

Case Study: Bussell Highway Upgrade with Biogenic Bitumen – Resurfacing

<i>Project Partners</i>	
Puma Bitumen	Binder Supplier
Asphaltech	Asphalt Producer and Asphalt Contractor
City of Busselton	Asset Owner

Background

Asphalt is a core material in road construction, yet it is the major contributor to Global Warming Potential (GWP) due to the use of Bitumen and high energy demands to produce the asphalt. Biogenic Bitumen modifiers are an innovative technology to reduce the carbon footprint of the asphalt product; by targeting the, the Global Warming Potential of asphalt can be significantly reduced without any detrimental effects on performance.

Polymer Modified Binders (PMBs) are commonly used in higher stress locations and produce a more durable and stress resistant pavement. The incorporation of biogenic material allows for both a more sustainable product, but also a more durable treatment to conventional paving grade bitumen.



Figure 1 CarbonBind A15E Asphalt DG 10 Wearing Course

Quality

To meet the performance requirements of ATS-3110 A15E:

- The full ATS-3110 A15E specification had to be achieved
- Every large-scale batch was tested to ensure compliance
- Terminal manufacturing procedures were closely monitored to ensure accurate modification

Innovation

Puma Bitumen developed CarbonBind A15E, a modified binder that incorporates renewable, modified plant-based materials that have already sequestered CO₂ from the atmosphere. This innovation:

- Reduced carbon intensity by 164 kg CO₂ per tonne of binder
- Matched the performance of standard A15E binders to ATS-3110 standards
- Required no plant modifications, special handling, or changes to asphalt mix designs

Manufacturing took place at Puma Bitumen's Kwinana terminal, using refined tank farm dosing systems and supported by a NATA-accredited laboratory for rapid quality control.

An example of the ATS-3110 test reports for the CarbonBind A15E are shown below:

Table 1, Results of CarbonBind A15E Delivered

Analysis	Method	Units	Min	Max		
Report Number					26/30309	26/30335
Softening Point	AG:PT/T131	°C	82	105	90.5	94.0
Torsional Recovery	ATM122	%	55	80	67	71
Viscosity @ 165°C	ATM 111	Pa.s		0.9	0.68	0.63

Sustainability

Conventional A15E has a global warming potential of 791kgCO₂/ton eq, the main contributor for emissions in Asphalt. Reducing the emissions of the binder, produces significant benefits for the overall environmental impact on the asphalt. This life cycle analysis and independently verified Environmental Product Declaration validate this benefit and can be used as a carbon benefit.

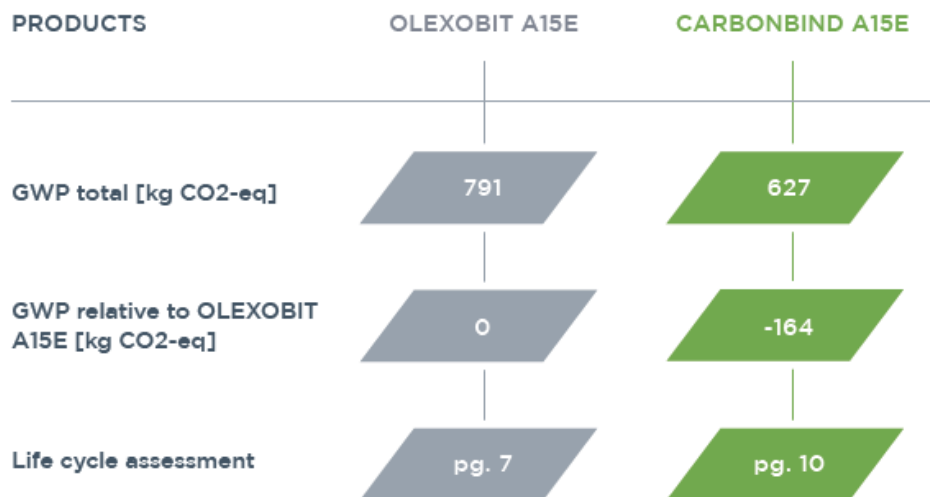


Figure 2, Global warming potential of conventional A15E to CarbonBind A15E

Asphaltech, the contractors for this project also use a asphalt with a Global Warming potential of 46kgCO₂/ton compared to the industry average of 60.3kgCO₂/ton. This more sustainable asphalt, used in conjunction with CarbonBind both lead the industry towards more sustainable construction practices, and help lead the industry towards 2050 net zero targets.

