FACT SHEET

Market summary – end-of-life tyres
In 2013–14 Sustainability Victoria commissioned market analysis into four waste materials identified as priorities for market development and four which are emerging materials of interest. This fact sheet summarises the findings for end-of-life (EOL) tyres.

Terminology
There are three main types of tyres used for vehicles in Australia.
› Passenger tyres: including those used on passenger vehicles, motorcycles and caravans, as well as trailers for domestic use.
› Truck tyres: including those used on buses, light and heavy commercial vehicles, prime movers, trailers and semi-trailers, and fire fighting vehicles.
› Off-road tyres: including those used on machinery or equipment used in areas such as agricultural, mining, construction and demolition.

Data on tyres is expressed in equivalent passenger units (EPUs), a standardised measure for the quantity of tyres which is used widely within the industry. The EPU weight for an EOL tyre has been assumed to be 8.0 kg, in accordance with the methodology adopted in previous studies.

Composition
The composition and the type of tyre may vary slightly depending on the manufacturer, however, they are generally one-half rubber, one-fifth carbon black and one fifth steel, with minor proportions of textiles and other additives. Due to the high proportion of rubber and carbon black content, they have a high calorific content of between 32 and 34 MJ/kg (with one tonne of tyres being equivalent to 0.7 tonnes of petroleum in terms of energy value1).

Volumes
At present, the size of the EOL tyre market in Victoria is approximately 88,000 tonnes per annum2, some 46 per cent of which is recovered for export or local crumb rubber granule processing3. The destination of the remaining 54 per cent is unknown at this stage, but is assumed to be stockpiled, illegally dumped or exported without registration with customs.

Processing
A traditional tyre reprocessing approach generally involves the following steps.
1. Whole tyres are sorted, and then shredded.
2. The rubber is subjected to further grinding and separation through sieves to separate the rubber into various sizes.
3. Steel is removed, generally by passing the shredded tyres over magnetised tables.
4. Rubber is passed over an air gravity table to remove any remaining synthetic substances.

EOL tyres can also be reprocessed into a form suitable for use as refuse-derived fuel. In this instance the product is referred to as tyre-derived fuel (TDF).

The process of shredding and grinding produces granules and crumb rubber/powder in a varying range of sizes. These are collectively referred to as tyre-derived products (TDPs). The table below summarises the range of sizes and applicable end uses for various TDPs and TDFs.

---

2 To estimate the quantity of end-of-life tyres in Victoria, 2009–10 data sourced from the Council of Australian Governments (COAG) Study into domestic and international fate of end-of-life tyres (produced by Hyder and published in 2012) was extrapolated by applying the apparent waste generation per capita figure to recent population projection data (National Regional Profile 2007-2011, ABS 2013). Series B of the ABS Population Projections was assumed as a conservative estimate for population growth in Victoria.
3 Extrapolated from Sustainability Victoria’s most recent figures on total Victorian recovery by material type (2007 08 to 2011–12)
Table 1: End uses for tyre derived products and fuels (TDPs and TDFs)

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>Potential End Use Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole tyres</td>
<td></td>
<td>TDF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Civil engineering</td>
</tr>
<tr>
<td>Cut/shredded tyres</td>
<td>300 mm +</td>
<td>TDF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Civil engineering</td>
</tr>
<tr>
<td>Tyre chip</td>
<td>30 mm – 299 mm</td>
<td>TDF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Civil engineering</td>
</tr>
<tr>
<td>Rubber granulate</td>
<td>1 mm - 29 mm</td>
<td>Soft surfacing and matting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moulded products</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explosives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mulches</td>
</tr>
<tr>
<td>Crumb rubber/powder</td>
<td>Less than 0.9 mm</td>
<td>Road surfacing – asphalt and sprayed bituminous surfacing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adhesives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General rubber mixing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elastomers</td>
</tr>
<tr>
<td>Steel</td>
<td>N/A</td>
<td>Established metal recycling market</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Concrete reinforcing</td>
</tr>
<tr>
<td>Textile</td>
<td>N/A</td>
<td>Carpet backing</td>
</tr>
</tbody>
</table>

The shredding units suitable for initial processing of EOL tyres range from small units that process 250 passenger tyres per hour to large units capable of processing 1,000 passenger tyres (eight tonnes) per hour. The capital costs for these units range from approximately $120,000–$370,000 plus GST.

