GRT
Global Road Technology

Global
Road
Technology

CASE STUDY
ROLLING RESISTANCE ANALYSIS REPORT

CASE STUDY
ROLLING RESISTANCE ANALYSIS REPORT

TABLE OF CONTENTS

REPORT PREPARED BY
MR. David Tulloch
Managing Director
RoadSafety Training Services Pty Ltd

1.0 EXECUTIVE SUMMARY

The consultant company and author of this report was engaged by Global Road Technology (GRT) to provide a comparative assessment of the rolling resistance properties between roads subject to GRT dust suppression treatments and other common regional in-situ road surfaces.

The report encapsulates rolling resistance values between three (3) typical GRT treated road surfaces, three (3) unsealed untreated roads and two (2) spray chip seal conventional sealed road surfaces.

The improvement in rolling resistance values between unsealed roads and GRT treated surfaces ranged from 11–31% with the direct GRT/Unsealed road comparison test results at Kerrs Road averaging a 15% improvement.

The key learning from this road surface rolling resistance project is that GRT treated road surfaces are the equivalent of; or slightly better than, conventional sprayed chip seal surfaces and a significant (rolling resistance reduction) improvement on typical untreated unsealed road surfaces.

The rolling resistance project results are summarized in Figure 1.1 below:

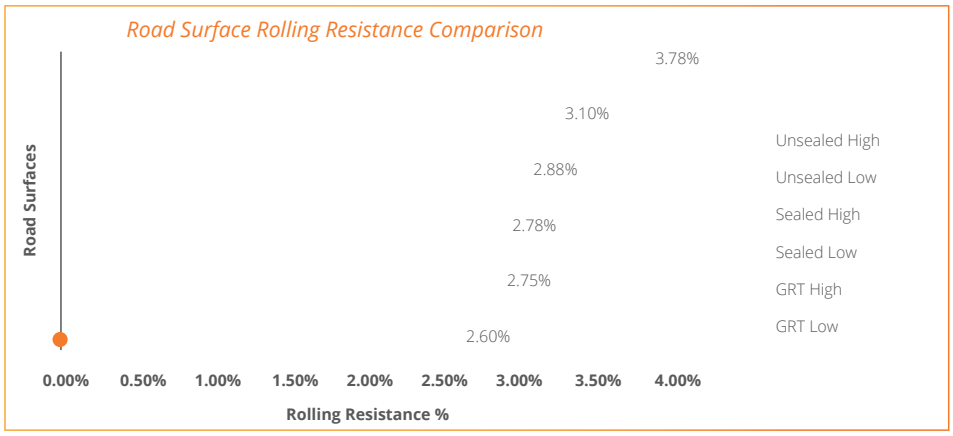

Figure 1.1: Summary of Rolling Resistance Results.

2.0 FRICTION PROJECT PURPOSE

The purpose and objectives of the rolling resistance project are:

1. Relative appraisal of rolling resistance properties for GRT dust suppressions treatments compared against conventional sealed and unsealed road surfaces.
2. To provide a measured statistical basis for future cost benefit analysis between different road surface characteristics including relative road roughness comparisons.
3. To afford a strong technical and marketing position for GRT business activities.

3.0 ROLLING RESISTANCE DISCUSSION

Rolling resistance is essentially the drag effect that road surface characteristics contribute to slowing a vehicles momentum when all other influencing elements such as transmission and engine component factors are eliminated along with the effect of road grade or gravitational forces.

These factors can be accounted for or neutralised in the rolling resistance test process; however, vehicle type cannot be isolated in terms of different vehicles which will have slightly different rolling resistance values even under the same test protocol and location.

The rolling resistance project was conducted over consecutive days using the same vehicle and test procedure at each test location to eliminate virtually all factors that could contaminate legitimate data comparisons between the different road surfaces subjected of the testing protocol.

3.1 ROLLING RESISTANCE TEST PROCESS

The data acquisition procedure was conducted using two identical Vericom VC4000DAQ instruments attached to the test vehicle recording time, distance, speed and acceleration data at a rate of 10 Hz.

