REJUVASEAL ASPHALT PAVEMENT PRESERVATION TREATMENT CANADIAN EXPERIENCE AND CHINESE FIELD TRIALS

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ABSTRACT

Asphalt pavements require systematic, routine, preventive surface maintenance to preserve the pavement and mitigate the wear and tear due to traffic and environmental effects. There is considerable applied technical information available on the growing, successful use of RejuvaSeal (proprietary coal-tar rejuvenator/sealer meeting North and South American agency requirements) and Sand RejuvaSeal (sealer plus sand such as fine boiler or nonferrous slag) for highway and airport asphalt pavement maintenance, sealing, and rejuvenation of aged (oxidized), deteriorated surfaces. Canadian highway and airport experience with Sand RejuvaSeal has shown its technical and economic benefits, and that it should be effective for about five years between treatments. The positive experience with the use of RejuvaSeal (Sand) to maintain asphalt pavements and economically extend their functional lives resulted in the May 2001 initiation of RejuvaSeal demonstration trials on a variety of asphalt pavement surfaces in China. Nine demonstration sites have been completed, with the RejuvaSeal applications fully documented and performance monitoring in progress. The Canadian and Yunnan Province experience with RejuvaSeal coal-tar rejuvenator/sealer is summarized with focus on the cost-effective maintenance of asphalt pavement surfaces.

1. INTRODUCTION

Commercial, road, highway and airport asphalt pavements are subject to surface aging (oxidation and hardening of asphalt binders), cracking, ravelling and deterioration due to the wear and tear of vehicle and maintenance equipment action, coupled with environmental effects such as thermal cycles and ultraviolet radiation. For cold climates, the use of deicing chemicals, snow removal, and particularly freeze-thaw cycles, contribute significantly to pavement deterioration. The use of blowers, plows and steel broom sweepers for airport winter bare pavement maintenance, potential fuel spills and auxiliary power unit and starter exhaust damage, accelerates apron, taxiway and runway asphalt pavement surface deterioration, particularly with airport foreign object damage (FOD) concerns. This harsh highway and airport asphalt pavement surface operating condition requires a pavement/maintenance management system and an effective (materials and methods), systematic preventive surface maintenance program to provide satisfactory functional performance (safe and smooth surface) over the design life (Asphalt Institute, 1997). It has been estimated that planning ahead and preventive maintenance (pavement preservation) can result in long-term pavement performance cost savings of four to ten dollars for each dollar invested in maintenance activities (Stidger, 2001). Applying maintenance treatments to asphalt pavements with light to moderate distress

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NOTE: RejuvaSeal is a proprietary (trade marked) coal-tar rejuvenator/sealer marketed in China by Crown Capital Enterprise Limited of Hong Kong. John Emery Geotechnical Engineering Limited (JEGEL) provides independent pavement materials testing and engineering services. The technical information given here has been developed specifically for RejuvaSeal and should be reviewed for specific asphalt pavement site applicability. The technical and logistical assistance of Crown Capital Enterprise Limited is gratefully acknowledged.

provides a substantial improvement in pavement life, while treating a severely distressed pavement accomplishes very little.

Practical, applied asphalt technology experience with RejuvaSeal and Sand RejuvaSeal (sealer plus frictional sand such as fine boiler, copper and nickel slags) preventive maintenance use, particularly for highways and airports in the Canadian 'prairie' climate that ranges from unbearably hot to extreme cold, has shown RejuvaSeal's effectiveness in the rejuvenation and sealing of aged and brittle (oxidized), deteriorated asphalt pavement surfaces. The coal-tar rejuvenator/sealer rejuvenates the surface of the old asphalt pavement so that it both mitigates the oxidation (age hardening) and provides strong sealer adhesion to the old surface.

There is considerable technical documentation of the rejuvenation efficacy of coal-tar rejuvenators/sealers, such as RejuvaSeal, meeting the general requirements of US Federal Aviation Administration Brief 44 (FAA, 1989) and related specifications such as Texas Item 3109, FAA Item P-629 and Canadian DND APS to extend pavement lives (Schoenberger, 1994, and Boyer, 2000). It should be noted that the rejuvenating action is most effective for open graded and/or high air voids asphalt concretes where the coal-tar rejuvenator/sealer can penetrate and soften the asphalt binder, and not as effective for intact dense graded and/or lower air voids asphalt concretes or where a surface treatment ('tight' surfaces) limits penetration (Boyer, 2000). However, even with tight asphalt pavement surfaces, the rejuvenator provides strong sealer adhesion to the old surface that is very important to durability.

