulk water associated with dynamic hydroplaning. The deposition of contaminants such as rubber from aircraft tires will eventually fill the macrotexture of the pavement surface and not allow draining of bulk water. Macrotexture is evaluated visually and at high friction test speeds (60 MPH) It is additionally quantified with an aqueous outflow meter. Unless the microtexture survey suggests a potential drainage problem, it is not considered part of this evaluation.

2.2 EQUIPMENT

The testing was completed using a Findlay Irvine GripTester (Serial No. 069). The FI GripTester is specifically listed as a qualified product for continuous friction measurement in FAA Advisory Circular 150/5320-12C.

The GripTester is a trailer-mounted fixed slip runway pavement friction measuring instrument designed to obtain real-time friction coefficients. The GripTester operates electronically and uses computer programs to aid in calibration of measuring equipment, planning friction runs, and performance of actual runs.

The GripTester measures surface friction by determining the force created against a calibrated measuring tire that is loaded to slip at a ratio of 14 percent. An electronic load cell to which the measuring wheel is attached measures this force. The load cell reads runway frictional changes as electronic values and transmits the data to a Signal Conditioner via shielded cable. In addition, an electronic encoder mounted next to the drive (main) wheel serves as a distance sensor. The distance sensor reads a digital pulse in increments of one per wheel revolution and transmits this information to the Signal Conditioner via shielded cable for calculation each time the GripTester travels 2.7 feet.

The Signal Conditioner, which is mounted on the GripTester frame, amplifies analog Mu data received from the load cell and distance sensor for transmission to the cab-mounted Processor. The signals from the electronic distance sensor provide both distance measurement and, when combined with increments of real-time, highly accurate speed measurement.

The Processor is connected to the Signal Conditioner by shielded cable. The Processor uses a Pentium Class Computer to calculate, store, and process friction data received. Processed data is transmitted to an eye-level computer screen for immediate monitoring. The data is also stored internally on the computer=s hard drive for data averaging and later printout.

The GripTester is equipped with a self-watering system composed of a water tank and a constant pressure pump mounted in the bed of the tow vehicle. The level of pressure is controlled to assure a constant amount of water, adjusted to the vehicle speed. The self-watering system simulates a wet pavement surface by providing a uniform depth of 0.04 inches of water in front of the friction measuring wheels of the Mu-Meter at both the 40 and 60 mph testing speeds. Using the self-watering system, areas of runway pavements with insufficient friction may be identified.

2.3 TEST PROCEDURES

Prior to any testing, the required calibration procedure as prescribed by Findlay Irvine, the GripTester's manufacturer, was performed. The first step in the calibration procedure requires the air pressure (measured at ambient temperature)

for the Measuring Wheel tires to be adjusted to 20 psi. Following this, the zero calibration adjustment of the load cell is performed.

All testing was conducted in accordance with FAA Advisory Circular 150/5320-12C, which details the procedures for conducting friction measurements except that the tests were conducted at a fifteen feet centerline offset. This distance was chosen for the purposes of evaluating the overall rubber contamination and is common industry practice.

The following data were recorded before each test run was performed:

a. Airport name and runway number;

b. Date and time of survey;

c. Type of test and the distance from runway centerline at which survey was conducted;

d. Weather conditions and ambient temperature; and

The on-board computer was programmed, in accordance with FAA Advisory Circular 150/5320-12C, to produce an average Mu value for each 500-foot segment of runway pavement surface.

The 40 mph testing speed was used on all test runs to determine the overall contaminant condition of the pavement surface. In order to properly evaluate the runway, a series of events, or marking points, were established on the runway pavement to allow a uniform interpretation of the test run results. The FAA Advisory Circular requires, when conducting friction surveys on runways at 40 mph, to allow 500 feet from the threshold end of the runway for acceleration of the vehicle and 700 feet for 60 MPH. The friction survey was terminated at the appropriate distance from the opposite end of the runway to allow adequate distance to safely decelerate the vehicle. Therefore inaccurate values will be reported from the threshold to a point 500/700 feet from the threshold end, and in the last 500/700 feet on the opposite end of the runway.

The FAA Specification P-632 does not specify the lateral location on the runway for performing friction surveys. An offset of 30 to 40 feet is chosen to eliminate the possible interference of surface polishing from aircraft tire wear or surface painted markings.

Test results can vary due to location, operator technique, temperature and test vehicle speed. If abnormal readings occur, each test is repeated over the same area until the results of two survey runs are statistically similar to verify that the results obtained from each survey run are reliable,

3.0 TEST RESULTS

This friction testing was performed following the application of "Paverx", a coal tar based rejuvenator. Friction measured with an ASTM Smooth tire mounted on a Fixed Slip CFME can detect changes in the mirco-texture of the pavement. Since the depth of the micro-texture is easily reduced by surface contaminants, it is prudent to measure the loss of friction from the application of a surface applied asphalt treatment. A loss of micro-texture depth can result in a decrease of the braking action at lower speeds. This is similar to the effect that rubber deposits have on runways.

To preclude the potential for viscous hydroplaning, the FAA has provided for skid resistance testing in Specification P-632 and Engineering 44B. Measuring skid resistance at 40 Miles Per Hour can identify if a problem with braking action exists.

FAA AC 150/5370-10e – Specification P-632

632-6.6 Skid Resistance. *Special attention must be afforded to skid resistance based on the use of the pavement surfaces.*

a. For Runway and High Speed Taxiway Exit Surfaces. *The pavement surface areas treated with rejuvenation product must be tested for skid resistance a minimum of forty-eight (48) hours after application of the rejuvenation product. The results of the friction evaluation must be equal or greater than the Maintenance Planning levels provided in Table 3-2, "Friction Level Classification for Runway Pavement Surfaces," in AC 150/5320-12, Measurement, Construction, and Maintenance of Skid-resistant Airport Pavement Surfaces, when tested at speeds of 40 and 60 mph with approved continuous friction measuring equipment [CFME].*

The Grip Number or Friction Value (mu) for the FAA Maintenance Planning Level is 0.53 GN.

