31 July 2024

The Committee's inquiry into the procurement practices of government agencies in New South Wales and its impact on the social development of the people of New South Wales.

Tyre Stewardship Australia (TSA) attended on Thursday 4 July 2024 and is responding to the questions on notice.

Question 1: *The Chair: Do you have any modeling on the environmental impacts and the cost impacts over time of using crumb? This was referring to specifically crumb rubber use in roads.*

Response to question 1:

TSA has conducted and supported various research and case studies into the benefits of using crumb rubber in roads in Australia with the below two reports being most relevant:

- Emissions avoidance of using rubber in roads and other applications: Tyre Stewardship Australia | Life Cycle Assessment of end-of-life tyres
- Fact sheet on the benefit of crumb rubber in roads: Tyre Stewardship Australia | Crumb Rubber in Roads: Comprehensive Fact Sheet | Tyre Stewardship Australia

Key findings from these reports include:

- Incorporating crumb rubber into bitumen reduces the demand for virgin materials, lowering the carbon footprint during construction.
- Crumb Rubber asphalt pavements require fewer maintenance activities due to improved durability, weather resistance, reduced rutting, and enhanced cracking resistance. Some analysis shows significant carbon footprint reductions (5.6% to 27.3%) with a 10 – 40% extension of pavement service life due to crumb rubber.

Additional research includes:

- The national specifications and proven engineering benefits of using crumb rubber modified binder: Austroads | National Specification for Crumb Rubber Binders in Asphalt and Seals
- A trial conducted in NSW found the extended service life and reduced environmental impacts underscore the importance of incorporating crumb rubber in asphalt for sustainable infrastructure development: SSROC and RMIT | SSROC - Life Cycle Assessment and Potential Environmental Benefits of Crumb Rubber Asphalt using Field Data
- The potential benefits of other-than-truck tyres crumb rubber to be used in asphalt roads: Austroads | Passenger Cars and other Non-truck Tyres Crumb Rubber in Asphalt: National Market Analysis Review of Industry Practices and Technology Transfer
- Journal of Cleaner Production | Exposure of crumb rubber modified bitumen to UV radiation: A waste-based sunscreen for roads

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Question 2: *Ms ABIGAIL BOYD: My understanding is that there's a sweet spot for the amount of crumb rubber you've got in with other things in order to create materials that are still strong enough. However, there are also competing recycled streams and reuse streams, like coal ash, which plenty of people are lobbying to be included in roads. In an ideal world, we might try to create a composite that has all of that in there. Do you know if there has been any work done on that? How do you see that competition between mandating different amounts?*

Response to question 2:

For sprayed seals and asphalt applications, crumb rubber is typically added in quantities of 5–18% by mass of the binder via the 'wet process' and up to 2% by mass of asphalt mixture via the 'dry process'.

Fly ash, however, is used in concrete and as a filler in asphalt replacing natural mineral fillers. Therefore, these products are not in competition, rather used in separate components of the road production.

Other road and transport applications can incorporate higher percentages of crumb rubber in their production. For example, speed humps and cycle paths can be made with 100% recycled crumb rubber (AARB, 2023). Crumb rubber can be combined with recycled plastics, a polymer-based additive, and a magnesium hydroxide-based flame retardant, to manufacture the outer shell of railway sleepers.

Additionally, geopolymer crumb rubber concrete can use alternatives like fly ash, slag to further reduce the associated emissions.

- Geopolymer crumb rubber concrete can use alternatives like fly ash, slag to further reduce the associated emissions: UNSW Waste-integrated Rubberised Concrete Noise Walls

Australian Road Research Board has developed best practice advice for the Commonwealth Sustainable Procurement Advocacy and Resource Centre (C SPARC), Department of Agriculture, Water, and the Environment, which provides additional information on the use of various recycled material in roads and rail infrastructure: AARB | Best Practice Advice on Recycled Material Use in Road and Rail Infrastructure

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Additional relevant references:

Emissions avoidance of using rubber in roads and other applications: Tyre Stewardship Australia | Life Cycle Assessment of end-of-life tyres

Fact sheet on the benefit of crumb rubber in roads: Tyre Stewardship Australia | Crumb Rubber in Roads: Comprehensive Fact Sheet | Tyre Stewardship Australia
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Question 3: *Ms ABIGAIL BOYD: I know a few years back there was a company that was taking old tyres and breaking them back down into their component parts—that we had oil and other things being created. I think it was a pilot at that time. Is that technology still being fostered? Is there anything that the Government should be doing to try to increase use of that?*

Response to question 3:

Pyrolysis is one of the options to process end-of-life tyres. Pyrolysis, in this context, refers to any technology that decomposes end-of-life tyres in a closed system using heat and no oxygen or air. This thermal decomposition process produces oil, gas, and carbon-rich solid fractions.

Currently in Australia and overseas, there are many approaches to pyrolysis with no single technology achieving market dominance. Australia processes around 1% of Australian end-of-life tyres through these operations each year. Worldwide there are many operational pyrolysis facilities, but estimates suggest that less than 3-5% of all global end-of-life tyres are currently processed using pyrolysis. This low rate may reflect the challenges that the pyrolysis industry has been trying to resolve over the past few decades, including:

- technology development and product quality and variability
- market acceptance of products
- regulatory approvals, public perception and environmental & safety considerations
- the extra refining and processing often needed to establish stable and high-value outputs.

While Australia still falls short in recovering and recycling all its tyres, any emerging and alternative management approaches warrants consideration, and up-to-date information to inform decision making. Governments can effectively use regulation through tyre product stewardship and procurement practices to support initiatives, incentives and innovation in manufacturing used recycled materials.

For more insights:

- Review of pyrolysis technologies and product opportunities for Australia: Tyre Stewardship Australia | Pyrolysis of end of life tyres
- An independent study to establish an industry guide to increase the knowledge and identify the potential issues before approval, funding or the building of tyre pyrolysis and gasification plant: Tyre Stewardship Australia, the Department of Environment and Science Queensland and Sustainability Victoria | Independent Guide on Thermal Processing Technologies

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