The incorporation of a frictional sand (angular, clean, durable fine aggregate) with the coal-tar rejuvenator/sealer application deals with any potential frictional characteristics (skidding resistance) concerns and/or required enhancement of frictional characteristics (particularly microtexture) for highway and airport asphalt pavement operational use. Additionally, a frictional sand sealer such as Sand RejuvaSeal provides some additional resistance to traffic and maintenance wear and tear. Of particular importance for ravelling old asphalt surfaces or surface treatments (coarse aggregate loss for instance), the Sand RejuvaSeal tends to 'lock-up' the coarse aggregate with an enhanced matrix and reduced rate of surface deterioration. Monitored highway and airport trials and projects in Saskatchewan and Alberta Canada have shown the economic and technical benefits of Sand RejuvaSeal as a surface maintenance preservation treatment.

2. SPECIFICATIONS FOR COAL-TAR REJUVENATOR/SEALER

The material, application method and performance requirement specifications for airport coal-tar rejuvenator/sealers are generally based on the FAA Brief 44 (FAA, 1989) and Specification Item P-629 (Dubey, 2000). These are typically end-result-specifications and cover aspects such as: submission and design requirements; materials; equipment; construction; quality assurance (sampling and testing, application rate(s), curing and frictional characteristics, acceptance of fuel resistance, acceptance of coal-tar sealing, acceptance of coal-tar rejuvenator/sealer material, acceptance of application rate(s), acceptance of curing and frictional characteristics, acceptance of fuel resistance, and dispute); and measurement for payment. The coal-tar rejuvenator/sealer material requirements are particularly important, and RejuvaSeal is formulated to meet appropriate agency specifications such as the Canadian DND APS (Asphalt Pavement Sealer) requirements given in Tables 1 and 2 (Canadian DND, 2000).

It should be noted that the APS allows the pavement engineer to specify rejuvenation, sealing or rejuvenation and sealing. The APS also emphasizes the importance of applying the coal-tar/sealer to clean, dry surfaces with a distributor that has been designed and equipped for the uniform application of sealer. As acceptable levels of frictional characteristics (skid resistance) are imperative for safe operational use of airport asphalt pavements, testing with a friction tester (SARYS or GripTester) is required after sealing, and frictional sand is uniformly applied as necessary ('black beauty' fine boiler

TABLE 1
BITUMINOUS MATERIALS FOR COAL-TAR REJUVENATOR/SEALER (APS)

Bituminous Material	Minimum, Percent	Maximum, Percent
Coal-Tar Pitch	35	50
Maltenous Type Petroleum Distillate	32	42
Coal-Tar Oils	14	40

TABLE 2
COAL-TAR REJUVENATOR/SEALER PROPERTY (MATERIAL) REQUIREMENTS (APS)

Property	Test Method	Requirement
Specific Gravity at 25°C (Minimum)	ASTM D 70	1.04
Engler Viscosity, 50 cc at 50°C (s, Maximum)	ASTM D 1665	4.5
Water, by Mass (Percent, Maximum)	ASTM D 95	2.0
Distillation, Percent by Mass 170°C (Percent, Maximum) 270°C (Percent, Minimum-Maximum) 300°C (Percent, Minimum-Maximum)	ASTM D 20	 30 25-45 30-55
Softening Point of Residue from 300°C Distillation Test (°C, Minimum-Maximum)	ASTM D 36	40-55

slag or equivalent, such as granulated copper and nickel slags, that is dry, hard, durable, free from clay, sand and foreign matter and well graded with 100 percent minus 2.36 mm and less than 10 percent minus 0.0150 mm) at a rate of 0.27 to 0.41 kg/m^2. The RejuvaSeal and Sand RejuvaSeal used for highway and airport asphalt pavement trials and projects in Alberta and Saskatchewan was based on the APS which has generally been adopted in Canada.

3. ENTWISTLE ALBERTA HIGHWAY SAND REJUVASEAL DEMONSTRATION PROJECT

Alberta Transportation and JEGEL have been monitoring a Sand RejuvaSeal demonstration project on Alberta Highway 16A:08 near Entwistle (some 100 km west of Edmonton) since August 1999 (Photographs 1 and 2) when the site was selected. The environmental conditions for this site range from hot summers to very cold, snowy winters typical of Canadian 'prairie' conditions (mean daily maximum temperature December to February of -15.4°C and annual snowfall of 105 mm water equivalent at Saskatoon Saskatchewan for instance).