Utilizing FAA Evaluation and Maintenance Guidelines from Advisory Circular 150/5320-12C, the following is an analysis of the pavement friction for the runway(s) tested.

Test Conditions of Pavement Before Treatment

October 28, 2010 17:37

Temp: 70F. Winds: Calm Sky Condition: Clear, Sunny

Surface: Dry – Rain Occurred 24 hours prior

Test Conditions of Pavement After Treatment

October 30, 2010 17:46

Temp: 59F. Winds: Calm Sky Condition: Clear, Sunny

Surface: Dry – Application Of Paverx Occurred 48 Hours prior

Results of Analysis Before/After Surface Treatment

LOCATION	Before Application		Maintenance Value		AFTER APPLICATION	Pass/Fail
40 Feet ROC	.72		.53		.66	PASS

Refer to the Appendix for the complete survey.

The Runway surveyed is above the Maintenance Planning Value and requires no action at this time.
It is recommended that these conditions continue to be monitored as required by the Advisory Circular.
Refer to FAA AC 150/5320-12C for guidance in this matter.

Chemtek/AeroGroup

Division of Chemtek, Inc. – AeroTest Unit

CERTIFICATION OF RUNWAY FRICTION

I HEREBY CERTIFY that on the dates and at the locations identified below, Friction Testing was conducted as prescribed by the Federal Aviation Administration as set forth in Advisory Circular 150/5320-12C.

I further certify that……..

The Certified Friction Measuring Equipment "CFME" used to collect the data is a device approved by the FAA for this purpose.

The CFME used for testing was fully calibrated by a factory trained technician within the previous thirty days.

The calibration of the CFME was verified immediately prior to data collection as prescribed by the manufacturer.

The accuracy of the CFME was verified by comparing data collected from a known standard within the last 365 days.

The Technician collecting the data was trained in accordance with the guidelines set forth in the Advisory Circular and experienced in the unit's operation as well as data collection.

The data was reviewed according to FAA guidelines using software produced by the FAA's Airports Division. The Analysis was written by staff with no less than five years training and experience in analyzing runway friction data.

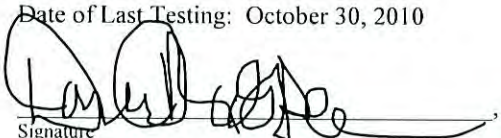
Be it known to whom ever presented, that the data presented in the reports attached hereto is accurate, validated and meets all requirements of the Federal Aviation Administration.

AIRPORT: Columbus-Lowndes County Airport (KUBS)

Runway(s): Rejuvenation of Runway 18/36

The friction of the surface rejuvenated areas evaluated exceeds the FAA's Maintenance Planning snd Minimum Value Thresholds as Specified in FAA AC 150/5370-10e Sec P-632.

