CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Demonstration of Rejuvaseal™
Li-Wen Expressway, Ying Tan, JiangXi, Peoples Republic of China

January 2003

TS^2 Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED

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TABLE OF CONTENTS

FIGURES

TABLES

CROWN CAPITAL ENTERPRISE LIMITED

Demonstration of RejuvaSeal
Li-Wen Expressway, Ying Tan, JiangXi,
Peoples Republic of China

January 2003

APPENDICES

No.	Description
A	Rejuvaseal™ – Technical Seminar, Ping-Gu (Beijing) China, August 2001
B	Rejuvaseal Descriptive Literature
C	Site Visit – LiWen Expressway – April 24/25, 2003

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1.0 INTRODUCTION

Crown Capital Enterprise Limited of Hong Kong entered into an agreement with the FHEB Construction Company of Beijing, China in January 2003. This agreement calls for the application of RejuvaSeal™, a sealer/rejuvenator for asphalt pavement on the newly completed Li-Wen Expressway, near Ying Tan, Jiangxi Province.

JiangXi Province lies south of the Yangtze River (Chiang Jiang), at the juncture of with PanTiang Lake. Hubei, GuangDong, Fujian, and Anhui and Zhejiang Provinces border JiangXi Province. JiangXi has seen a major growth in the highway system, due to a government drive to build national highways linking JiangXi with major cities in the adjoining provinces. YingTan lays approximately 100 kilomtres south east of NanChang, the capital city of JiangXi, which straddles the Gan Jiang River. The present population of YingTan is estimated at approximately 0.5 million. See figure 1.0 for a map showing the location of JiangXi. The majority of the area lies at 50 to 100 metres in elevation, on the extensive plain that borders the East China Sea. The regions' latitude (28 degrees north), mean that there are four seasons, with temperatures ranging from 42 Celsius in the long, hot summer to minus 5 Celsius in the short winter. NanChang is known as one of the "Four Ovens" of China, due to the high temperatures in the summertime. There is a rainy season, which stretches from June thru in to September.

In the immediate YingTan area, a significant consolidated sedimentary sequence predominates and there are a significant number of outcrop exposures available. The predominant rock type is a weekly-cemented pink sandstone, which can be readily quarried with rudimentary tools and is used primarily in the construction of buildings and retaining walls. This same material forms the predominant construction stone for the Li-Wen Expressway. A large number of rock-cuts have been made to achieve a satisfactory profile for this newly completed Expressway. The asphalt in the area is manufactured from crushed and screened sandstone hauled from quarries in close proximity to the Li-Wen Expressway, as well as washed sand from the various rivers. The bitumen binder for the asphalt is sourced from various locations. Barrels at the Asphalt Plant near the jobsite showed a Shell Oil Company label. Emulsified Bitumen was understood to be used on this particular Expressway. Actual source of the Shell Product could not be ascertained.

2.0 CO-OPERATIVE PROGRAM

The intent of the agreement with FHEB Construction Company of Beijing is to demonstrate RejuvaSeal™ at the location selected by the FHEB Construction Company. The demonstration will subsequently allow analysis of the performance of Rejuvaseal™ on a newly laid asphalt surfaces. A demonstration was undertaken on Li-Wen Expressway, immediately north of the city of YingTan on January 24, 2003. The portion of the Expressway that was treated was composed of asphalt pavement of October-November, 2003 vintage. No details are known about the subgrade, but inspection of the shoulders show a sandy-silty material. Knowing construction techniques in highways in China in general, minimal gravel would be used for an immediate coarse base, beneath the asphalt pavement. The surface of the asphalt is quite permeable and concern had been expressed about water percolating through the porous pavement and softening the sub-grade. Furthermore, this asphalt pavement is new and it was apparent that the bitumen content was less than optimal and keen interest was expressed in having the bitumen content improved in the near surface portion to improve binding of the aggregate which is gap-graded, having a significant number or voids

3.0 REJUVASEAL™

RejuvaSeal™ is a proprietary product that is supplied by Crown Capital Enterprise Limited of Wanchai, Hong Kong. Rejuvaseal™ has been proven in numerous applications in North and South America to rejuvenate asphalt pavement at various stages of its life and economically extend the life of the pavement. Rejuvaseal™ is a three component, asphalt sealer rejuvenator that is comprised of Coal Tar, Coal Tar Oils and Petroleum Solvents.

