

Use of waste tyres in road construction

Prof. S. B. Patil ¹, Prof. A. A. Lole ², Prof. N. U. Bavane ³, Prof. S. S. Shinde⁴

Dept. of civil Engineering, Sanjay Ghodawat Group of Institutions, Maharashtra, India

Abstract - Now-a-days disposal of different wastes produced from different Industries is a great problem. These materials pose environmental pollution in the nearby locality because many of them are non-biodegradable. The modified bitumen and granulated or ground rubber or crumb rubber can be used as a portion of the fine stone aggregate. A mixture of hot bitumen and crumb rubber derived from post-consumer waste or scrap tyres. It is a material that can be used to seal cracks and joints, be applied as a chip seal coat and added to hot mineral aggregate to make a unique asphalt paving material.

Key Words: crumb rubber, chip seal coat.

1. INTRODUCTION

The American Society of Testing and Materials (ASTM D8) defines rubberised bitumen as "a blend of asphalt cement [bitumen], reclaimed tyre rubber and certain additives, in which the rubber component is at least 15% by weight of the total blend and has reacted in the hot asphalt cement [bitumen] sufficiently to cause swelling of the rubber particles," [AST05] This definition was developed in the late 1990's. Centre for Transportation Engineering of Bangalore University compare the properties of the modified bitumen with ordinary bitumen. It was observed that the penetration and ductility values of the modified bitumen decreased with the increase in proportion of the plastic additive, up to 12 percent by weight. Therefore the life of the pavement surfacing using the modified bitumen is also expected to increase substantially in comparison to the use of ordinary bitumen.

1.1 HISTORY

Rubberized Bitumen is being used in USA from 1960 Currently Arizona, Florida, Texas and California using 2 million tons of Rubberized Bitumen. Rubberized Bitumen is very popular in Australia for chip sealing wearing course sand structural layers. Use of Rubberized Bitumen being increase in developing countries of Latin America. In 1960s scrap tyres were processed and used as a secondary material in the pavement industry. One application was introduced by two Swedish companies which produced a surface asphalt mixture with the addition of a small quantity of ground rubber from discarded tyres as a substitute for a part of the mineral aggregate in the mixture, in order to obtain asphalt mixture with improved resistance to studded tyres as well as

to snow chains, via a process known as "dry process". In the same period Charles McDonalds, a materials engineer of the city of Phoenix in Arizona (USA), was the first to find that after thoroughly mixing crumbs of RTR with bitumen (CRM) and allowing it to react for a period of 45 min to an hour, this material captured beneficial engineering characteristics of both base ingredients. He called it Asphalt Rubber and the technology is well known as the "wet process".

By 1975, Crumb Rubber was successfully incorporated into asphalt mixtures and in 1988 a definition for rubberised bitumen was included in the American Society for Testing and Materials (ASTM) D8 and later specified in ASTM D6114- 97. In 1992 the patent of the McDonald's process expired and the material is now considered a part of the public domain. Furthermore, in 1991, the United States federal law named "Intermodal Surface Transportation Efficiency Act" (then rescinded), mandated its widespread use, the Asphalt-Rubber technology concept started to make a "quiet come back". Since then, considerable research has been done worldwide to validate and improve technologies related to rubberised asphalt pavements. Nowadays, these rubberised bitumen materials, obtained through the wet process, have spread worldwide as solutions for different quality problems (asphalt binders, pavements, stress absorbing lays and inlayers, roofing materials, etc.) with much different evidence of success demonstrated by roads built in the last 30 years.

2. PROCESS OF MAKING RUBBERISED BITUMEN

This terminology is related to the system of producing RTR-MB with the original wet process proposed by Charles McDonald in the 1960s. The McDonald blend is a Bitumen Rubber blend produced in a blending tank by blending Crumb Rubber and bitumen. This modified binder is then passed to a holding tank, provided with augers to ensure circulation, to allow the reaction of the blend for a sufficient period (generally 45–60 min). The reacted binder is then used for mix production.

Continuous Blending-reaction Systems: This system is similar to the McDonald process of blending, the difference is that CRM and bitumen are continuously blended during the mix production or prepared by hand and then stored in storage tanks for later use. Therefore, it consists of a unique unit with agitators, in which the reaction occurs during the blending.