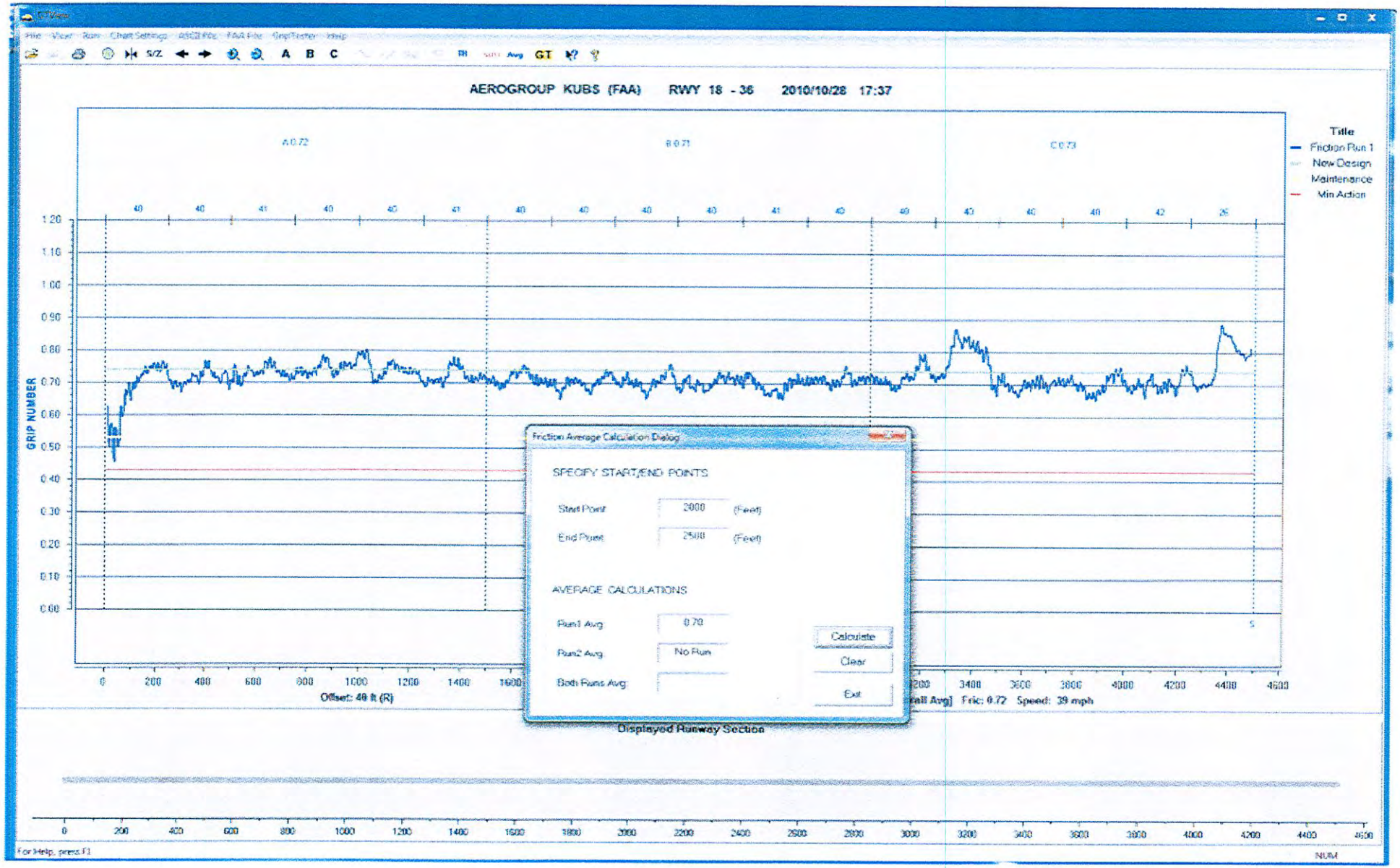
Date of Last Testing: October 30, 2010



Signature , October 31, 2010
Date

Chemtek/AeroGroup - Post Office Box 14481 – Research Triangle Park, North Carolina 27709

Sunday, October 31, 2010 1:07:52 AM



GRIPTESTER DATA SUMMARY FILE - AEROGROUP

FILE HEADER

Licenced To:	AEROGROUP
Airport ICAO Code:	KUBS
Date:	October 28, 2010
Time:	17:37
Runway:	RUNWAY 18 - 36
Start End:	36
Side:	Right, 40 feet from centerline
Number of Runs:	1
Runway Length:	4500 (Feet)
Set Test Length:	4500 (Feet)
Actual Run Length:	4502 (Feet)
Jurisdiction:	FAA
Units:	Imperial
Fric Readings/Rev:	1
Scale:	375.4 (Friction readings per 1000 feet)
Target Speed:	40 mph
Water Applied:	Yes, Water Film Depth (0.04inches)
New Level:	0.74
Maintenance Level:	0.53
Min Action Level:	0.43
Ice Level:	N/A
GT Serial #:	069 (MK1)
Tire Type:	ASTM
Tire Circum:	812 (mm)
Tire Serial #:	A53-090814
Tire Spec Date:	Oct 29, 2007

OPERATOR MESSAGE

70, sunny, calm, dry

AVERAGE VALUES

	RUN DATA	
Distance (ft)	Avg Speed (mph)	Avg Friction
000- 250	40	0.67
250- 500	40	0.72
500- 750	41	0.73
750- 1000	40	0.75
1000- 1250	40	0.75
1250- 1500	41	0.72
1500- 1750	40	0.72
1750- 2000	40	0.70
2000- 2250	40	0.71
2250- 2500	40	0.70
2500- 2750	41	0.70
2750- 3000	40	0.71
3000- 3250	40	0.73
3250- 3500	40	0.78
3500- 3750	40	0.70
3750- 4000	40	0.70
4000- 4250	42	0.70
4250- 4500	26	0.78
Overall Avg.	39	0.72

SECTION FRICTION AVERAGES

	Fric:
Section A	0.72
Section B	0.71
Section C	0.73
Run Average	0.72

EndOfFile

GRIPTESTER FAA FILE - AEROGROUP
(Moving Average Friction Value Evaluation)

Licenced To: AEROGROUP
Airport ICAO Code: KUBS

Runway: RUNWAY 18 - 36
Start End: 36
Date: October 28, 2010
Time: 17:37
Position: 40R feet
Operator Note:

Friction evaluation for forty mph data.

