



Old tyres, new seal: adopting crumb rubber technology for use on New Zealand roads

Each year, approximately 4 million used tyres are stockpiled around New Zealand. Some are disposed of legitimately, while many are illegally buried or dumped and become pollutants. Instead, some could be converted to tyre-derived crumb rubber and added to bituminous binders.

Since the 1960s, the use of crumb rubber has become international common practice to address pavement performance issues and to dispose of used tyres. This project investigated manufacturing and modifying crumb rubber seal for New Zealand roads using end-of-life tyres.

Based on a literature review, researchers found that a wealth of knowledge exists in Australia and South Africa on the criteria for crumb rubber and the expected binder performance after being modified. The key is understanding the interaction between crumb rubber and the bitumen through composition control and careful temperature and time management.

While seal designs are different between countries, the overall principles of chipsealing practice remain the same, and international approaches can be adapted to New Zealand conditions. To minimise the construction risks of a highly modified bituminous binder, pre-coating and liquid additives are needed to improve bitumen compatibility, aggregate adhesion and workability.



Topping bitumen with aggregate near Masterton

Risks of crumb rubber – emissions, odours and heat

Crumb-rubber-modified (CRM) sealing products carry emission and odour risks when using conventional technology. Overseas studies show that emission levels are often well within the maximum allowance but remain a risk at high operating temperatures. Reducing the handling and spraying temperature of the modified binder would certainly help reduce emissions and benefit the general health and safety of workers and others nearby.

Over the past decade, additives have been introduced to reduce the necessary operating temperatures, and commercially available odour suppressants have been used to reduce the smell.

Achieving lower operating temperatures through emulsification of CRM binders is the best way to mitigate health and safety risks, but it is not a mature technology, and both Australia and South Africa have progressed the use of crumb rubber seals without emulsions.

Meanwhile, Australia has also recently demonstrated the viability of recycling CRM asphalt from reclaimed asphalt pavement. This is a potential end-use for end-of-life CRM chipseals.

Crumb rubber supply in New Zealand

For this product to be viable in New Zealand, we need a secure crumb rubber supply. While there are plenty of used tyres available, crumb rubber manufacturing is limited here. This will likely change with the regulated product stewardship scheme, and there are potential suppliers who could produce the specified materials in New Zealand. The scheme would allow funds collected at the start of the supply chain to go to the collectors and processors of used tyres, subsidising the final product. This would also keep the price of crumb rubber related products competitive.

Technological viability here depends on the economics for New Zealand contractors to 'gear-up' for crumb rubber related production and construction of modified chipseals.

Recommendations for further research

Life cycle assessments of CRM chipseal have demonstrated environmental benefits over conventional polymer-modified materials but should be treated with care. This is because calculations are often based on assumptions and estimates that may not be applicable to the New Zealand context. Future studies should overcome these problems by directly monitoring production and construction activities. A detailed assessment of energy consumption and greenhouse gas emissions should also be part of any New Zealand field trial of CRM chipseals.

The remaining obstacle in New Zealand is the industry's move away from hot cut-back bitumen towards emulsion products, which reduces the risk of burns to workers. The difficulty with emulsifying CRM binders means this could significantly impact further progress. While potential solutions exist, further research and development needs to show the feasibility of the new technologies.



RR 679 – *The reuse of end-of-life tyres to enhance the performance of chipseal binders*, Waka Kotahi NZ Transport Agency research report. Available at www.nzta.govt.nz/resources/research/reports/679