3.1 PRIOR EXPERIENCE

Refer to Appendix A for a copy of the brochure provided to participants at a seminar held in Ping-Gu (Beijing Municipality) in August 2001. This outlines the experience with Rejuvaseal™ at various locations in North America and South America. Further information is available from Crown Capital Enterprise Limited. Rejuvaseal™ has been used at numerous airports in North and South America, as well as highways in Alberta, Canada; Cearo State, Brazil and North Dakota and Texas, as well as other locations in the U.S.A.

4.0 TEST PROGRAM

Since Jiangxi Province is located in a semi-tropical climate (Latitude: 28 North) at a low altitude (50 to 100 metres), it's a demanding setting for asphalt, given the year round warm climate (extremes of 45 Celsius in summer and minus 5 Celsius in the winter) and intense exposure to ultraviolet radiation, all which contribute to the oxidation and breakdown of the asphalt binder.

JiangXi has a significant concentration of highways in China, with some 18,000 kms of National and Provincial Highways. The FHEB Construction was responsible for construction of a 28.5 km portion of the Li-Wen (Liliang to Wenzhou)Expressway, that stretches from kilometres 149.5 (near YangTin) to kilometre 178 (near YuJiang). The owner of the Expressway is the JiangXi Provincial Expressway. Kilometre 0 for this Expressway is the City of Wenzhu

In view of the aforementioned problems with this newly opened expressway, the FHEB Construction Company is definitely interested in determining how to economically improve the quality of the asphalt road surface. To this end, the FHEB Construction Company has agreed to try RejuvaSeal™ on the Li-Wen Expressway, just north of the city of YingTan. The agreement resulted in the testing of RejuvaSeal™. See Figure 4.0, showing the location of this Expressway with respect to YingTan and NanChang.

On January 23, two test strips on the outside westbound lane (adjacent to the shoulder) of Li-Wen Expressway were treated with RejuvaSeal™. The test Strips were at the following geographic location:

Table 4.1A – Test Strip One	**Geographic Location of Test Strip**	
System	**Northing**	**Easting**
Geographic (deg, min)	28^0 18.630'	116^0 58.762'
Universal Transverse Mercator Grid (50R) (metres)	3131610	0497977

Table 4.1B – Test Strip Two	**Geographic Location of Test Strip**	
System	**Northing**	**Easting**
Geographic (deg, min)	28^0 20.596'	117^0 04.316'
Universal Transverse Mercator Grid (50R) (metres)	3135243	0507050

See Figure No 4.1 for a photo showing the test strips as implemented. Particulars of the test strips are as follows:

Table 4.2

Particulars of the Test Strips

Test Strip Number	Strip Width (m)	Patch Length (m)	Total Area m^2	Total Area yd^2 Approx	RejuvaSeal™ Applied		Application Rate			
					litres	Kgs	US Gal /yd^2	Litres /m^2	m^2 /Litre	m^2 /Kg
One	3.75	850	3,188	3,810	605	665.6	0.042	0.19	5.27	4.79
Two	3.75	1,000	3,750	4,483	681	748.8	0.040	0.18	5.51	5.01
Total	-	1,800	6,938	8,293	1,286	1,414.4	0.041	0.19	5.40	4.90

Subsequent inspection of the test strips on January 25, showed that the application rate of 5.0 m^2/kg (test strip two) was appropriate for the asphalt pavement at this location and could be used as a guide for other locations with similar physical characteristics.