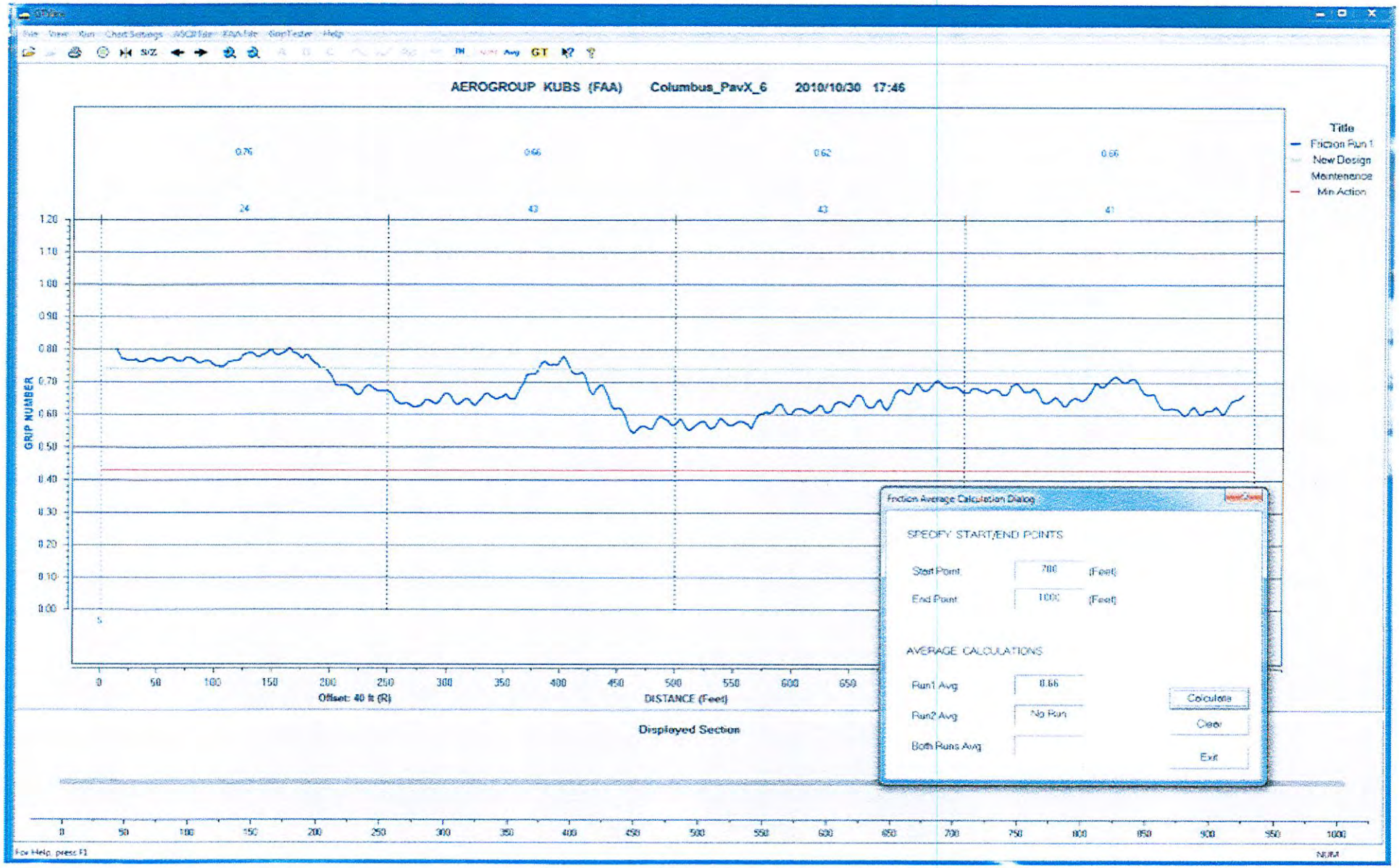
Distance From Threshold (feet)			Avg Fric	Action
100	-	600	74	
600	-	1100	70	
1100	-	1600	76	
1600	-	2100	71	
2100	-	2600	71	
2600	-	3100	71	
3100	-	3600	73	
3600	-	4100	74	
4100	-	4600	69	

!! - Below minimum value - Immediate corrective action required.
** - Below maintenance value - Corrective action required.
~~ - A Moving average, that included part of this section, was below the minimum value.

Moving averages over the following range(s) were below the minimum value!

No Ranges!

Sunday, October 31, 2010 1:06:42 AM



GRIPTESTER DATA SUMMARY FILE - AEROGROUP

FILE HEADER

Licenced To:	AEROGROUP
Airport ICAO Code:	KUBS
Date:	October 30, 2010
Time:	17:46
Surface:	Columbus_PavX_6
Side:	Right, 40 feet from centerline
Number of Runs:	1
Set Test Length:	1000 (Feet)
Actual Run Length:	1002 (Feet)
Jurisdiction:	FAA
Units:	Imperial
Fric Readings/Rev:	1
Scale:	375.4 (Friction readings per 1000 feet)
Target Speed:	40 mph
Water Applied:	Yes, Water Film Depth (0.04inches)
New Level:	0.74
Maintenance Level:	0.53
Min Action Level:	0.43
Ice Level:	N/A
GT Serial #:	069 (MK1)
Tire Type:	ASTM
Tire Circum:	812 (mm)
Tire Serial #:	A53-090814
Tire Spec Date:	Oct 29, 2007

OPERATOR MESSAGE

59, sunny, calm, dry

AVERAGE VALUES

RUN DATA

Distance (ft)	Avg Speed (mph)	Avg Friction
000- 250	24	0.76
250- 500	43	0.66
500- 750	43	0.62
750- 1000	41	0.66
Overall Avg.	36	0.67