Highway 16A:08 is essentially a fairly low traffic volume, old highway pavement section, parallel to the major provincial Northern Trans-Canada (Yellowhead Route) Highway 16. The Highway 16A:08 asphalt concrete pavement is 44 years old, with an aged deteriorating chip seal surface (surface treatment) as shown in Photographs 1 and 2. There has been significant loss of chip seal fines (ravelling), resulting in the coarse aggregate being readily removed by traffic action and maintenance activities. The surface treated old asphalt pavement is in overall very poor condition with cracking, patching, some flushing, chip seal loss and some wheelpath rutting. At best, the chip seal surface is at its terminal serviceability condition (very poor condition) and presented a real challenge to demonstrate the effectiveness of Sand RejuvaSeal. This pavement section would normally be repaired and resurfaced with hot-mix asphalt as was done recently for an adjacent pavement section.

PHOTO 1 ENTWISTLE ALBERTA SAND REJUVASEAL SITE

The old, very poor condition, asphalt concrete pavement has a deteriorating chip seal surface with patching, crack sealing and some rutting.

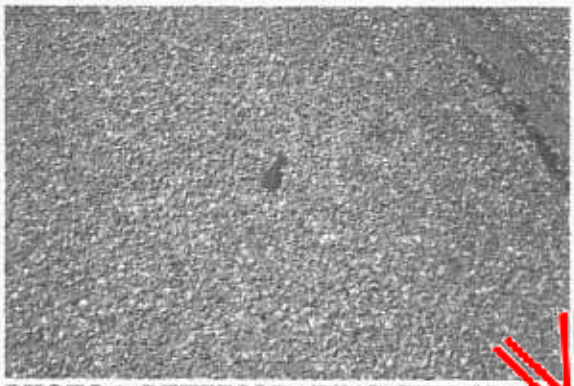

PHOTO 2 DETERIORATING CHIP SEAL SURFACE APPEARANCE

The significant loss of chip seal fines results in the removal of coarse aggregate by traffic and maintenance equipment wear and tear.

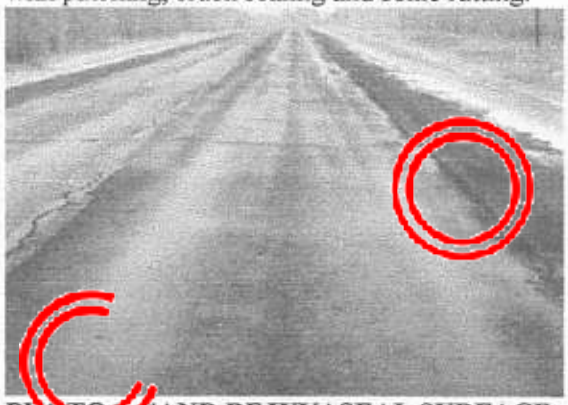

PHOTO 3 SAND REJUVASEAL SURFACE APPEARANCE, 1 MONTH

The Sand RejuvaSeal (0.272 l/m^2) was applied to the westbound lane (right) with the east-bound lane (left) used as an untreated control.

PHOTO 4 SAND REJUVASEAL SURFACE APPEARANCE, 12 MONTHS

The Sand RejuvaSeal has a good surface appearance, particularly compared to the still deteriorating (ravelling) untreated control (left).

PHOTO 5 SAND REJUVASEAL SURFACE APPEARANCE, 22 MONTHS

The Sand RejuvaSeal has maintained its good surface appearance, while the untreated control (left) continues to rapidly deteriorate.

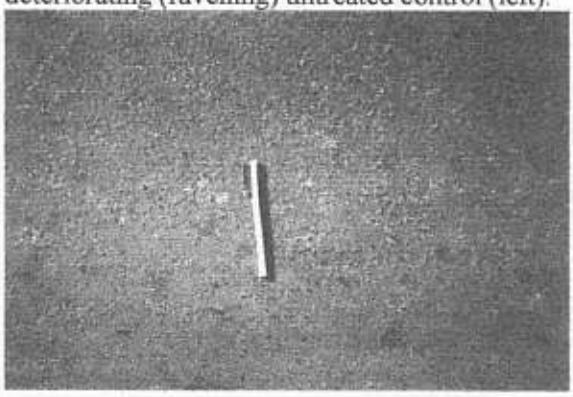

PHOTO 6 SAND REJUVASEAL SURFACE PERFORMANCE, 22 MONTHS

The coarse aggregate continues to be 'locked' in place by the Sand RejuvaSeal improved surface matrix, with little chip seal deterioration.