Test locations were selected based on their suitability for the test process i.e. as level and straight as possible over a distance of at least 800m. The rolling resistance test is a 'coast down' method where the vehicle is accelerated to a constant speed (80km/h) and allowed to roll down out of gear to a predetermined speed (40km/h) while instrumented data acquisition is occurring.

The test is conducted over the same section of road surface in both directions and averaged, effectively neutralizing road grade, wind direction and velocity as factors in the data output. The tests are repeated and the data filtered through a spreadsheet program to provide rolling resistance values.

Photograph 3.1: Depicts the Toyota Hilux rolling resistance test vehicle (tyres–36psi).

It is acknowledged that a difference test protocol such as changed coast down speeds may result in slightly difference values; however, the project objectives were strictly for road surface comparison and the test procedure is considered statistically competent for this purpose.

4.0 GRT TREATED ROAD RESULTS

A selection of three (3) different GRT Treated road surfaces were subjected to the rolling resistance test process. These road locations and the low to high rolling resistance results obtained are outlined below.

4.1 SCHULTZ'S ROAD RESULTS

The results at Schultz's Road were very consistent with minimal difference noted. The road surface was in good condition and GRT product evenly applied.

The road roughness results displayed a smooth ride analogous with conventional sealed roads in good condition as observed in the Moonie Highway results outlined in this report.

Photograph 4.1: Depicts the Schultz's Road test location.

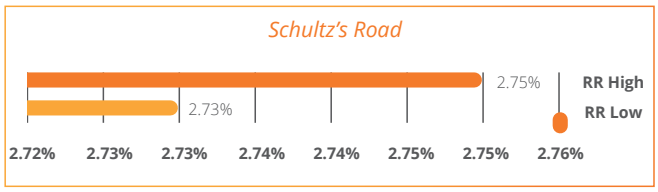

Figure 4.1.1: Rolling Resistance Results

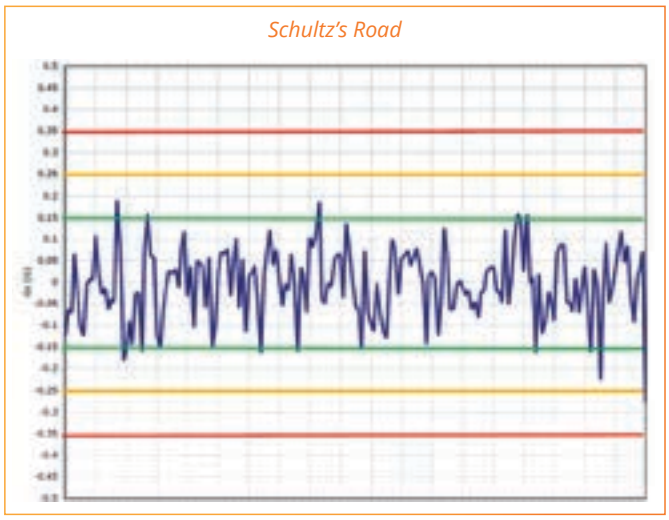

Figure 4.1.2: Relative Road Roughness.

4.2 HALLIFORD ROAD RESULTS

The Halliford Road results were the best (lowest) rolling resistance results obtained during the project testing, including noticeably better performance than the conventional spray chip seal surfaces. The road surface was relatively freshly treated with GRT product approximately 2 weeks after works had been completed.

Photograph 4.2: Depicts the Halliford Road test location.