Specialised machinery is then required to convert the shredded tyre product into a recycled rubber crumb or powder. Capital costs for establishing a crumb rubber facility would likely exceed $6 million.

An alternative to shredding is the baling of whole tyres. Second-hand balers are readily available to purchase, with capital costs well under $50,000. Low upfront costs and overheads, relatively simple operating procedures and strong international demand for baled whole tyres also contribute to the low barriers to entry in this style of market. It should be noted that whilst not illegal, the export of whole baled tyres is not supported by Tyre Stewardship Australia (TSA) or the Australian Tyre Recyclers Association (ATRA).

---

4 “Used Tyre Baler”, http://www.alibaba.com/showroom/used-tire-baler.html
5 “Tire Baling with Hydraulic Tire Baler”, http://www.youtube.com/watch?v=62QWItzFEA
**Products and applications**

Six TDPs and their relevant standards are outlined below.

**Crumb rubber/powder in sprayed bituminous surfacing**

Crumb rubber can be used to replace the traditional polymer modified binder in sprayed bituminous surfacing for its plasticity and waterproofing properties. The properties of rubber have been reported in the *Economics of Tyre Recycling* report by Australian Roads Research Board (ARRB) Transport Research (2004) to improve the binding capacity of the sealant, particularly in sprayed bituminous surfacing. Sprayed bituminous surfacing is a surface treatment consisting of a sprayed film of bituminous binder covered with aggregates and then rolled.

ARRB reports that the success of this product has been well established in Australia, and is attributed to the higher application rate of this product and subsequent resistance to cracking. In 2011, the Australian Asphalt Pavement Association also reported that crumb rubber modified binders have also been shown to have a longer service life and improved performance compared to traditional modified binders.

**Crumb rubber/powder asphalt**

The use of crumb rubber in sprayed bituminous surfacing is relatively well established in Victoria. Production of crumb rubber asphalt is, by contrast, yet to be fully realised.

Crumb rubber asphalt is produced when crumb rubber is mixed with bitumen in asphalt production. Previous trials have reported excellent results, and VicRoads has developed a supplement to asphalt production standard Section 407 (Section 421, Bitumen Crumb Rubber Asphalt), which covers the special requirements for bitumen crumb rubber asphalt. However, while there is an established protocol for the addition of crumb rubber to hot mix, the existing standard has not been well promoted by the industry and is not commonly specified in mix designs and road construction specifications.

**Moulded products, soft surfacing and matting**

Recycled rubber granulate can be used in a range of moulded products, flooring and matting, which can be used in sporting grounds and playgrounds. These products would be required to conform to Australian Standards, including AS 4422:1996: Playground surfacing – Specifications, requirements and test method; and AS 4693: Surfaces for sports areas.

**Civil engineering**

Whole tyres can be used as a low cost fill in a number of civil engineering applications, including retaining walls, blast walls and sea walls. The products would be required to adhere to traditional construction design standards, including Australian Standards Bridge Design Code AS 5100 and Australian Standards for Concrete Structures AS 3600.

**Crumb rubber/powder in tile and rubber glue**

Rubber powders are used in the manufacture of contact adhesives, such as those used in tiling applications. While the use of “rubber-based adhesives” is commonly specified in construction applications, the Australian Master Tilers Association notes that rubber is actually used as a ‘filler’ in many cement-based adhesives and the rubber particles play no part in the binding process.

Regardless of the function of the rubber particles, the adhesives market is one of the major purchasers of crumb rubber products, and has been for many years. Accordingly, the adhesives market is very mature and the available capacity is taken up by existing suppliers.

**Tyre-derived fuel**

Tyre-derived fuel (TDF) is produced when EOL tyres are converted into a product for use as fuel. Typically, cut/shredded tyres and tyre chip can be used as the fuel feedstock. TDF can be used as a replacement for fossil fuels in cement kilns, power stations, smelters or paper mills.

There is a thriving market in the export of TDF, accounting for at least 18 per cent of total annual EOL tyres in Victoria. Against landfill costs, the export of TDF offers around $100 per tonne more revenue for a tyre collector.