The Sand RejuvaSeal was placed on September 29, 1999, with the westbound lane treated and the eastbound lane left untreated as a control as shown in Photograph 3. The westbound lane was first swept to remove all loose material from the chip seal surface. Then, RejuvaSeal test patches were applied at 0.181, 0.226 and 0.272 l/m^2 (0.04, 0.05 and 0.06 US gal/yd^2) to evaluate the appropriate application rate. Based on these test patches, a RejuvaSeal application rate of 0.272 l/m^2 was selected. For comparative purposes, the first 287 m of the westbound lane (from east to west, 3.2 m wide) was treated with 0.226 l/m^2 of RejuvaSeal and then the next 1357 m were treated at the selected application rate of 0.272 l/m^2. A total of 5260 m^2 of chip seal surface was treated with RejuvaSeal. Approximately 0.48 kg of fine sand (fine boiler slag – 'black beauty') per m^2 was then applied to complete the Sand RejuvaSeal treatment of the chip seal surface. While ambient conditions were rather cool (about 15°C) and damp (light on and off drizzle), the Sand RejuvaSeal cured satisfactorily.

The Alberta Transportation and JEGEL demonstration site observations are best summarized through the descriptions given with Photographs 3 to 6 taken 1, 12 and 22 months after the Sand RejuvaSeal treatment of the chip seal surface. After 22 months (two winter seasons), the Sand RejuvaSeal treated surface is in significantly better condition, with a much lower rate of deterioration, than the control surface. As also noted by Alberta Transportation, the surface of the treated chip seal is somewhat softer than the untreated control, indicating that the Sand RejuvaSeal has mitigated some of the asphalt binder age hardening and provided strong adhesion to the chip seal surface. The chip seal coarse aggregate is well coated with Sand RejuvaSeal, so that the coarse aggregate is 'locked-in' by the improved matrix. This reduction in ravelling potential (coarse aggregate loss) is very important. The sand has resulted in an overall 'sandpaper' like texture. The Sand RejuvaSeal appears to have also mitigated some of the secondary cracking through some edge softening.

It is clear that the two-year performance of the Entwistle Sand RejuvaSeal demonstration project exceeds expectations from experience with conventional highway sand seals, and is most promising, particularly given the terminal serviceability condition of the chip seal surface prior to Sand RejuvaSeal treatment and the harsh climate. Further performance monitoring in progress is, of course, necessary to check the effective life of the Sand RejuvaSeal for highway applications, but about five years (similar to quality highway scrub seal) appears to be a reasonable assumption at this time. In summary, rejuvenation, adhesion, sealing, friction and wearing resistance are clearly demonstrated attributes of Sand RejuvaSeal for highway applications from the Entwistle site.

4. MOOSE JAW SASKATCHEWAN AND COLD LAKE ALBERTA AIRPORT SAND REJUVASEAL

RejuvaSeal and Sand RejuvaSeal have been used for asphalt pavement preventive rejuvenation/sealing at a number of South and North American airports. The use of mobile distributors for the efficient and effective uniform application of coal-tar rejuvenator/sealer for large airport surfaces is very important as shown in Photograph 7 at CFB Wainright Alberta. Also, it is very important to monitor the frictional characteristics (friction number) of the treated airport asphalt pavement surfaces to ensure that acceptable levels are achieved and maintained as indicated in Photograph 8 for Sand RejuvaSeal at Wainright.

The monitoring of Sand RejuvaSeal projects at CFB Moose Jaw Saskatchewan and CFB Cold Lake Alberta is of interest, as the taxiway and runway asphalt pavements involved were experiencing considerable ravelling (loss of fines leading to insufficient matrix to hold the coarse aggregate in place) which created a potential FOD problem. The Sand RejuvaSeal treatment of the Cold Lake trial section that resulted in subsequent full use, was applied to the 20 year old runway asphalt pavement in October 1999 (Photograph 9) at a rate of 0.272 l/m^2 with 0.47 kg/m^2 of frictional sand ('black beauty'). This Sand RejuvaSeal treatment of the Cold Lake trial section resulted in a much improved surface matrix to resist ravelling (Photograph 10 with sand patch macrotexture test). The demonstrated satisfactory overall performance of the trial section resulted in the Sand RejuvaSeal treatment of the Cold Lake asphalt pavement taxiways and runways in September 2000.