EndOfFile

Paverx
Photo Gallery

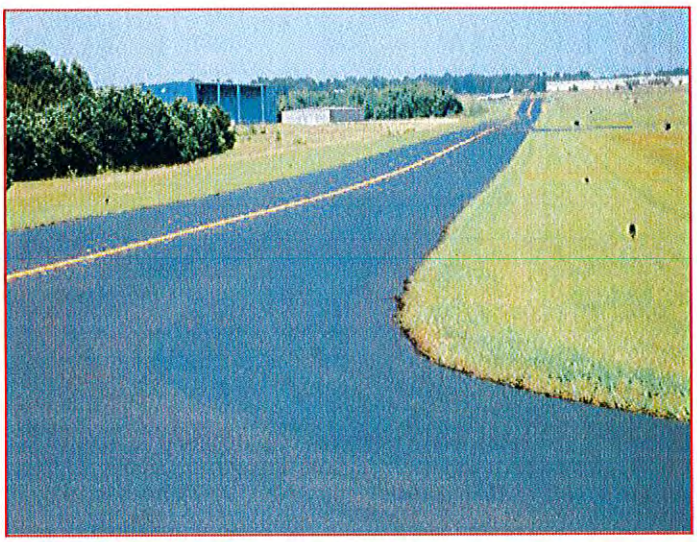
Research Commons - RTP, NC

Capital Region Airport - Lansing, MI

Paverx Photo Gallery

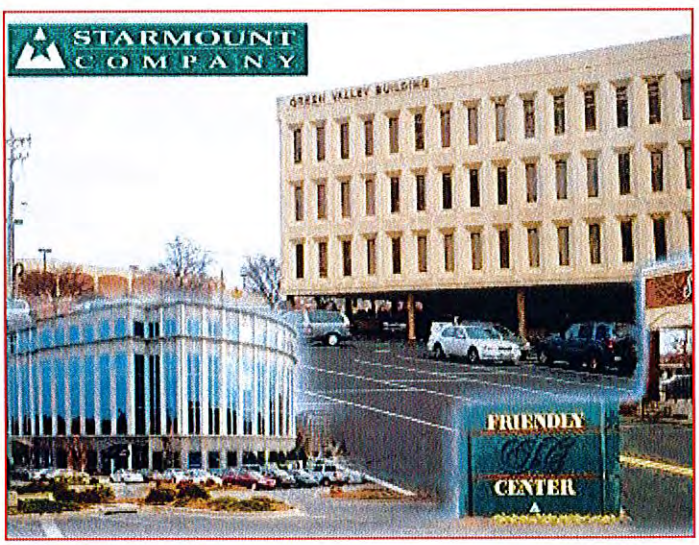
Huntsville Madison Co. Airport - Huntsville, AL

Johnston Co. Airport Smithfield, NC



Jamestown Airport Jamestown, ND

Shopping/Business Centers Greensboro, NC



Paverx Certified Applicators

HASCO

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Michael Harper
Tressie Harper
336.643.5557
mike@hasco.2000.com
www.hasco2000.com

Infrastructure Pavement Technologies

Hilton Head, SC
Gerry Peckage
724.554.9786
iptllc@yahoo.com

ASTECH Corp.
Asphalt Surface Technologies

St. Cloud, MN
Bruce Batzer
800.852.3691
batzer2@hotmail.com

Barnett Paving

Wichita Falls, TX
Kevin Barnett
940.322.6888
info@barnettpaving.com
www.barnetpaving.com

DENCO C.O.R.P. Highway Construction

Mingo, IA
Dennis Thomas
641.363.7212
dennisaved@yahoo.com

PMS Construction

Dallas, GA
Adam Bruner
770.609.5832
info@pmsconstruction.com

Sunbelt Sealing, Inc. 601-352-6900

Jackson, MS
Jeff Marshall
601.352.6900
jeff@sunbeltsealing.com

paverx

ASPHALT REJUVENATOR

Paverx is applied only by licensed, bonded and factory certified contractors.

For Technical Information Contact:

David Rigsbee 888.829.0931 Voice/Fax
P.O. Box 14481 1.919.300.5543 International
Research Triangle Park, sales@pavetek.com
North Carolina 27709 www.paverx.com

Contact Information

Appendix I Technical Information

paverx
ASPHALT REJUVENATOR

Technical Product Specification

Description Paverx is a coal tar solvent asphalt rejuvenator and sealer. It is formulated to rehabilitate and preserve oxidized or otherwise aged asphalt binder and to impart a fuel resistant surface seal without an appreciable reduction is surface friction. Its self-healing properties repairs and aids in the propagation of hairline surface cracking. The binder modifiers lower the viscosity reducing brittleness and restore the ductility or flexibility of the surface. Its patent pending formulation provides superior penetration of the rejuvenator. Its binder modifiers go deep into the surface preventing further oxidative damage from surface active O_2. By modifying the damaged binder and replacing lost oils, it extends the life of runways, taxiways, parking lots and roads three to seven years.

Paverx protects asphalt form attack by petroleum solvents such as jet fuel (JET A, JP-4), gasoline (AvGas and Motor Fuels) as well as lubricating and hydraulic oils. The treated surface is impervious to properly treated spills. Unlike emulsion sealers, Paverx is guaranteed not to chip, peel, flake or delaminate from the surface. Application restores the surface to a rich black even appearance.

Product Use and Benefits
Restore Flexibility To Aged Brittle Asphalt
Reduce Further Loss of Fines
Reduce FOD Potential
Reduce Crack Propagation
Prevent Water Infiltration Damage

Pavement Preservation Technologies

Technical Data – Paverx exceeds the FAA's Engineering Brief 44 and the TXDOT spec for sealer/rejuvenators.

Composition:
RT 12 Coal Tar ASTM D490 (30%-50%)
Aromatic Solvent Naphtha (30%-40%)
Bituminous Rejuvenator Oils (15%-40%)

Typical Material Properties:
Specific Gravity ASTM D70 1.06
Engler Viscosity ASTM D1665 < 8.0
% Water by Vol. ASTM D95 < 2.0
Softening Point ASTM D36 40°-55°

Distillation % by wt ASTM D20
To 170 C. <20
To 270 C. 20-50
To 300 C. 40-60

Minimum Initial Viscosity Reduction:
40 Percent within 48 hours

Weather Limitations:
Surface should be dry before and for 24 hours after application. Temperature – 40 degrees and rising.

Application: Paverx is applied in one application. The application rate is determined by pre-testing the surface with up to six application rates of .05, .06, .07, .08. 09 and 1.0. Paverx is applied at 70 – 100 F. to a clean surface.

Friction and Safety: All airfield and road pavements should be friction tested before and after application of sealer/rejuvenators. Paverx will not lower friction below FAA minimum requirements when properly applied.