---

**Market overview**

**Table 2: Summary of EOL tyre generation and destinations within Victoria**

<table>
<thead>
<tr>
<th>Victorian generation and destination of EOL tyres</th>
<th>Total tonnes (2012–13)</th>
<th>Proportion of recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>EOL tyres generated</td>
<td>88,109</td>
<td>–</td>
</tr>
<tr>
<td>Tyres recovered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reported exports</td>
<td>~23,119</td>
<td>26%</td>
</tr>
<tr>
<td>Crumb rubber</td>
<td>~15,523</td>
<td>18%</td>
</tr>
<tr>
<td>Rubber granules</td>
<td>~1,725</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>40,367</td>
<td>46%</td>
</tr>
<tr>
<td>Unknown</td>
<td>47,742</td>
<td>54%</td>
</tr>
</tbody>
</table>

---

Market risks

Lack of industry support for National Product Stewardship Scheme

The current market sees significant volume of EOL tyres and the associated revenue flowing toward collectors who undercut best practice market operators and stockpile EOL tyres to avoid processing fees or disposal charges.

There is a risk that this practice will continue without an effective governance scheme for the EOL tyre industry. To address this, Tyre Stewardship Australia (TSA) was formed in January 2014 to implement the national Tyre Product Stewardship Scheme. The scheme’s objective is to reduce the amount of EOL tyres damaging the environment via landfill, illegal dumping or undesirable export while increasing recycling rates. The TSA is beginning to receive more support from the tyre industry, as is the commencement of the import levy on tyres in July 2014 to support the scheme.

Lack of an effective regulatory framework

For many years the lack of an effective regulatory framework in Victoria has adversely impacted market growth.

In response, after extensive consultation, the Victorian Government announced an Interim Waste Management Policy (IWMP) to regulate tyre stockpiles in Victoria, effective from 29 April 2014 for one year.

The intent of the IWMP is to take action to protect Victorians against the fire risk from tyre stockpiles by making stricter rules on how tyres are stored. The enforcement of the IWMP will underpin improved EOL tyre management in Victoria by inhibiting the unsafe stockpiling of EOL tyres as a legitimate end point.

In the year that the IWMP is active, a Regulatory Impact Statement (RIS) process is being undertaken. It is intended that the RIS will create regulatory continuity post the IWMP.

Unpredictability of export markets

Given a significant volume of EOL tyres are exported as TDF, the fluctuations in international market prices have a large bearing on exports volumes. This in turn influences the extent to which local operators stockpile tyres. That is, when prices are down, storing of EOL tyres increases while the owners wait for a better resale price. International demand coupled with market access policies (such as the China’s “Operation Green Fence”) can have significant impacts on the international price and therefore the flow of EOL tyres through and out of the local market.

Influx of overseas technology providers

Technology providers with tailored processing solutions for EOL tyres are currently choking the market with information. Some is well informed while some is based on assumptions made using conditions from overseas markets. The key risk in this market segment relates to the success or failure of any future plant. Where a new processing plant to fail this would no doubt impact the willingness of others to invest in similar technology.

Risks to local processing markets

Local markets for crumb rubber are subject to competition from inferior imported products which come into the market at low cost. While poorer quality inputs may not significantly impact some products, others markets (such as in sprayed bituminous surfacing) are very sensitive to quality issues and reputational damage. Given there are limited controls in place to regulate the quality of imported crumb rubber, local producers must work hard to market the benefits of premium grade material.

Market barriers

There are a number of barriers impeding the full potential of markets for TDPs. They include:

- lack of regulation
- disparities in the current pricing system
- high cost of infrastructure
- the impact of cheap imported products
- limited acceptance of content within specifications or tender documents
- barriers to energy from waste, and
- barriers to addressing existing stockpiles.

Market opportunities

In summary, there are a number of market opportunities for EOL tyres in Victoria however the case for “higher order” processing will not be maximised until the issue of stockpiling of EOL tyres, in particular, is is addressed.

Further information

For more information contact Karl Shanley on (03) 8626 8741
email Karl.Shanley@sustainability.vic.gov.au
or visit www.sustainability.vic.gov.au/marketanalysis

This fact sheet summarises a more comprehensive market analysis report completed by Hyder Consulting on behalf of Sustainability Victoria (May 2014). Due to the confidential nature of some information provided by stakeholders the full market analysis report is not publicly available.