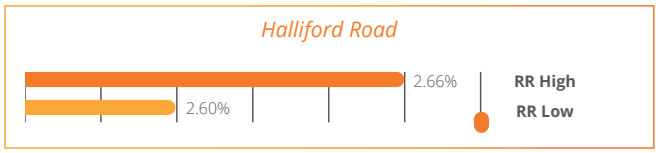

Figure 4.2.1: Rolling Resistance Results

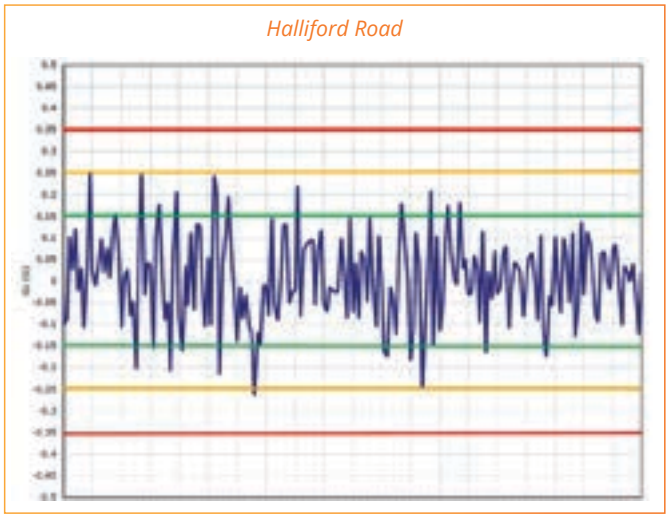

Figure 4.2.2: Relative Road Roughness.

4.3 KERRS ROAD RESULTS

Kerrs Road was selected as a direct comparison as it was subjected to testing at both a GRT treated and untreated location. The results at the treated location confirmed the previous two treated locations results, falling within the rolling resistance range of 2.60 – 2.75% for the GRT treated test locations.

The road surface characteristics at this location exhibited some cracking and minor deformations and small potholes which did not detract from the consistent and low rolling resistance values obtained but is noticed in the corresponding road roughness graph.

Photograph 4.3: Depicts the Kerrs Road test location.

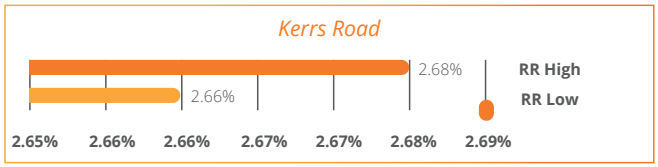

Figure 4.3.1: Rolling Resistance Results

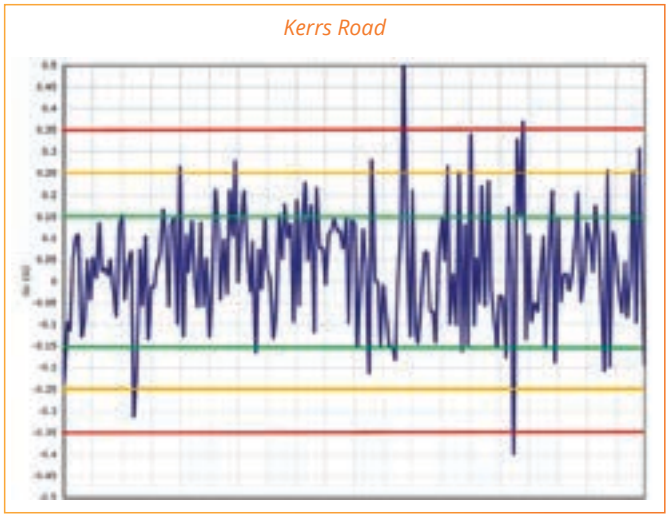

Figure 4.3.2: Relative Road Roughness.

5.0 UNSEALED ROAD RESULTS

A selection of three (3) untreated unsealed road surfaces were subjected to the rolling resistance test process.

These roads provided a variety of unsealed surfaces from a consolidated surface with minimal loose material to a moderately consolidated surface with modest quantities of loose gravel and an unconsolidated surface with significant quantities of small loose material and sections of mild corrugation.

The greater variety of unsealed road surfaces provided significantly higher and a larger range of rolling resistance values which are outlined in the following pages.

5.1 DULEEN DA ANDINE ROAD RESULTS

This road surface was consolidated and displayed moderate quantities of small loose material dispersed throughout the test road section length. The results fell within the mid-range of the untreated unsealed road surfaces as depicted below.

The change in road roughness from a GRT treated surface and an untreated is clearly displayed in the graph on the following page.

Photograph 5.1: Depicts the Duleen Da Andine Road test location.