MATERIAL SAFTEY DATA SHEET (MSDS)

CHEMTEK INCORPORATED

INFORMATION (800)672-8536, CHEMICAL EMERGENCY (800)535-5053
Box 86 - Yanceyville, N.C. 27379 USA

HMIS DESIGNATION

HEALTH: 3 FIRE: 2 REACTIVITY: 0

IDENTIFICATION

TRADE NAME:Paverx **SYNONYMS:** Pavement Protectant and Rejuvenator

DOT: RQ Tars, liquid, 3, UN 1999, III, (Contains petroleum distillates -HAZARDOUS SUBSTANCES benzo(a)pyrene, dibenz(a,h)anthracene) Bulk only - not regulated in containers 55 gallons or smaller
This product is not a marine pollutant.

SAFE HANDLING PROCEDURES

KEEP AWAY FROM CHILDREN

Precautions To Be Taken In Handling And Storage: Avoid skin or eye contact, and exposure to mist or vapors. Avoid flames, sparks, or hot surfaces. Keep containers closed. Wash after handling. Empty containers may contain combustible liquid and vapors. Do not heat, weld or cut with a torch. Long term exposure to some of the components of this product have been shown to cause cancer in laboratory animals and people, and are classified as human carcinogens according to International Agency for Research on Cancer ("IARC").

PROTECTIVE EQUIPMENT	VENTILATION REQUIREMENTS
EYES: Safety Glasses or Splash Goggles	None required in excess to normal ventilation when used outside.
	RESPIRATORY
SKIN: Neoprene, rubber or Plastic Gloves	None Normally Required - outside air conditions

SPECIAL CLOTHING/EQUIPMENT: Oil Resistant Apron, Long Sleeve Work Shirt

HAZARDOUS COMPONENTS AS DEFINED BY THE STANDARD

BASIC MATERIAL	OSHA PEL	ACGIH TLV	SARA III, SEC 313	OSHA Hazard
Refined Coal Tar	0.2 mg/m^3	0.2 mg/m^3	Yes(*)	contains carcinogens
Aromatic Solvent Naphtha	500 ppm**	100 ppm**	Yes(*)	irritant, combustible
Coal tar oils	----------	0.2 mg/m^3	Yes(*)	irritant, combustible, contains carcinogens

* Rejuvaseal contains the following components at the listed levels, with the respective Chemical Abstract Numbers: Naphthalene <5% 91-20-3; anthracene <1% 120-12-7; benzo(a)pyrene <1% 50-32-8; 1,2,4-trimethyl benzene <15% 95-63-6; xylenes, mixed isomers <2% 1330-20-7; phenanthrene <3% 85-01-8; polycyclic aromatic hydrocarbons < 3% (mixture)

Please Note: Judgement Is Based On Indirect Test Data

(MSDS CONTINUED)

FIRE, EXPLOSION AND REACTIVITY DATA

FLASH POINT: 125 - 135 EF (Approximate) METHOD: Indirect
FLAMMABLE EXPLOSIVE LIMITS (AIR) - LEL: Not Determined UEL: Not Determined
EXTINGUISHING MEDIA: Dry Chemical, carbon dioxide, Foam, Water fog. Handle as a Class B fire.
SPECIAL HAZARDS - FIRE FIGHTING PROCEDURES: Wear self-contained breathing apparatus and full protective clothing. Avoid skin and eye contact..
HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of carbon, nitrogen and/or sulfur.

MATERIAL IS STABLE Y HAZARDOUS POLYMERIZATION N
CONDITIONS TO AVOID: Sources of flame or sparks, presence of oxidizing agents.
INCOMPATIBILITY: Chlorine, Oxygen or other oxidizers

HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE: INHALATION Y SKIN CONTACT Y SKIN ABSORPTION Y
INGESTION N EYES Y
EFFECTS OF OVEREXPOSURE:
SKIN CONTACT: May cause irritation. May cause sensitivity to sunlight if skin is exposed. Harmful amounts may be absorbed through the skin.
INGESTION: May cause nausea, vomiting, diarrhea. Aspiration of liquid may cause chemical pneumonitis.
EYES: May cause irritation.
INHALATION: May cause respiratory tract irritation, dizziness, unconsciousness, even death if overexposure severe.
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: None Noted
Target Organs: Skin, possibly lungs, nasal passages, bladder, liver, kidney and central nervous system.
TOXICOLOGY: CONTAINS CARCINOGENS listed as such by the Occupational Safety and Health Administration, American College of Governmental Industrial Hygienists, National Toxicology Program, and the International Agency for Research on Cancer.

EMERGENCY FIRST AID PROCEDURES

EYES: Wash with large amounts of water. If irritation persists, seek medical aid.
SKIN: Remove contaminated clothing. Wash with soap and water. Wash contaminated clothing separately or dispose of it.
INGESTION: DO NOT INDUCE VOMITING. Give 3-4 glasses of water. Seek medical aid.
INHALATION: Remove to fresh air.

CONTROL PROCEDURES - SPILL, LEAKAGE OR DISPOSAL

STEPS TO BE TAKEN IF MATERIAL IS SPILLED: Stop flow, dike spill, eliminate all ignition sources, absorb on inert material and scrape up.
WASTE DISPOSAL METHOD: DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS. The wastes from this material may be hazardous wastes according to the Resource Conservation and Recovery Act ("RCRA")

PHYSICAL DATA

APPEARANCE AND ODOR: Black Fluid with aromatic hydrocarbon odor
VAPOR DENSITY: <0.01
SOLUBILITY IN WATER: Negligible VAPORPRESSURE: <.01
SPECIFIC GRAVITY: >1.04 (Estimated) WATER REACTIVE: No
BOILING POINT: Not determined
DATE OF REVISION: 12-15-05 SUPERCEDES: New PREPARED BY: MGK

NOTE:CHEMTEK MAKES NO WARRANTY EITHER EXPRESSED OR IMPLIED, WITH RESPECT TO THE COMPLETENESS OR CONTINUING ACCURACY OF THIS INFORMATION AND DISCLAIMS ALL LIABILITY FOR RELIANCE THEREON.