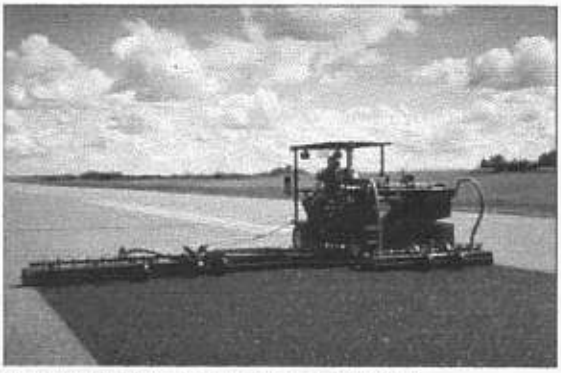

PHOTO 7 TYPICAL REJUVASEAL RUNWAY APPLICATION SITE

RejuvaSeal is applied using mobile distributors designed and equipped for effective, uniform application of coal-tar rejuvenator/sealer.

PHOTO 8 SARYS FRICTION TESTER (SFT) IN ACTION ON RUNWAY

Acceptable levels of frictional characteristics (skid resistance) are imperative to the safe use of runways, taxiways, roads and highways.

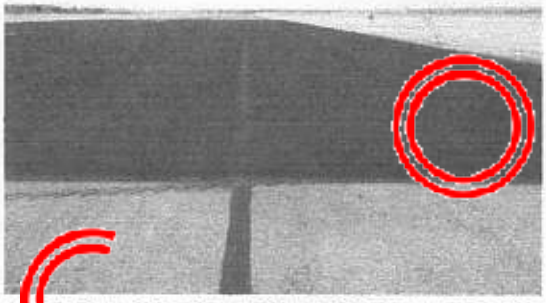

PHOTO 9 COLD LAKE ALBERTA AIRPORT SAND REJUVASEAL TRIAL SECTION

The runway asphalt concrete pavement surface (foreground) exhibited oxidation and ravelling with considerable coarse aggregate loss.

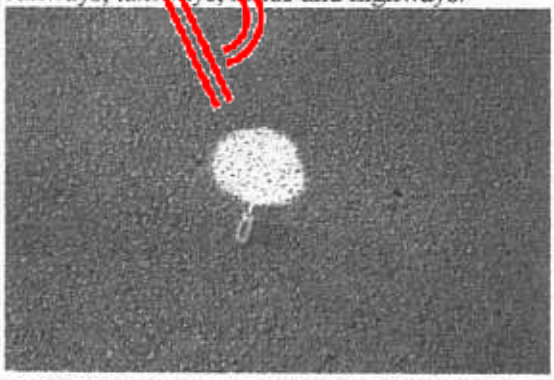

PHOTO 10 RUNWAY SAND REJUVASEAL APPLICATION APPEARANCE

The Sand RejuvaSeal (0.272 l/m^2) has good frictional properties and appearance, with a much improved surface matrix to resist ravelling.

PHOTO 11 MOOSE JAW SASKATCHEWAN AIRPORT SAND REJUVASEAL, 22 MONTHS

The Sand RejuvaSeal (0.226 l/m^2) has good frictional properties and appearance, particularly compared to the control section being cored (right).

PHOTO 12 RUNWAY SAND REJUVASEAL SURFACE PERFORMANCE, 22 MONTHS

The improved surface matrix continues to resist oxidation, deterioration and aggregate loss, even with extensive winter maintenance steel broom use..

The Sand RejuvaSeal treatment of the asphalt pavement taxiways and runways at CFB Moose Jaw in October 1999 was based on the satisfactory evaluation of a previously treated runway test section. For Moose Jaw, the Sand RejuvaSeal was applied to the 31 year old (generally) asphalt pavement surfaces at a rate of 0.226 l/m^2 with 0.27 kg/m^2 of frictional sand ('black beauty'). Inspection of the treated surfaces after 15 and 22 months (after two years of winter maintenance with considerable steel broom use) indicated that the Sand RejuvaSeal has good frictional properties and appearance (Photograph 11), and the improved surface matrix (Photograph 12) continues to resist oxidation, deterioration and coarse aggregate loss (ravelling) with very few coarse aggregate popouts. From this ongoing airport asphalt pavement monitoring program it is anticipated that the Sand RejuvaSeal treatment service life will be at least four years for the harsh airport service conditions.