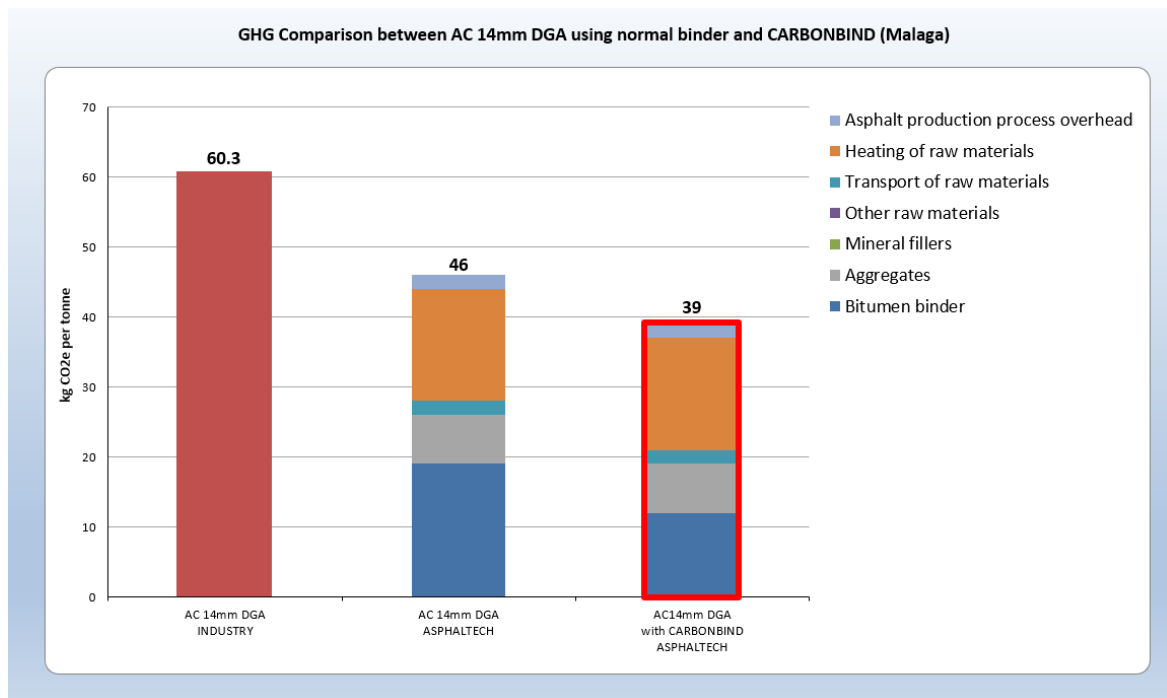


Figure 3, Typical Asphalt emissions from Asphaltech in Malaga

Implementation



Figure 4, CarbonBind A1E in Busselton

Results

Environmental Impact

- 24,600 kg CO₂ saved through binder substitution alone
- Stored biogenic carbon directly within the pavement
- Supported verifiable sustainability reporting with LCAs and EPDs

Operational Impact

- No additional testing, delays, or equipment changes required

Industry Impact

- Demonstrated that sustainable binders can be commercially viable at scale

Key Learnings

- Sustainability goals can be achieved without sacrificing technical performance or cost efficiency.
- Co-production of standard and sustainable binders allows for direct performance benchmarking, aiding future adoption.