Project Evaluation Report

A convenient truth: Glass asphalt
Strategic Waste Initiative Scheme

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Fulton Hogan Industries is the leading road resurfacing company in Australia. Our experience and knowledge in road surfacing has been attained during a period of over 60 years in the business. Our experience extends to major resurfacing contracts in spray sealing and asphalt for State Road Authorities, Local Government, Airports and Private Sector. Contracts have been undertaken in both remote and high density trafficked areas.

In addition to conventional surfacing materials Fulton Hogan Industries Pty Ltd are able to produce specialised products to suit a wide range of applications including:

- Polymer modified asphalt
- Bitumen Treated Base
- Heavy duty pavements
- Coloured asphalt
- Crack sealing
- Stone Mastic Asphalt (SMA)
- Recycled asphalt (RAP)

Recent initiatives and innovative approaches have lead to trials incorporating crushed recycled glass in asphalt mixes. Benefits associated with incorporation of glass include reduction of costs through raw material savings and perceived environmental benefits which will lead to market differentiation. At this stage, none of our competitors are incorporating recycled glass into asphalt.
1. INDUSTRY OVERVIEW

The minimization of waste produced by various industries, construction sites, homes etc. is a great concern in most countries.

More than two-thirds (69%) of Australians are concerned about the accumulation and disposal of household waste, according to a survey conducted by the Australian Bureau of Statistics in 2007-08. Australia’s growing economy and its increasing use of energy and other resources have brought prosperity and wellbeing to many Australians.

As a result more waste is produced than ever before:

- Overall, waste generation increased by about 31 per cent between 2003 and 2007 - despite a significant increase in recycling to 52 per cent.
- The amount of waste disposed to landfill has grown by 21 per cent in four years.
- Waste generation in Australia continues to rise, largely due to factors such as increased household incomes; fewer people per household (and therefore a larger number of households); busy life styles and reliance on pre-packaged foods).
- Rapid advances in technology resulting in electronic items becoming obsolete in increasingly shorter timeframe
- Worldwide, next to granular materials, asphalt is one of the most used materials for road construction; is also one of the biggest opportunities of using recycling materials.

Recycling initiatives in the Australian Asphalt Industry includes incorporating of materials like crumbed rubber and profilings from old asphalt pavements.

2. HISTORY

In 2002 Fulton Hogan (then Pioneer Road Services) performed the first trials with glass asphalt for City of Canning, local council in Western Australia.

Since then Fulton Hogan WA produced approximate 100,000 tons of glass asphalt for local councils: City of Canning, Town of Vincent and Shire of Kalamunda.

3. PLANT MODIFICATIONS
Despite the production of trial mixes with glass it was quickly determined that there were a number of issues that need to be resolved. Unlike normal crushing circuits where a number of fractions are screened for asphalt production, 100% of the material is required to pass the 5mm screen. This caused excessive wear and high maintenance on the originally supplied crusher.

The glass supplied to Fulton Hogan was mainly broken bottle glass in 20mm culets and this caused problems with the shape and size of the crushed material. Unless the material is crushed to a small size, it shape is elongated and flat resulting in fractured particles stripping easily and plucking out of the asphalt surface under the influence of traffic.

However a final hurdle remains after the resolution of the above problems, and that is the acceptance of crushed glass within the industry.

In order to address the above issues adjustments were made to the glass crushing plant:

- The original primary crusher was replaced with a small cone crusher which decreased the downtime and reduced the wear.
- At the end of the conveyor from the primary crusher, the material is screened, diverting less than 5mm material to the storage bin and the plus 5mm to a secondary crusher. This reduced the amount of glass going to the high wear secondary crusher which increased productivity and reduced wear on the cone crusher.
- The 5mm trommel screen has been replaced with a 8 x 4 precision screen to allow all year production, the trommel screens tend to block very quickly as the moisture content of the glass increases in winter months.

4. CONCLUSIONS AND GOING FORWARD

Production trials have been completed in order to establish the influence of the waste glass to the properties of the conventional dense graded granite mixes used in WA for Local and State Authority contracts. The trial mixes and application are shown in Table 3.1. These mixes were tested for a range of parameters:
- General Testing (PSD, Bitumen content, Marshall properties)
- Tensile Strength Ratio
- Indirect Tensile Resilient Modulus
- Fatigue

Test results have shown that the addition of 5% waste glass to dense graded asphalt mixes has low impact on the asphalt long term properties, particularly when used in residential streets or roads with larger volumes of light traffic.

Glass is a recyclable product, and only that portion of glass that cannot be economically or efficiently utilised in the remanufacture of new glass should be used. For Western Australia, given the nearest re-processing plant for glass is Adelaide, the energy savings by remanufacture are marginal, and only applicable to very clean glass.

Local government should be encouraged to use recycled products wherever possible. Glass in asphalt replaces some sand and small aggregate fractions in the mix, and any savings in these resources should be valued, as this reduces drain on new resources and resulting habitat loss.

Reuse of glass also saves on landfill space, which is also a valuable commodity and should be reserved for only those materials that cannot be recycled.

Fulton Hogan will continue the research into glass asphalt in order to develop a larger data base and give more certainty to any possible performance advantages or disadvantages to adding glass to asphalt.

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