

Plastic Roadways

Paving roads with asphalt strengthened by waste plastic keeps plastic out of landfills



Plastic-paved roadway (Photo Courtesy of MacRebur)

The Impact

Although many single-use plastic bans are underway, an effective solution is needed to address waste plastic that is difficult to recycle. This waste is causing congestion in landfills and contributing to ocean pollution. Plastic roadways put waste plastic to good use in strengthening local infrastructure.

Description

Currently, in California, most roads are paved with asphalt, a substance that is obtained primarily from oil refining. A plastic-paved road adds plastic composites from recycled plastic waste into the binding mixture of the asphalt, decreasing the total asphalt needed and strengthening the road. Asphalt roads are both weaker and less flexible than plastic roads and have an average lifetime of about 18 years. On the other hand, plastic roads have an estimated lifespan of 50 years and therefore require less maintenance.

There are many ways to incorporate plastic into an asphalt road, and the technology is rapidly advancing. These roads must address environmental protection while being strong enough to hold up to the crushing loads of trucks and buses. One method being explored is to add plastic from recycled fishing net fibers by melting the nets into the hot asphalt. However, more research is needed to optimize the amount and type of fibers that are added to the mixtures, and to address the problem of fiber clumping, which can reduce the effectiveness of the fibers in improving the mixture's properties.

Where It's Been Implemented

As of February 2021, around 60,000 miles of plastic roadways had been paved in India on land sanctioned by the national government for use as plastic roads. Similar roads are beginning to spring up all around Europe, Africa and Asia.

MacRebur is a company from the U.K. that specializes in plastic-paved roadways. The company has constructed these roads all over the U.K., Spain, Croatia, Malaysia, Estonia and Switzerland and, in 2018, helped a team at the University of California at San Diego install the first road utilizing recycled plastic in the U.S. Additionally, MacRebur has a supplier in Southern California that is trying to break into the California market.

In 2020, the California Department of Transportation (Caltrans) attempted to pave a stretch of State Highway 162 between Feather River and Christian Avenue in Oroville with recycled plastic as a pilot project. Although the project encountered a few complications, Tom Pyle, Chief of the Office of Asphalt Pavement, and his team successfully completed the project, which covers a 1,000 foot stretch of Highway 162.

Key Drivers

Using polymer-enhanced binders for road pavement can make roadways more resilient than regularly paved roads. Plastic-paved roads contract less in colder weather and maintain more of their strength during extreme heat than traditional asphalt roads. They contribute to solving worldwide plastic pollution while reinforcing existing infrastructure using an eco-friendly solution.

Plastic Oceans estimates that humans produce 380 million tons of plastic annually, with a significant portion entering our oceans. Plastic roadways reuse lots of plastic otherwise destined for landfills and can repurpose plastic in existing landfills. The Caltrans pilot project on State Highway 162 recycled 150,000 plastic bottles for each one-mile segment, and MacRebur's patented polymer binder uses up to the equivalent weight of 740,541 single-use plastic bags in each kilometer of road paved.

Key Factors for Success

Financial support for paving roads with recycled plastic is critical. Since the technology is in an early phase, measures are needed to make construction as cost-effective as possible. It is also important that education concerning recycling plastics and roadways is provided to ensure plastic roads are seen as an effective solution to the existing plastic problem and not as an excuse to increase plastic usage.

Key Obstacles

Just as in traditional road paving, toxic material that can harm road workers may be released from the melting of polymers during construction of plastic roadways. Measures must be taken to ensure safe work conditions. Plastic roads also must be studied over the long term to make sure that microplastics don't leak out of the roads. Resistance to the initial costs of paving these roads must be met with education on the necessity and benefits of plastic roadways.

Resources

- Cathrina Barros, Supervising Transportation Engineer for Caltrans, cathrina.barros@dot.ca.gov
- California Department of Transportation (Caltrans). ["Caltrans Repaves Roadway with Recycled Plastic Bottles"](#)
- Caltrans. ["Use of Recycled Plastic in Asphalt and Concrete Pavement Applications"](#)
- Journal of Engineering Science and Technology, May 2012. ["Use of Waste Plastic in Construction of Bituminous Road"](#)

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