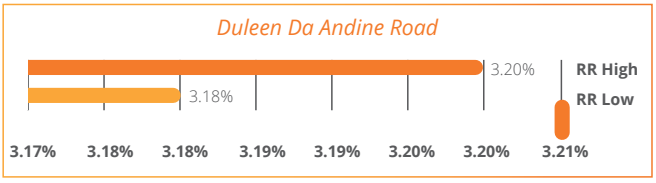

Figure 5.1.1: Rolling Resistance Results

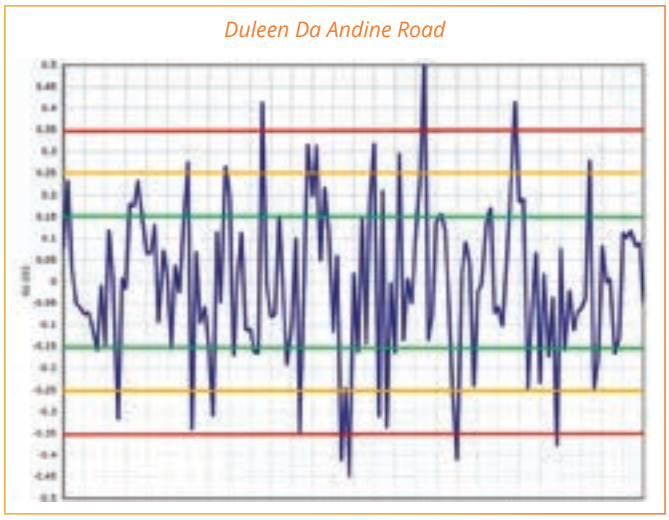

Figure 5.1.2: Relative Road Roughness.

5.2 KERRS ROAD RESULTS

The Kerrs Road unsealed surface was well compacted with minimal loose material observed on the travel surface. The rolling resistance results were the lowest recorded for unsealed untreated road surfaces and this feature corresponded with the reduced road roughness graph display in Figure 5.2.2.

Photograph 5.2: Depicts the Kerrs Road test location.

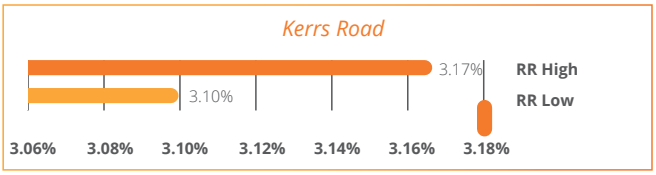

Figure 5.2.1: Rolling Resistance Results

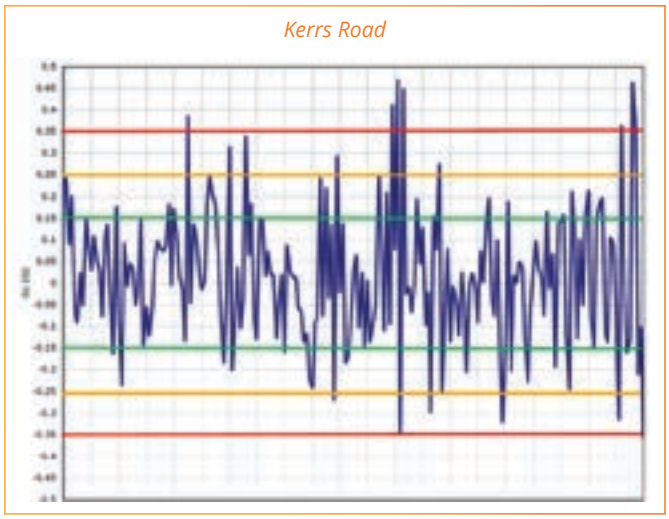

Figure 5.2.2: Relative Road Roughness.

5.3 GLEN MONA ACCESS ROAD RESULTS

This surface was selected to provide rolling resistance values for an unconsolidated road surface with significant quantities of small size loose material and sections of mild road surface corrugation.

The results displayed the substantial increase in rolling resistance about 30% to that of the roads treated with a GRT product finish.

The extent road roughness in comparison with GRT treated road surfaces is illustrated in Figure 5.3.2:

Photograph 5.3: Depicts the Glen Mona Access Road test location.