The first demonstration strip, some 0.85 kilometres long, on the Li-Wen Expressway is located approximately 9 north-west of the City of Ying Tan. The second demonstration strip, some 1.0 kilometres long on Li-Wen Expressway is located approximately 12 kilometres north of the City of YingTan. See figure 4.0, which follows, for a location of the general locale. The location of the test strips is graphically shown in figure 4.1, which follows.

of the test strips. Refer to Figure 4.0 for the location. Work commenced at 11:00 am on January 24, on a cool, windy overcast day, where the mid-day temperature reached 15 Celsius.

The first test strip, 0.8 kilometres long, on the outside westbound lane of this four-lane Expressway was treated. The test section is located on a straight section and commences on the approach to the bridge over the _____ River. There is a slight camber to the road, which causes water to run off toward the shoulder, rather than puddle on the road. The asphalt surface on the section treated, was reputedly 3 months old (October-November 2003 vintage). No significant oil spills were observed, just the occasional drop of transmission oil, crankcase oil or hydraulic fluid. The asphalt pavement surface was not worn, as it had only been open two weeks. There were no longitudinal cracks and no lateral cracks although some portions showed some segregation of the asphalt/binder. The initial portion of the treated Expressway section was on a compacted silty-clay, sub-grade. The center portion was on the bridge and the final portion was on the east end approach

On January 24, the Desco D200 Sprayer was filled with 3.5 barrels of RejuvaSeal. The widths of the lanes are 3.75 metres between the painted lane dividing line and the shoulder marker line. An inside shoulder, nominally 0.5 metres occurs and an outside shoulder of 1.3 metres exists. RejuvaSeal™ was applied, using a Desco D200 Sprayer, to ensure uniformity in the application. The initial test strip was completed in two passes and work on this initial test strip finished at 12:20 pm.

Ambient temperatures at the time of the application were in the 10 to 12 degree Celsius range, with humidity in the 85% range. The application ceased at 10:50. The lane remained closed until 7 pm on January 26, when it was re-opened for traffic. Photos showing the test application of RejuvaSeal™ follow in figures 4.2, 4.3 and 4.4. on the following pages.

The site was visited on January 25 around 10:20 pm and a difference was readily perceived between the RejuvaSeal™ treated section and the adjoining untreated lanes. This was one day after the application of RejuvaSeal™ and at this location the newly treated surface was evident, as the black resilient surface layer, which was now approximately 1millimetre thick, did not allow water to puddle on the surface, as it immediately ran off. . No carryover of the RejuvaSeal™ was observed from vehicle tires at the east end of the demonstration strip, so it can be presumed that the surface was dry

The second test strip, 0.8 kilometres long, is located on the outside westbound lane of this four-lane Expressway, so,e 12 kilometres east of the initial test strip. The test section is located on a broad sweeping curve at the exit to East YingTan. There is a slight camber to the road, which causes water to run off toward the shoulder, rather than puddle on the road. The asphalt surface on the section treated, was reputedly 3 months old (October-November 2003 vintage). No significant oil spills were observed, just the occasional drop of transmission oil, crankcase oil or hydraulic fluid. The asphalt pavement surface was not worn, as it had only been open two weeks. There were no longitudinal cracks and no lateral cracks although some portions showed some segregation of the asphalt/binder. The entire portion of the treated expressway section was on a compacted silty-clay, sub-grade.

The Desco D200 Sprayer was filled with 3.5 barrels (55 US Gallons/barrel) of RejuvaSeal. The width of the lane is 3.75 metres between the painted lane dividing line and the shoulder marker line. An inside shoulder, nominally 0.5 metres occurs and an outside shoulder of 1.3 metres exists. RejuvaSeal^{TM} was applied, using a Desco D200 Sprayer. The initial test strip was completed in two passes and work on this initial test strip finished at 4:20 pm.

Ambient temperatures at the time of the application were in the 10 to 12 degree Celsius range, with humidity in the 85% range. The application ceased at 4:20pm. The lane remained closed until 7 pm on January 24, when it was re-opened for traffic. Photos showing the test application of RejuvaSeal^{TM} follow in figures 4.2, 4.3 and 4.4. on the following pages.

