Technical Torque #26

Where traction meets the road – end of life; Part 2 - Russell Walsh

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Every year approximately 6.5 million new, (replacement), tyres are imported into New Zealand, this does not include the tyres fitted to new and second life vehicles.

As ***Stuff*** commented in 2017:

"The wheels on the bus go round and round, so the song goes.

But eventually they need to be replaced, and the old tyres get put on a pile.

That pile grows by one tyre for every New Zealander each year, whether they drive or not and it never stops growing.

Now it's reached the stage where the tyres, and the industry supposed to recycle them, keep going round and round in a game of musical chairs where the incentive is on shifting the problem and clipping the ticket rather than solving it.

Each tyre attracts a collection fee of between $3 to $5 for disposal. Tyre centres have bins full of tyres to be collected meaning all a tyre disposer has to do is drive by, collect them and send an invoice. Truck tyres cost even more to dispose of. It's a simple business case to pick them up and then worry about what to do with them.

As one insider puts it, "there is no money in recycling tyres. There is only money in collecting them."

History of tyre recycling.

Rubber based tyres have been in use as the essential connection between road vehicles and the road for well over 100 years. For many of these years little thought was given to what to do with them once had reached the end of their useful life, dumping in landfills or burning was commonplace. There were some attempts to use End of Life Tyres, (**ELTs**) for such things as rubber door mats, wharf fenders, retaining walls and above ground gardens, whilst these were all noble attempts they did little to reduce the worldwide mountains of used tyres.

Because of the need to find alternative sources for rubber during the war it was found that subjecting **ELTs** to the process of pyrolysis[1] could help. In this process tyres are heated in an oxygen free furnace enabling the recovery of component products such as oil and carbon

[1] *The decomposition of compounds when subjected to high temperatures.*

black for further use. This process, however, was energy-intensive and not environmentally friendly.

The 1970s saw the development of machinery capable of shredding tyres, this is still a major part of the process today. Building upon this, shredded **ELTs** were further refined leading to the development of crumbed rubber. The use of these included sports and playgrounds fields due to their durability and air cushioning effect

Over the years recycled **ELTs** have been developed into applications used in the construction, sports and energy generation industries, examples include roading, insulation and matting but the process is expensive.

Recycled tyres can be used for pathways and roading

In 2024 New Zealand buyers of new tyres began to pay a Tyre Stewardship Fee levied on all new tyre purchases. This levy is used to support a tyre recovery and recycling program, Tyrewise. Tyrewise collects ELTs from retailers and approved collection centers throughout the country.

Because of the rubber chemical structure, **ELT** recycling has to be completed in a way that will not cause harm to the environment. Thankfully technology has come to the rescue again resulting in a clean and efficient process.

The recycling process.

1. Collection

ELTs are collected from retailers or approved recycling collection points by sustainable transport and transported to an approved recycling facility.

2. First shredding

Tyres are shredded into pieces between 5 and 40 CM, these can be used for energy generation or processed for further use.

3. Second shredding

Further processes that include the recovery of materials such as rubber, textiles and steel produces rubber chips, granules and rubber in a powder form for later use.

4. Removing steel fragments from recycled tyres

Modern tyres include metal components, in the bead and steel belts, that are used to provide strength and stability, these must be removed if the end product of the recycling process is to achieve the desired outcome.

Metal recovery is relatively simple process whereby the shredded tyre is passed under a very strong magnet extracting the metal which then can be recycled in its own right.

Recycled tyre uses for roading.

Incorporating recycled tyre rubber into material used for roading, namely asphalt, was pioneered in Arizona in the United States in the 1960s and is now becoming widespread in many states. Countries in Europe followed along and it is now a widespread practice helped along by the EU ban on the disposal of whole tyres in 2003, and shredded tyres in 2006 into landfill.

In Australia a report[2] concluded that "*The extended service life and reduced environmental impacts underscore the importance of incorporating recycled materials, like crumbed rubber, into asphalt for sustainable infrastructure development*".

A further report in May 2025 also from Australia, "*Paving the way: Recycling tyres for roads* [3]" reported on a monitored trial undertaken by 12 local councils in the Sydney area in which 40,000 square metres of asphalt was laid and where 28,500 kilograms of crumbed tyres was incorporated into 6,500 tons of asphalt. It was estimated that 4,500 passenger car tyres and 1,000 truck tyres were recycled for this project. After 12 months of monitoring, it was concluded that:

- Asphalt incorporating crumbed rubber performed the same or better in 80% of applications.
- There was a 50% reduction in rutting depth in some applications.

The report adds that it may take some years before the full benefits are realised.

[2] https://www.governmentnews.com.au/rubber-roads-have-environmental-benefits-council-led-trial-shows/

[3] *12 councils unite to transform Australia's roads with recycled tyres - Manufacturers' Monthly*

A Life Cycle Assessment conducted at three of the trial sites by the Royal Melbourne Institute of Technology (RMIT) University found up to a potential 30% per cent reduction in environmental impacts over the road's service life. These include:

- A reduction in carbon footprint during both the production and construction phases.
- Recovering steel during crumb rubber production.
- Diverting waste tyres from landfills.
- Reducing frequency of maintenance interventions.

Recycled tyres as fuel substitutes

In 2017 the Government announced a series of grants to address the problem of the increasing number of ELTs that were either going direct to landfill or otherwise disposed of.

One of these grants was for Golden Bay Cement at their Portland, Whangarei, plant. The production of cement requires raw product, limestone, to be kiln heated to a temperature of around 1,400o C. The output is then ground to fine powder at which time other ingredients, such as gypsum are added to improve its end use performance.

The website of FUTURECOAL.org[4] says that roughly 450 grams of coal are needed to produce 900 grams of cement. It also says that approximately 90% of the energy requirements of cement plants are derived from coal.

On their website, Holcim[5] New Zealand say that around 1.5 million tonnes of cement is produced annually in New Zealand emitting an estimated 1.23 million tonnes of CO2-e based upon the estimated conversion factor of 0.82 tonnes of CO2-e for each tonne of cement produced.

Conclusion

New Zealand is now using world best practice technology and processing ELTs into a wide variety of products for wide variety of uses all designed around minimising environmental impact and reducing the use of fossil fuels.

All the images used above were retrieved from a number of open access websites.

[4] Heavy Industries: Cement - FutureCoal
[5] Low-Carbon Solutions