5. HEALTH AND ENVIRONMENTAL CONSIDERATIONS

The Material Safety Data Sheet (MSDS) for specific coal-tar rejuvenator/sealers gives the relevant health hazard data and personal protection information that must be followed. Independent personnel monitoring during RejuvaSeal applications completed in accordance with the RejuvaSeal MSDS personal protection equipment information, indicates that there is no health hazard. Environmental monitoring of RejuvaSeal treatments at Cold Lake and Wainright coordinated by JEGEL, with independent environmental laboratory testing of asphalt concrete cores, sweeping material and asphalt pavement surface runoff (treated and untreated areas) has shown no significant exceedences of applicable environmental regulations (CCME for instance), particularly when treated and untreated areas are compared (some natural components and/or activities such as deicing can cause exceedances).

6. DEMONSTRATION OF REJUVASEAL IN YUNNAN PROVINCE

Crown Capital Enterprise Limited of Hong Kong entered into an agreement with the Yunnan Highway Management Department, Kunming, in May 2001 to analyze the performance of RejuvaSeal on highways within Yunnan Province. Two demonstrations of RejuvaSeal have been undertaken in close proximity to Kunming. The initial location was on the two-lane Kun-Lu Highway that leads from Kunming, some 70 km north/north-west to LuChwen. The test section is located on the northern outskirts of the city of Kunming, just 1 km short of the Highway tollgate. A second demonstration was undertaken at the 38 km marker on the primary Kun-Chieu Highway (G320) that leads from Kunming, some 129 km northeast to Chieu Chin. This test section is approximately 30 km northeast of Kunming. The Kun-Lu highway demonstration test section is located on a straight asphalt pavement section with a slight uphill grade. A 348 m long strip on the southbound lane was undertaken. There is a slight camber to the road, which causes water to run off rather than puddle on the road. The asphalt surface on the section treated is apparently two years old, with no major disfigurations or fuel spills observed, although excess asphalt cement in some locations had bled through to the surface resulting in a smooth, shiny surface. On May 9, 2001, RejuvaSeal was applied at a rate of 0.23 and 0.16 l/m^2 / (average 0.20 l/m^2) as shown in Photograph 13. Details of the application are summarized in Table 3.

The test strip application was completed and the lane remained closed for about 8 hours, when it was re-opened to traffic. At 05:00 on May 10, light rain started to fall and when the site was visited around 09:30, the difference between the RejuvaSeal treated section and the adjoining untreated section was readily perceived. Water readily soaked into the untreated section, whereas water beaded and ran off the treated section.

The Kun-Chieu RejuvaSeal demonstration was undertaken on July 3, 2001. This portion of the highway was built in 1996 and the asphalt pavement is approximately 120 mm thick. A 600 m long strip on the slow lane on the north bound side of this four lane, divided portion of this primary highway was treated. The test section is located on a straight section with a slight uphill grade. There is a slight camber to the road, which causes water to run off rather than puddle on the road, save for sections with adverse wear. The asphalt pavement surface of the section treated is essentially six years old. No

TABLE 3
REJUVASEAL DEMONSTRATION SITE DETAILS

CITY	SITE	DEMO DATE 2001	OUTFLOW METER TESTS	FUEL RESISTANCE TEST	EXTRA TESTS
Kunming	Kun-Lu Highway	May 9	No	Yes	Observations
	Kun-Chieu Highway	July 3	After	Yes	Observations
Beijing	Shun-PingGu Highway	Aug 23	Before/After	Yes	No
Xian	Ring Road	Aug 30	Before	Yes	Yes
ChongQing	ChengYu Exp, Km 308.5	Sep 18	Before	Yes	No
ChengDu	ChengYu Exp, Km 42.5	Nov 7	Before/After	No	No
	Chen Guan Exp, Km 0.0	Nov 6	Before/After	No	No
Guangzhou	Guangzhou, Huanshi St.	Nov 8	Before/After	Yes	Yes
	Guang-Quin Expressway	Dec 14	Before/After	Yes	No
Shanghai	JinHai St. Pudong	Nov 20	Before/After	No	No
	Shanghai Intl Airport	Nov 22	Before/After	No	Skid

PHOTO 13 TYPICAL CHINESE REJUVASEAL DEMONSTRATION SECTION
The RejuvaSeal was applied to this 600m^2 Kun-Chieu Highway demonstration section with paint rollers to ensure uniformity (0.22 l/m^2).