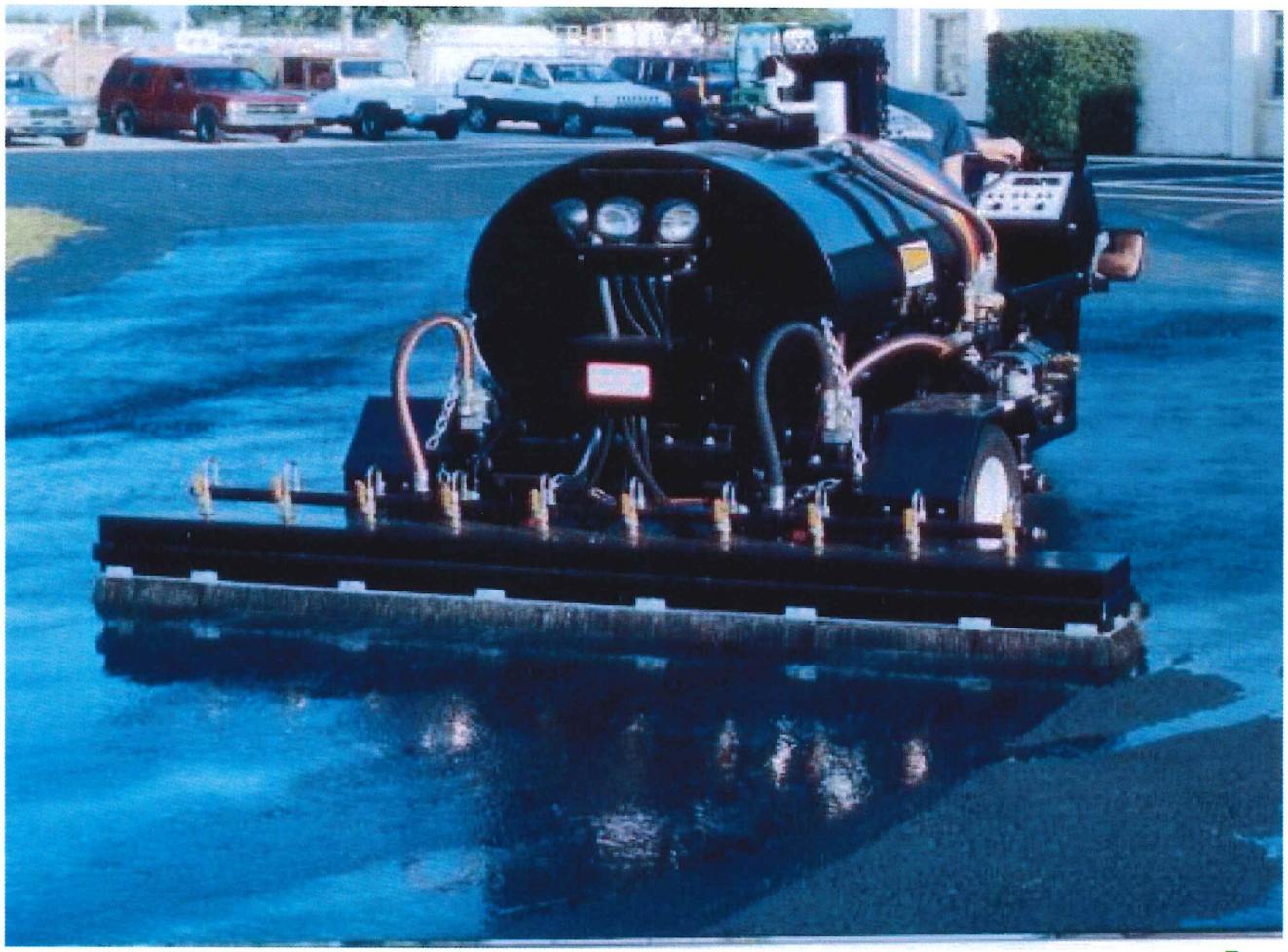


Figure 4.2 RejuvaSeal Application using Desco D200 Sprayer

Figure 4.3 Finished Surface in the Rain