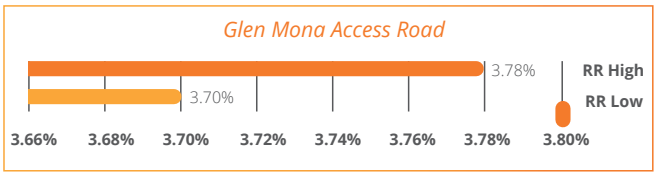

Figure 5.3.1: Rolling Resistance Results

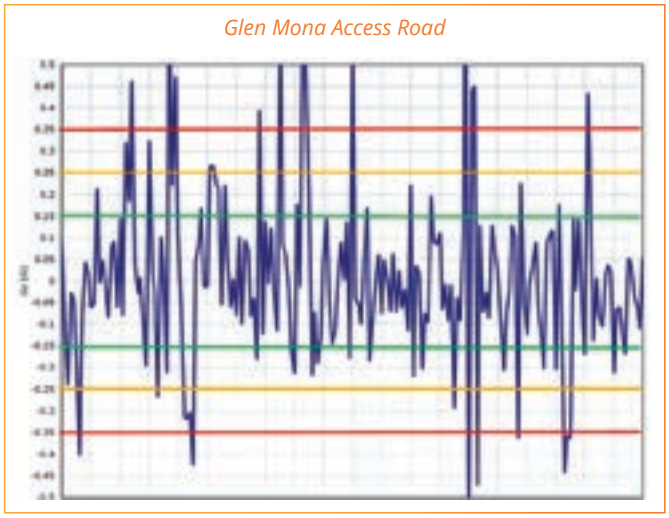

Figure 5.3.2: Relative Road Roughness.

6.0 SEALED ROAD RESULTS

A selection of sealed roads were subjected to the test process for contrast purposes. The majority of conventional sealed roads in the test project region are comprised of a sprayed chip seal construction using a variety of stone aggregate sizes.

The surface selection included an older sealed surface in relatively good condition and a new recently resurfaced section of the Moonie Highway.

6.1 BROADWATER ROAD RESULTS

This test section surface was defect free and relatively well travelled (worn). It was selected for testing comparison as a typical conventionally sealed surface in the area where GRT product is applied to roads of similar formation construction and traffic volume. The GRT road surfaces all outperformed this surface by an average of 5%.

Road roughness magnitude results were similar to GRT treated road surfaces.

Photograph 6.1: Depicts the Broadwater Road test location.

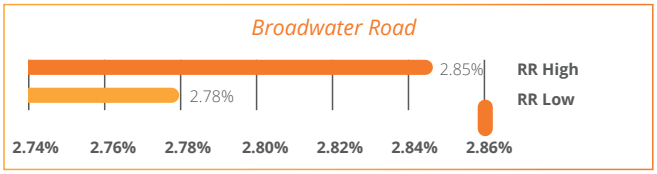

Figure 6.1.1: Rolling Resistance Results

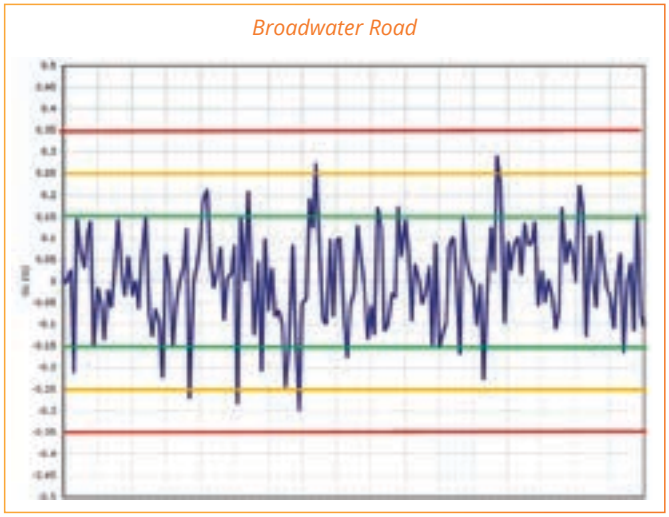

Figure 6.1.2: Relative Road Roughness.

