

Crumb Rubber Use Really Rolling

Caltrans Repurposed More Scrap Tires From Landfills into Paving Projects

Caltrans photo by Sri Balasubramanian

Increasingly, used tires that used to clog landfills, or, worse, be dumped along roadsides are being ground into particles and used by Caltrans as asphalt blending material. This crumb rubber modifier, CRM for short, made up 41 percent of the total asphalt paving material used in 2015.

For Caltrans, the rubber really did meet the road in 2015. The department exceeded a legislative goal to use more asphalt containing crumb rubber in its road paving projects last year after falling short in the previous two years, and in the process diverted more than 4.6 million waste tires from landfills and tire stockpiles in calendar year 2015.

California law ([Public Resource Code section 42703\(a\)\(3\)](#)) requires Caltrans to incorporate a set amount of crumb rubber modifier (CRM) into its asphalt paving projects. The legislation is part of a larger effort to recycle more of the 40 million-plus used tires generated each year in the state, most of which end up as waste in landfills.

In 2015, Caltrans used 4,175,289 metric tons of asphalt paving material, of which 1,722,802 metric tons contained CRM — 41.3 percent of the total amount used, according to the 2015 Crumb Rubber Report prepared by Caltrans. The law specifies that Caltrans must use at least 11.58 pounds of CRM per metric ton of hot-mix asphalt, which would require about 35 percent of its total asphalt pavement material contain CRM.

When the report is approved by the California State Transportation Agency (CalSTA), CalSTA will submit it to Legislature.

The 41.3 percent CRM usage mark is the highest in recent history for Caltrans, and equates to 14.56 pounds of CRM per metric ton, or a total of 60.8 million pounds of pulverized tire rubber used in 2015. The 41.3 percent CRM mix represents a big jump from 2014, when the ratio was 26.7 percent, and 22.9 percent in 2013.

After those years' results fell short of the 35 percent CRM goal, Caltrans in early 2015 required the use of rubberized hot mix asphalt (RHMA) for the surface layer of all asphalt paving projects statewide.

Not only is Caltrans' CRM use removing millions of unsightly and potentially toxic tires from the public exposure — every mile of RHMA asphalt diverts an estimated 150 tires from landfills — this kind of material also helps extend highway durability. The crumb rubber mixed with the asphalt adds elasticity to the pavement surface, helping resist cracking from temperature changes and propagating cracks from bottom layers.

There are limitations to the use of RHMA. Because of its flexibility and cost, the mix is only viable when placed as the top 2 to 3 inches of pavement overlay on the surface. It is not viable as material in the bottom layers. It also does not perform as well when placed at temperatures of 45 degrees or lower since the crumb rubber in RHMA hardens in those conditions and is difficult to work with, or in elevations of 3,000 feet or higher, where chain wear and truck traffic adversely affect the material's performance.

RHMA also is a more expensive material than conventional asphalt. Costs range from 3 percent to 33 percent higher, depending on the type of project. It is generally not utilized for smaller pavement projects requiring 1,000 metric tons or less of material because of the cost of setting up a crumb rubber blending facility for the project.

But the higher cost is offset when RHMA is used to resist cracks from being reflected from the bottom layers because the thickness of RHMA required to mitigate reflective cracking is about half the thickness of conventional asphalt.

To better track the department's commitment to

crumb rubber-fortified highways in the future, Caltrans is requiring:

- A review of all pavement projects that incorporate crumb rubber for the next three years to predict CRM usage in the future.
- A tally of the amount of CRM used for each asphalt paving project, to ensure the department continues meeting its requirement of crumb rubber in its asphalt pavement projects.
- Pavement condition surveys over the next three years to compare the lifespan and duration of conventional asphalt with RHMA overlays.
- Update of the Highway Design Manual, to allow the use of conventional asphalt for the surface layer by exception only, and make RHMA the de-facto material for road surface.
- Exploring the opportunity to incorporate a small amount of CRM into asphalt binders used in asphalt paving materials. MM

Source: 2015 Crumb Rubber Report; Srikanth N. Balasubramanian, Chief, Caltrans Office of Asphalt Pavements



Top left: In the waste tire conversion process, old tires are sent through through an initial shredding machine where the rubber is split into big chunks. Bottom left: Multiple shredding machines work in tandem to reduce the rubber into smaller and smaller pieces. Right: The finely shredded product, now in particle form, is ready to be shipped in super sacks, background. Caltrans diverted about 4.6 million tires from landfills in 2015.