Travelling Lane only

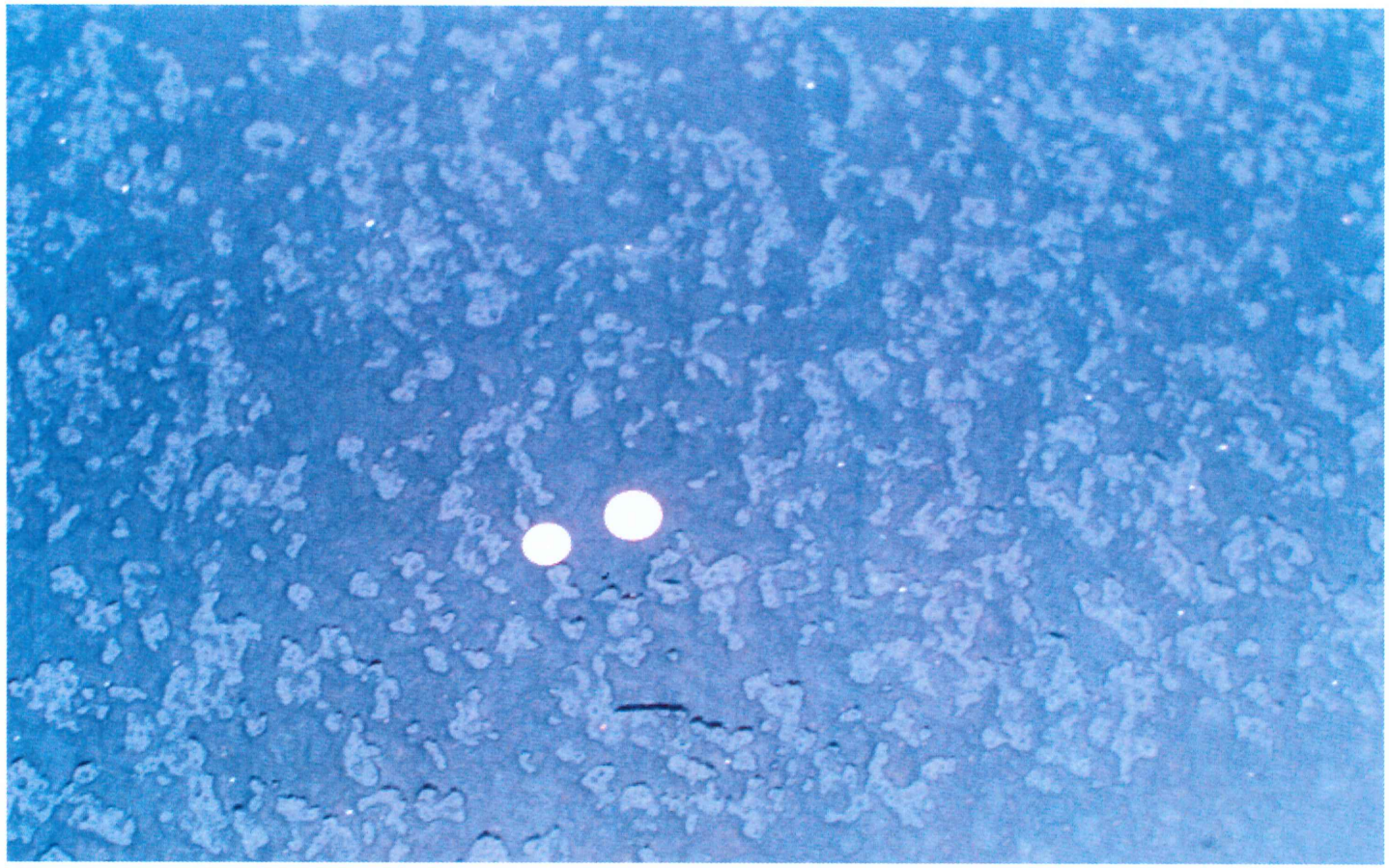
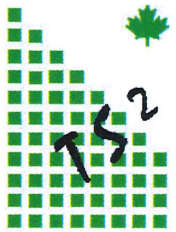


