



TNRCC INFORMATION

Waste Tire Recycling Program, Office of Permitting
September 1999

SUBJECT: The Many Uses of Crumb Rubber

According to the Scrap Tire Management Council (STMC), 250 million scrap tires are generated annually in the United States and the use of crumb rubber from scrap tires to make various products has increased from 4.5 million tires in 1994, to 6 million in 1995, and to 8 million tires in 1996. The crumb rubber market is projected to increase 10 - 15% annually; however, there is a need for the creation of new uses for crumb rubber.

Crumb rubber is defined as rubber that has been reduced to a particle size of 3/8-inch or less. Mesh, or sieve size, is commonly used to describe or measure the size of crumb rubber. Crumb rubber is sized by the mesh screen or sieve through which it passes in the production process. A 30 mesh means there are 30 holes, or openings, per linear inch of screen. Depending on the size of the crumb produced and under what conditions, 99% or more of the steel and fabric can be removed. Ten to twelve pounds of crumb rubber can be derived from one scrap passenger tire. The typical process to make crumb involves three stages. First, the scrap tire is reduced to 2 1/2-inch to 4-inch size shreds by a slow speed "shear" shredder or shredders. Second, the shreds go through two or three successively narrower blade shredders to further reduce the shreds to 3/8-inch or less. Finally, the particles are processed to even smaller mesh sizes by using cracking or grinding rolling mills. Screens and gravity separators are used to remove metal, and aspiration equipment is used to remove fibers.

There are methods for producing crumb rubber from whole tires: 1) Cryogenic systems use sub-zero temperatures to freeze the tire shreds and then shatter them in a hammer mill to make it easy to separate the rubber from the steel and fabric; and 2) Ambient systems operate at room temperature and literally tear the tire material apart. Steel and fabric are then removed. The number of passes through the mill in both systems determines the mesh size range of the product. Most users of crumb rubber demand complete removal of steel, non-ferrous metals, sand and other unwanted materials.

Crumb Rubber Used in Asphalt	The STMC estimates that in 1995, an estimated 240 million pounds of crumb rubber were sold annually; 44% of which went into crumb rubber-modified asphalt (CRM). CRM is a general term used to identify a group of technologies which incorporates scrap tire rubber into asphalt paving materials. The Texas Department of Transportation is the largest builder of roads in the U.S. and has paved more than 2500 miles of roadway and airstrips with rubber modified asphalt. For more details, see the WTRP Fact Sheet entitled "Tires In The Road."
Molded and Extruded Products	Crumb rubber can be added to other polymers (rubber or plastic) to extend or modify the properties of polymeric materials. Bound rubber products use crumb rubber formed into a set shape, usually held together by an adhesive material (urethane or epoxy). Surface modified rubber uses technology known as surface modification to modify the outer few molecular layers of rubber particles of scrap tires, enabling them to bond with materials like polyurethane, latex, and other polymers. For examples of products made from crumb rubber, see the WTRP Fact Sheet entitled "Molded and Extruded Products That Can Be

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Crumb Rubber Used in and Athletic Facilities Amendment	Crumb rubber is used on running and jogging tracks, athletic fields and golf courses because crumb provides resiliency and durability. Crumb rubber is used either in the supporting structure for the playing field (soil sub-base) or mixed with the material that comprises the running track surface. This makes the playground or track more resilient, enhances drainage capability and provides a softer playing surface for children and athletes which creates fewer ground-related injuries. Compared to traditional materials used as surfaces of playgrounds, scrap tire chips are economical, clean, non-toxic, do not float and are easy to maintain. Crumb rubber retards weed growth, does not decay or attract insects, animals or rodents, and has roughly twice the cushioning effect of other materials. Research has demonstrated that the addition of rubber particles at the correct volume and depth dramatically reduces soil compaction. The result is better quality turf which is less susceptible to disease and requires up to 30 percent less water, fertilizer and pesticides. This treatment apparently is effective for between 25 - 50 years, offering a long-term solution to heavily used areas that would normally require decompaction more frequently. Crumb rubber can also serve as a top dressing application which consists of sprinkling crumb over grass in a 3/4-inch layer, protecting established grass and new growth. This method is less disruptive and easier than tilling crumb rubber into the soil. A related use for crumb rubber is mixing it with sand or soil in horse arenas, race tracks and other equestrian surfaces. This makes the surfaces looser and softer, thereby reducing concussions to riders and muscle strain and fatigue for horses.
Crumb Rubber Used in Compost	Wood chips can be replaced with rubber bits in the composting of municipal sewage sludge. The crumb can be reused again and again, while wood chips used in the same applications deteriorate and must be replaced more often. One part rubber chips and two parts hardwood chips are mixed with one part biosolids and a small amount of yard trimmings to produce compost.
Crumb Rubber Used in Mulch	Using crumb rubber as mulch conserves moisture, suppresses weed growth, and reduces the amount of pesticides, water and fertilizers needed in landscaping and agricultural applications. It does not decompose and does not attract insects or rodents. For more details, see the WTRP Fact Sheet entitled “Using Tire Shreds as Mulch.”
ISTEA and Crumb Rubber	Section 1038 of the Intermodal Transportation Efficiency Act of 1991 (ISTEA) required states to use increasing amounts of CRM in federally-funded highway projects. Because of protests from the states, the National Highway System bill repealed subsection (d) of Section 1038 which was the state procurement requirement. States considered the product unproven and problematic. The bill retained sections allowing FHWA to grant funds to states for research and technology transfer regarding the use of CRM.