

GROWING A SUSTAINABLE FOOTPRINT WITH TONERPLAS

TONERPLAS IS A HIGH-PERFORMANCE ASPHALT ADDITIVE ENGINEERED USING POST-CONSUMER RECYCLED PLASTIC POLYMERS. AFTER NEARLY 10 YEARS IN DEVELOPMENT, BEING TESTED AND TRIALLED ON AUSTRALIAN ROADS, CLOSE THE LOOP IS LOOKING TO INCREASE ITS FOOTPRINT IN THE SECTOR.

In recent years, policy changes and examples of innovation have propelled the road construction industry forward, not only to increase the use of its own waste but to be a valuable market for other waste streams.

Long before the COAG ban on waste exports or the implementation of Victoria's Recycled First Policy, Close the Loop, a major take-back provider of ink and toner cartridges, had a zero waste to landfill policy. This prompted the team to investigate markets for waste printer toner, which is a high-grade polymer.

A trip to the United States demonstrated to Close the Loop that using these polymers in asphalt could be successful

and even increase performance. When a surveyor studied the roads and returned good results, Close the Loop got to work creating TonerPave.

From there the team began the wide search for industry partners to develop the use of this innovative asphalt additive using waste toner powder. Metro Asphalt and Downer answered the call and the first road was laid in 2013.

Several years later, post-consumer recycled soft plastics were added via an advanced manufacturing process designed and installed by the team at Close the Loop, and TonerPlas was released.

Steve Morriss, Founder of Close the Loop, says ever since the inception of TonerPave

back in 2013, the team have been working on iterations of the technology, trialling different things along the way to improve performance characteristics.

"For us, TonerPlas is about more than using a waste material in roads, it's about using that material to enhance the performance of the asset. Building viable end markets is the key to recycling because you aren't recycling until someone purchases that recycled product," he says.

As an asphalt additive, TonerPlas is designed to melt and disperse into the bituminous binder and the asphalt mix, which helps to reduce cold temperature cracking, increase rut resistance and lengthen asphalt life.

"That road was laid back in 2018 with much support from the council and today the road still looks pristine. Jim Appleby, General Manager of Reconomy at Downer inspected the road recently and saw no faults," Morriss says.

A Victorian Government and Metropolitan Waste and Resource Recovery Group case study found a trial, in which Downer used TonerPlas and a mixture of recycled glass and reclaimed asphalt, showed it improved road fatigue life by 65 per cent, meaning reduced cost of ownership over the lifetime of the asset.

"The performance characteristics enhanced by using TonerPlas include increased fatigue resistance and improved stiffness and rut resistance," Morriss says.

In 2020, the product was added to the Infrastructure Sustainability Council of Australia's iSupply directory for use Australia wide.



TonerPlas is made from waste toner powder and post-consumer recycled soft plastics.



TonerPlas has been added to the Infrastructure Sustainability Council of Australia's supply directory and is ready for use Australia-wide.

David Hitzler, Close the Loop Technical Manager, says his approach is always to work out how to transform a material and make it fit within a new application. This is what led to the creation of TonerPlas.

"I see mixed soft plastics and toner not for their messy and difficult to handle form, but for the benefits in improving the mechanical properties they can provide to the asphalt binder matrix," he says.

"TonerPlas really provides increased stiffness into the binder matrix which ultimately reflects on the properties of the asphalt. It improves stiffness at high surface temperatures most critically without affecting performance at the low temperature stiffness."

The polymers in TonerPlas also impart elasticity which works to directly improve fatigue life of the pavement.

In a supply partnership with REDcycle, Close the Loop use post-consumer soft plastics that are dropped into bins at Coles and Woolworths stores all over Australia to create TonerPlas.

Elizabeth Kasell, Director of RED Group which runs the REDcycle collection program, says TonerPlas is an important end market for REDcycle materials because it's a highly engineered additive that also improves the performance of a road.

"REDcycle only really wants to provide material to end manufacturers who are using it as a high-performance product, not just as a way to put plastic into anything," she says.

"The construction industry is a great end market because it has the capacity to use a significant volume of recycled material. It's also what I would consider as fit for purpose, meaning the REDcycle

materials don't require a huge amount of energy, resources or cleaning to be used in construction."

REDcycle works very closely with Close the Loop to ensure the success of their material at every point in the supply chain.

"I think TonerPlas points to a successful circular economy model that is actually working, its Australian based and it has so many positive outcomes beside just using a difficult to recycle waste stream," Kasell says.

To ensure the performance qualities of TonerPlas are consistently achieved, Close the Loop and its industry partners perform rigorous testing at each stage of the product's development and provide reports to end users like local councils that verify the origin, chain of custody, and end use of their waste materials.

"Our main focus in the laboratory, apart from stringent quality control, is to digest

the additive in bitumen and measure the modification of the properties. That is the key to binder testing to ensure you are modifying the binder in the correct way," Hitzler says.

"Performance testing is also critical and our partnership with Downer remains hugely important to prove the performance of TonerPlas in asphalt."

The market is now open and all asphalt companies can use TonerPlas. Asphalt manufacturers looking to introduce TonerPlas to their asphalt need to create their own unique mix designs.

Close the Loop has specific usage guidelines for asphalt manufacturers to ensure the quantities and methodologies being used lead to the best results. Usually, TonerPlas is introduced into the plant at the same stage as other additives and it is generally used as a dry mix additive.

In Victoria, Downer's Reconophalt asphalts containing TonerPlas have been issued conditional registration from the Department of Transport, a strong signal that this innovative material can be standardised and widely used.

"Looking ahead we plan to work with innovative people to use TonerPlas in council works and major road projects alike," Morris says.

"We want to manufacture TonerPlas in multiple geographies. The holy grail of recycling is to use the waste where it is generated and if we can get support from state and local government we want to set up manufacturing capability, provided we have certainty of the continued usage of the product in that area." ■



Downer laid the first iteration of TonerPlas, TonerPave on a road in 2013.