Figure 4.4 Finished Surface after the Rain



4.1 RejuvaSeal™ Testing

To date the comparison of the asphalt treated with Rejuvaseal™ has been compared on a subjective basis over a very short period at the test site on Li-Wen Expressway. Testing equipment brought to the site for comparison on a more disciplined, objective basis solely consisted of an Outflow meter manufactured by Humble Equipment Co. of Reston, Louisiana, U.S.A. This was to establish the Water Dissipation (Hydroplaning Comparison).

Testing equipment will be brought to the site for comparison on a more disciplined, objective basis in the future, and to this end, the following tests will be undertaken.

- Fuel Resistance Comparison
- Elasticity/Ductility Testing

4.2 Water Dissipation

An "Outflow Meter" manufactured in the U.S.A. by Humble Equipment Company of Ruston, Louisiana and sold under the trademark "Outflow Meter" (see figure 4.5) was used to measure the asphalt pavement's capability to dissipate water, as concern has been expressed about hydroplaning on the RejuvaSeal™ treated surface, versus the untreated surface. The Outflow Meter gives readings in seconds for the dissipation of a known quantity of water. It is suggested that any readings between 3 and 10 seconds are satisfactory results for an asphalt surface, if hydroplaning is to be minimized.

Readings were taken with this aforesaid Outflow Meter at three locations on February 5 on that portion of the Expressway selected for the demonstration adjacent to the test strips and again on Febuary 17, on the demonstration portion. These latter readings were taken at 9:30 am on January 17. The results are shown in the table that follows:

Table 4.3		**Outflow Meter Readings**		
Test Date	Location relative to shoulder demarker line of Expressway	Location relative to east end of test section	Before RejuvaSeal™ (secs)	After RejuvaSeal™ (secs)
Jan 25	1.3metres north	385 m west	18	n/a
Jan 25	2.6metres north	384 m west	6	n/a
Jan 25	2.1metres north	383.5 m west	37	n/a
Jan 27	16metres north	15 m west	n/a	21
Jan 27	3.1 metres north	14.5 m west	n/a	8
Jan 27	0.4 metres north	14 m west	n/a	10

- **Readings in the 3 to 10 second range are quite acceptable from a skid resistance viewpoint.**

