

Does road bitumen flushing cause crashes on New Zealand state highways?

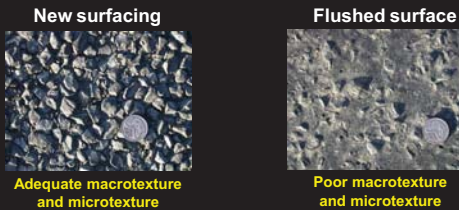


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Introduction

Loss of control road traffic crashes comprised 30% of all crashes which occurred in New Zealand for the five year period 2006 to 2010. Previous research has established that low skid resistance is a contributing factor to loss of control type crashes. Skid resistance is a function of microtexture and macrotexture (adhesion and hysteretic effects). *Flushing* occurs when bitumen is near the surface of the aggregate, reducing macrotexture. On a flushed pavement surface gaps between individual aggregate particles (macrotexture) is lessened, resulting in reduced skid resistance.



Objective

- To determine the effect of flushing on state highway traffic crashes within selected New Zealand National Maintaining Agencies (NMAs).

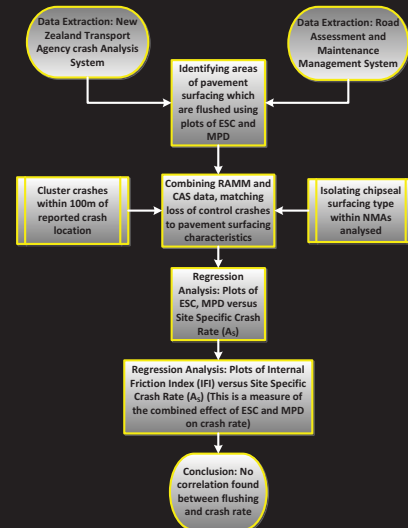
Methodology

- The study utilised a combination of skid resistance and macrotexture depth to identify areas of the pavement which were flushed.
- Skid resistance was represented by equilibrium SCRIM coefficient (ESC) which is measured by a Sideway Force Coefficient Investigatory machine (SCRIM) vehicle.
- Mean Profile Depth (MPD) represents macrotexture and is measured by lasers fitted to the SCRIM survey vehicle.



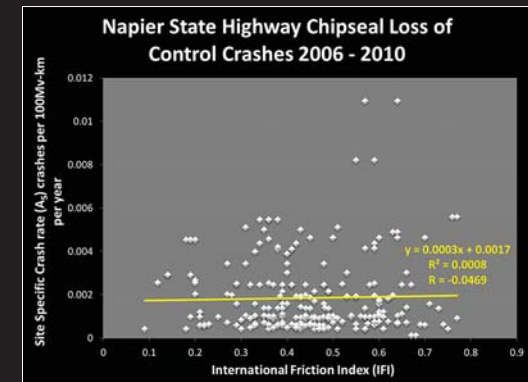
SCRIM survey vehicle

Research Process



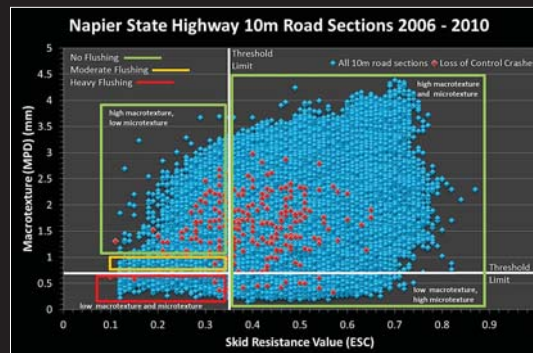
Effect of Flushing on Crash Rate

A plot of site specific crash rate (A_s) versus International Friction Index (IFI) for the Napier region is shown below. Linear regression shows no relationship between A_s and IFI as indicated by correlation coefficient (R) and coefficient of determination (R^2) values. Results were similar for the Auckland, Northland and West Waikato regions, and also when A_s was plotted against ESC and MPD.



Extent of Flushing

Plots of ESC versus MPD for the state highway network identified the areas of road surfacing which were flushed. Three flushing bands were established based on threshold limits specified by NZTA. Loss of control crashes in wet conditions were distributed throughout the flushing severities indicating that the flushed surfaces were not significantly contributing to crashes.



Conclusions

The main findings of the research are:

- Plots of ESC versus MPD show that flushing is not a major contributing factor to crashes in the NMAs analysed;
- This research found no correlation between road traffic crashes and bitumen flushing as indicated by regression analysis between crash rate and MPD, ESC or IFI; and
- A bivariate analysis is not adequate to assess the multivariate nature of a crash. Road geometry (e.g. curvature, gradient), environmental and driver elements all contribute to crashes.

Acknowledgements

Appreciation and thanks is expressed to the following people who aided in the compilation of this report.

- Dr Doug Wilson and Dr Theuns Henning, University of Auckland;
- Darren Newland, Dr John Donbavand and Dr Chris Kennedy of WDM Ltd;
- Fiona Derrick, Downer; and
- Matt Smith, Opus International Consultants.