User Should Satisfy Himself That He Has All Current Data Relevant To His Particular Needs.

Appendix II
Technical References

BUILDING & EARTH
Geotechnical, Environmental and Materials Engineers
5545 Derby Drive • Birmingham, AL 35210-5414 • Ph: (205) 836-6300 • Fax: (205) 836-9007

December 1, 2005

Mr. Alan Clements, P.E.
GW Jones & Sons, Inc.
401 Franklin Street
Huntsville, AL 35801

Re: Huntsville Madison County Airport
Pavement Rejuvenation Project

Dear Mr. Clements:

Your office asked that I visit the project site and make a review of the portion of the runway that had received the rejuvenation treatment. My comments/observations are discussed below.

For my observations I made some penetration comparisons with treated and untreated areas for both grooved and ungrooved surfaces. I did not obtain any appreciable penetration differences by probing the surfaces of both the grooved and ungrooved pavements. Several areas of the grooved surfaces were also checked for possible closure. The grooves indicated a good coverage, and no pooling or deterioration was noted. Upon these observations it is not likely that the grooves will experience closure.

These results conform to specifications. If you have any questions or need additional information please contact my office.

Sincerely,
Building & Earth Sciences, Inc.

George R. Hays, CET IV
Branch Manager

ATLANTA
2720 Grassview Drive
Alpharetta, Georgia 30004
Ph: (770) 343-6499
Fax: (678) 297-0678

COLUMBUS
5045 Milgen Court, Unit #2
Columbus, Georgia 31907
Ph: (706) 562-0048
Fax: (706) 565-6733

SAVANNAH
3911 Old Louisville Road, Suite 107
Savannah, Georgia 31408
Ph: (912) 966-5044
Fax: (912) 966-5057

TULSA
10828 East Newton Street, Suite 111
Tulsa, Oklahoma 74116
Ph: (918) 439-9005
Fax: (918) 439-9255

BUILDING & EARTH

Geotechnical. Environmental and Materials Engineers

5545 Derby Drive • Birmingham, AL 35210-5414 • Ph: (205) 836-6300 • Fax: (205) 836-9007

December 28, 2005

Mr. Alan Clements, P.E.
GW Jones & Sons, Inc.
401 Franklin Street
Huntsville, AL 35801

Dear Mr. Clements:

Five sets of eight cores were provided to Chicago Testing Labs as production testing to determine and verify a 20% minimum decrease in viscosity. The viscosity test results from these samples were compared to the viscosity control test results determined from preconstruction testing.

Eight cores were provided for each test in order to provide enough material needed for the test. The top 3/8" of each core was sawed, and a composite sample from the eight cores was used for the following tests:

Extraction, ASTM D2172, Method A
Asphalt Recovery ASTM D1856
Absolute Viscosity ASTM D2171
Control Absolute Viscosity: 105,600

Test results are listed below:

	Test 1	Test 2	Test 3	Test 4	Test 5
Laboratory Number	512045	512046	512047	512048	512049
Location	1032'S 87' W	2936'S 60'W	3539'S 83'W	6205'S 64'W	6733'S 69'W
Absolute Viscosity @ 140F	27,310	16,780	21,220	32,250	15,300
% Decrease in Viscosity	74	84	80	69	86

Test results conform to specifications.

Sincerely,
Building & Earth Scienc s, Inc.

George R. Hays, CET IV
Branch Manager

ATLANTA
2720 Grassview Drive
Alpharetta, Georgia 30004
Ph: (770) 343-6499
Fax: (678) 297-0678

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5045 Milgen Court, Unit #2
Columbus, Georgia 31907
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Savannah, Georgia 31408
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10828 East Newton Street, S ite 111
Tulsa, Oklahoma 74116
Ph: (918) 439-9005
Fax: (918) 439-9255

BUILDING & EARTH
Geotechnical, Environmental and Materials Engineers
5545 Derby Drive • Birmingham, AL 35210-5414 • Ph: (205) 836-6300 • Fax: (205) 836-9007

January 9, 2006

Mr. Alan Clements, P.E.
GW Jones & Sons, Inc.
401 Franklin Street
Huntsville, AL 35801

Dear Mr. Clements:

Seven sets of eight cores were provided to Chicago Testing Labs as production testing to determine and verify a 20% minimum decrease in viscosity. Four tests results (6 – 9) are provided below. The remaining three tests will be provided as soon as they are made available. The viscosity test results from these samples were compared to the viscosity control test results determined from preconstruction testing.

Eight cores were provided for each test in order to provide enough material needed for the test. The top 3/8" of each core was sawed, and a composite sample from the eight cores was used for the following tests:

Extraction, ASTM D2172, Method A
Asphalt Recovery ASTM D1856
Absolute Viscosity ASTM D2171
Control Absolute Viscosity: 105,600

Test results are listed below:

	Test 6	Test 7	Test 8	Test 9
Laboratory Number	512074	512075	512076	512077
Location	W1	W2	W3	R/W
	282' E R/W CL	249' E R/W CL	237' E R/W CL	1253' S
	10' N of S Edge	13' N of S Edge	18' S of N Edge	55' E CL
Absolute Viscosity @ 140F	14,260	35,360	24,600	22,390
% Decrease in Viscosity	86	67	77	79

Test results conform to specifications.

Sincerely,
Building & Earth Sciences, Inc.