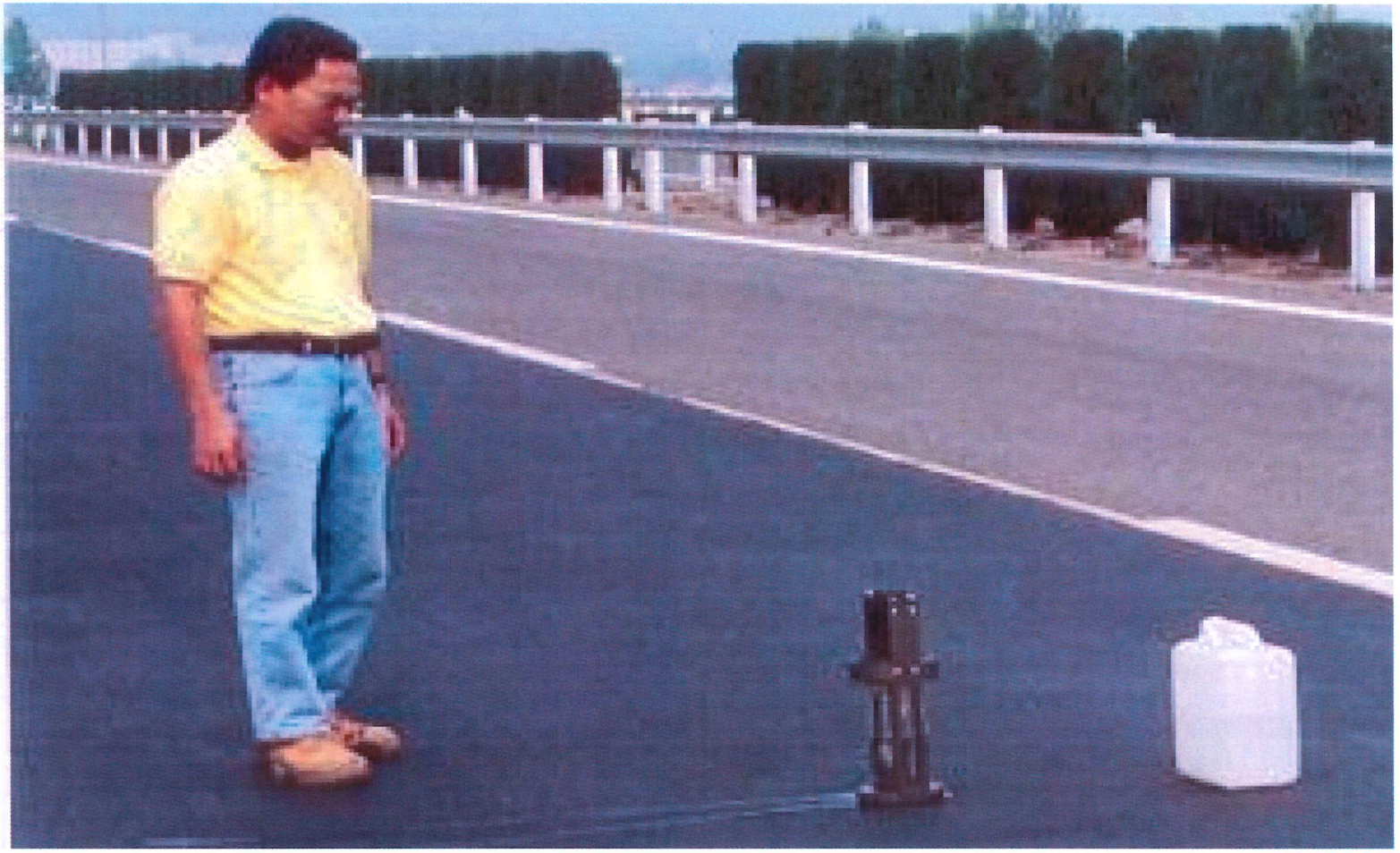


Figure 4.5
Humble Equipment Co. Outflow Meter

4.3 Fuel Resistance Comparison

Fuel Resistance Comparison will be undertaken on several sections of the untreated and RejuvaSeal™ treated sections in close proximity to the Outflow meter tests in the near future. This comparison will consist of pouring about a cupful of diesel fuel onto the road surface and then later checking the penetration of the fuel. If the fuel readily penetrated the asphalt pavement surface, then resistance to this form of chemical attack was presumed to be lower than if the fuel pooled on the surface of the asphalt pavement and slowly evaporated.

4.4 Elasticity/Ductility Testing

This aspect of the testing is beyond the capabilities of the field equipment available to both Crown Capital Enterprise Limited and RejuvaSeal™ personnel and as such, external assistance has been sought from outside experts in the field of Asphalt Testing. To this end, independent consultants have been contacted for advise on testing.

5.0 Test Completion Schedule

The team of technicians from the Hong Kong office will be dispatched to undertake further testing on the trial section in the near future. The projected completion of this testing is scheduled as shown in the following chart.

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Appendix A

Rejuvaseal^{tm} – Technical Seminar, Beijing, Peoples Republic of China, August 2001

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Appendix B

Rejuvaseal^{tm} – Descriptive Literature

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