PHOTO 14A OUTFLOW METER TESTING OF UNTREATED SECTION

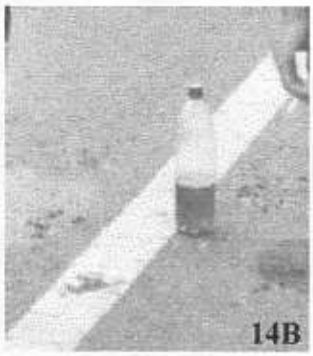

PHOTO 14B FUEL RESISTANCE TESTING OF TREATED SECTION

significant oil spills were observed, just the occasional drop of transmission oil, crankcase oil or hydraulic fluid. The highway surface was noticeably worn, as the exposed limestone aggregate was quite smooth, with some rutting due to traffic wear. There was appreciable aging and oxidation of the asphalt cement, which extended to a depth of 3 to 4 mm. The RejuvaSeal was applied at a rate of 0.22 l/m^2 using paint rollers to ensure uniformity of application. The width of the lane is 3.65 m between the painted centerline and the shoulder marker line. Details of the application are summarized in Table 3:

The test strip application was completed, and the lane remained closed for about 5 hours when it was re-opened to traffic. A heavy rain started to fall about 7 hours after completing the application; and when visited the following day the difference between the RejuvaSeal treated section and the adjoining untreated section was readily perceived. Water readily soaked into the untreated section,

whereas water beaded and ran off the treated section. In the travel worn (rutted) sections, water was impounded, but did not soak into the asphalt pavement and where lineal cracks were noticed, water did not appear to be seeping into the asphalt pavement either.

A Humble Equipment 'Outflow Meter' was used to measure the asphalt pavement's capability (macrotexture) to dissipate water (Photograph 14A), as concern had been expressed about potential skidding and hydroplaning on the RejuvaSeal treated surface, versus the untreated surface. The Outflow Meter gives readings in seconds for the outflow dissipation of a known quantity of water. It is suggested that readings between 3 and 10 seconds are satisfactory for an asphalt pavement surface, if hydroplaning is to be minimized. Readings on both untreated sections and RejuvaSeal treated sections, in close proximity to each other (northern end of the section treated with RejuvaSeal in southbound lane), indicated that there was adequate outflow (macrotexture) for both untreated and treated sections. Further Outflow Meter monitoring will be completed once the asphalt pavement has had a longer time to react to the RejuvaSeal treatment and more traffic has passed over the test section.

In addition to testing with the Outflow Meter, Fuel Resistance Tests were conducted, using diesel fuel as the testing liquid (Photograph 14B). The RejuvaSeal treatment gave a significant improvement in resistance to damage caused by diesel fuel and this has been corroborated in independent test work in China and North America.

Additional information for the Kun-Chieu Highway asphalt pavement was developed from JEGEL testing of two cores from the test section. Laboratory testing consisted of extraction and gradation, core bulk and maximum relative densities, and percent air voids. The 19 mm dense graded asphalt mix gradation specification from ASTM D3515 was used for comparison purposes. The Core 1 gradation deviates significantly from a dense grading line, particularly in the middle sieve sizes where it just 'hugs' the coarse side of the grading limits. The Core 2 gradation is nowhere close to meeting the ASTM D3515 grading limits, and is gap-graded. The asphalt cement content is also very low, especially for Core 2, and the air voids very high. The high air voids is probably one reason that the asphalt pavement oxidized quite readily, as air and water have ready access to the matrix.

Subsequent visits to the two demonstration sections have shown that water penetration has been minimized. The rejuvenated surface now extends to a depth of 5 to 8 millimetres, and based on tests using a pocket knife/screwdriver, the treated asphalt pavement is now more elastic and ductile than the adjacent untreated sections. Additional demonstrations of RejuvaSeal have been conducted at the sites summarized in Table 3. The monitoring of these Chinese RejuvaSeal demonstration sites, for a wide range of asphalt pavements and operational conditions, will be of great assistance to the development of RejuvaSeal use in China as a standard asphalt pavement preservation treatment.

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