George Hays

George R. Hays, CET IV
Branch Manager

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2720 Grassview Drive
Alpharetta, Georgia 30004
Ph: (770) 343-6499
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5045 Milgen Court, Unit #2
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Fax: (918) 439-9255

BUILDING & EARTH
Geotechnical, Environmental and Materials Engineers
5545 Derby Drive • Birmingham, AL 35210-5414 • Ph: (205) 836-6300 • Fax: (205) 836-9007

January 16, 2006

Mr. Alan Clements, P.E.
GW Jones & Sons, Inc.
401 Franklin Street
Huntsville, AL 35801

Dear Mr. Clements:

Seven sets of eight cores were provided to Chicago Testing Labs as production testing to determine and verify a 20% minimum decrease in viscosity. The final three tests results (10 – 12) are provided below. The viscosity test results from these samples were compared to the viscosity control test results determined from preconstruction testing.

Eight cores were provided for each test in order to provide enough material needed for the test. The top 3/8" of each core was sawed, and a composite sample from the eight cores was used for the following tests:

Extraction, ASTM D2172, Method A
Asphalt Recovery ASTM D1856
Absolute Viscosity ASTM D2171
Control Absolute Viscosity: 105,600

Test results are listed below:

	Test 10	Test 11	Test 12
Laboratory Number	512078	512079	512080
Location	2141' S 38' E R/W CL	5020' S 69' E R/W CL	6517' S 87' E R/W CL
Absolute Viscosity @ 140F	22,060	27,350	34,720
% Decrease in Viscosity	79	74	67

Test results conform to specifications.

Sincerely,
Building & Earth Sciences, Inc.

George R. Hays, CET IV
Branch Manager

ATLANTA
2720 Grassview Drive
Alpharetta, Georgia 30004
Ph: (770) 343-6499
Fax: (678) 297-0678

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Founded 1912
Testing • Inspection • Training • Consulting • Research • Geotechnical

Report No. 606005-006

June 19, 2006

HASCO
7206 Horseshoe Bend Trail
Summerfield, NC 27358

Bituminous Pavement Cores; Received June 6, 2006
Johnston County Airport; Smithfield, NC

Two sets of bituminous pavement cores were received from HASCO on June 6, 2006 with testing instructions that they be tested for viscosity.

The top 3/8" of the cores were sawed and a composite of each set of the tops was tested using the following procedures.

Extraction, ASTM D 2172, Method A, using trichloroethylene as the solvent and a high speed centrifuge to remove suspended mineral matter from the extract.
Asphalt Recovery, ASTM D 1856
Absolute Viscosity, ASTM D 2171

Following are the test results:

Laboratory Number	606005	606006
Absolute Viscosity @ 140F, Poises	500,000+	500,000+

The recovered asphalt was very hard and difficult to test.

Respectfully submitted,

CHICAGO TESTING LABORATORY, INC.

FAX: 336-643-1977

George J. Giroux

Chicago Testing Laboratory, Inc.
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Report No. 606040 A & B

July 3, 2006

HASCO
Attn: Mr. Michael Harper
7206 Horseshoe Bend Trail
Summerfield, NC 27358

Bituminous Pavement Cores; Received June 28, 2006
Johnston County Airport; Smithfield, NC

Two sets of bituminous pavement cores were received from HASCO on June 28, 2006 with testing instructions that they be tested for viscosity. It was indicated that these cores had been treated with a rejuvenator.

The top 3/8" of the cores were sawed and a composite of each set of the tops was tested using the following procedures.

Extraction, ASTM D 2172, Method A, using trichloroethylene as the solvent and a high speed centrifuge to remove suspended mineral matter from the extract.
Asphalt Recovery, ASTM D 1856
Absolute Viscosity, ASTM D 2171

Following are the test results:

Laboratory Number	6060040A	606040B
Absolute Viscosity @ 140F, Poises	83,969	97,050
% lower viscosity from original test on report 606005-006	83.4	80.5

Respectfully submitted,

CHICAGO TESTING LABORATORY, INC.

George J. Giroux

FAX: 336-643-1977

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Report No. 1006106 June 21, 2010

HASCO
Attn: Mr. Michael Harper
7206 Horseshoe Bend Trail
Summerfield, NC 27358

Bituminous Pavement Cores; Received June 7, 2010
Johnston County Airport; Smithfield, NC

One set of bituminous pavement cores was received from HASCO on June 7, 2010 with testing instructions that they be tested for viscosity. It was indicated that these cores had been treated with a rejuvenator in 2006.

The top 3/8" of the cores were sawed and a composite of the tops was tested using the following procedures.

Extraction, ASTM D 2172, Method A, using trichloroethylene as the solvent and a high speed centrifuge to remove suspended mineral matter from the extract.
Asphalt Recovery, ASTM D 1856
Absolute Viscosity, ASTM D 2171

Following are the test results:

Absolute Viscosity @ 140F, Poises	109,700
% lower viscosity from original test on report 606005-006	78.1

Respectfully submitted,

CHICAGO TESTING LABORATORY, INC.

George J. Giroux

FAX: 336-643-1977

References

(1) US Today. Issue: June 26, 2010.

(2) 11th Annual Minnesota Pavement Conference: Session Summaries. February 15, 2007. University of Minnesota St. Paul Campus - Center for Transportation Services.

(3) Boyer, Robert E., Ph.D., P.E. "Asphalt Rejuvenators 'Face, or Fable.'" Asphalt Institute. Prepared for Presentation at the Transportation Systems 2000 (TS2K) Workshop. San Antonio Texas, February 29 - March 3, 2000.

(4) Boyer, Robert E., Ph.D., P.E. "Asphalt Rejuvenators 'Face, or Fable.'" Asphalt Institute. Prepared for Presentation at the Transportation Systems 2000 (TS2K) Workshop. San Antonio Texas, February 29 - March 3, 2000.