6.2 MOONIE HIGHWAY RESULTS

The Moonie Highway was selected as an example of a major arterial road environment in the project region. The test surface was recently resurfaced and completely free of defects although there were small quantities of loose stone on the travel surface as a result of the recent road works. The rolling resistance results were consistent with that obtained from the Broadwater Road tests although road roughness was distinctly smoother.

Photograph 6.2: Depicts the Moonie Highway test location.

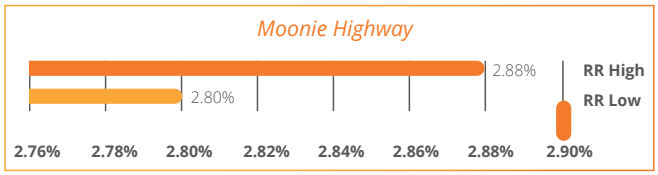

Figure 6.2.1: Rolling Resistance Results

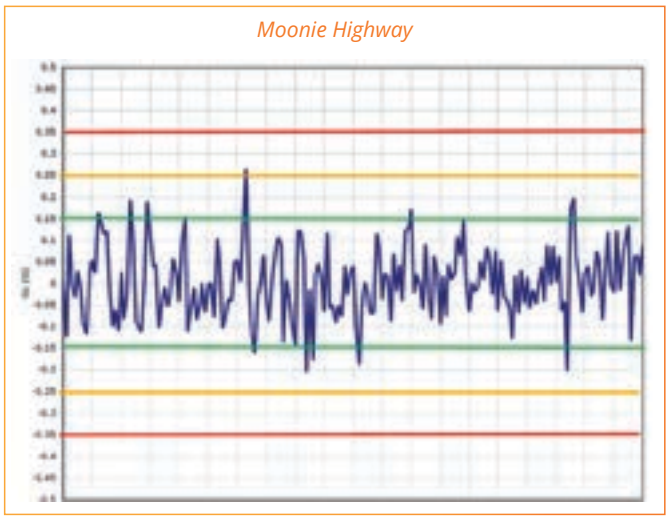

Figure 6.2.2: Relative Road Roughness.

7.0 RESULTS SUMMARY

The field data obtained from this project clearly establishes that current GRT product road surface application activities has a measurable beneficial outcome in terms of rolling resistance, road roughness and the associated positive road related factors broadly defined but not limited to the following elements:

- Reduction in fuel consumption
- Extended tyre life
- Mechanical maintenance benefits
- Increase ride comfort (rolling resistance and surface smoothness linked)
- Reduced traffic noise (linked to road roughness)
- Increased travel speed reduced travel time (as above)
- Improved vehicle safety (controllability/stability linked to road roughness improvements)

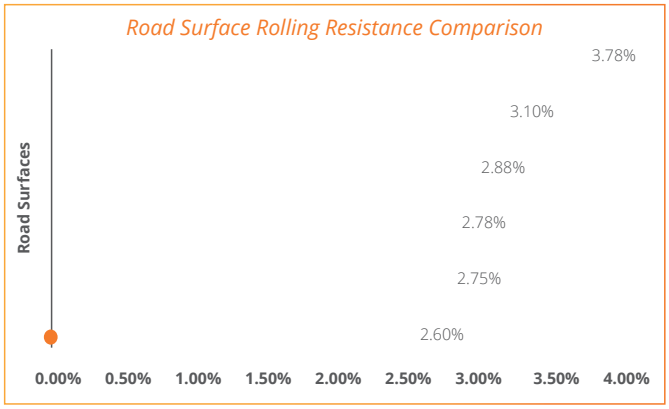

Figure 7.1: Summary of Rolling Resistance Results

8.0 RECOMMENDATIONS & COMMENTARY

The following comments are provided for consideration by Global Road Technology (GRT) management:

- The rolling resistance and associated road roughness data contained within this report provides competent confirmation of the quantifiable beneficial improvements obtained through the application of GRT product on Regional in-situ unsealed road surfaces.
- It is opined that this data is appropriate to be used for positive marketing of GRT product and associated business activities.
- Additional independent rolling resistance testing may be considered to provide supplementary data and/or for appraisal of heavy vehicle rolling resistance on GRT road construction activities.