

Rubberised roads for superior performance

The results of several full scale road experiments conducted in many parts of the world clearly indicate that use of rubberised bitumen in pavings will undoubtedly lead to saving and safety

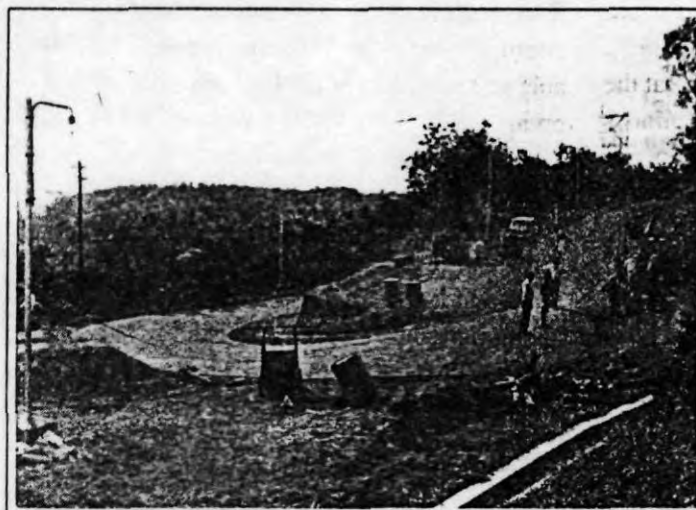
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There is a growing demand now for rubberised roads because of its durability, cost effectiveness and superior performance. The experiments have confirmed the benefits of rubberised roads. Some of the drawbacks of bituminous roads like high susceptibility to temperature variations, tendency to crack, etc. caused engineers and scientists to look for alternative methods of road construction which ultimately led to the use of rubber in road building.

In India, we have over 20 lakh kilometres of roads of which only about 48 per cent is surfaced. Of the surfaced pavements, the lion's share is accounted by bituminous roads. Considering the fact that bulk of the bitumen required for road construction in India is produced from the imported crude petroleum and also considering the paucity of good quality aggregates for road construction, there is absolutely no justification in building bituminous roads

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which lasts only for short duration, sometimes a year or even less in certain cases. It is in the above context that engineers are forced to heavily lean on the modification of bitumen using natural rubber and to use the improved quality binder for constructing roads, combining 'saving with safety'.



A rubberised road — superior performance

Basically rubberised bitumen comprises of a bituminous compound into which rubber in a suitable form and proportion is incorporated using an appropriate technique. Rubberised bitumen is then used in pavings using conventional road building techniques. Following the incorporation and uniform distribution of rubber,

bitumen undergoes radical changes in its properties to a large extent on the type and grade of rubber used, ratio of bitumen to rubber, and the method of incorporation of rubber into bitumen. It has been clearly established that for maximum effectiveness, the rubber must dissolve in the binder (bitumen). When properly incorporated, rubber increases the viscosity, strength and heat resistance of the system.

Popular belief

Prior to 1950s, the popular belief was that while adding rubber into bitumen, the rubber remained as discrete particles which absorbed some of the oily constituents from bitumen, thus making it harder, but also making it durable as the oily fraction was subse-

quently not lost so readily during atmospheric weathering. Laboratory studies conducted in early 1950s made it clear that when rubber is added to hot bitumen, it exists in the bitumen at first as a dispersion of fine particles. At this stage its contribution to the mechanical properties of bitumen is not much. On heating, the rubber

particles swell and finally disperse to give a tough rubbery material. In this condition, the rubber is able to change the mechanical properties of bitumen considerably. Being an unsaturated hydrocarbon, rubber gets degraded on prolonged heating at high temperatures and then its effectiveness is greatly reduced.

Advantages

Laboratory studies conducted have established that the main effect of incorporation of rubber into bitumen are on the viscosity, strength and elasticity of the latter. Even small quantities of rubber markedly change the above properties: Viscosity is increased considerably, susceptibility to temperature is reduced drastically and strength is improved immensely.

When the rubberised bitumen is used in constructing pavements, the following advantages are expected to realise: Improved resistance to cracking, better resistance to fatting up, improved resistance to deformation or flow, higher stability and more resistance to stripping.

These advantages indicate that the performance of rubberised bituminous pavements can be definitely superior to conventional bituminous roads. However, actual full scale trials are the only way to ascertain the cost benefit aspects of the rubberised roads.

The results of several full scale road experiments conducted in many parts of the world clearly indicate that proper incorporation of adequate quantity of natural rubber in appropriate form into bitumen and use of such rubberised bitumen in pavings will undoubtedly lead to 'saving and safety'.

Additional cost

Estimates prepared by the Natural Rubber Producers Research Association in 1971 show that 12 per cent to 15 per cent additional cost will have to be incurred for seal coats using 2 per cent rubber and 16 per

cent additional cost for rolled asphalt at 4 per cent rubber. Experiments conducted by the Rubber Research Institute of India show that additional cost involved for the normal type of road surfacing usually adopted in Kerala would be about 16 per cent with 2 per cent rubber. Thirteen kilometres of road on the way to Sabarimalai (a pilgrim centre) has been recently rubberised (with the active involvement of the public in that area) incorporating 2 per cent rubber on the weight of bitumen and the additional cost incurred was about 17 per cent. The additional cost of rubberisation which comes in the range of say 15 to 20 per cent will be more than compensated by the advantage accruing by the use of natural rubber.

Results of laboratory experiments as well as full scale road trials have clearly established the superiority of natural rubber modified bitumen in pavings compared to ordinary bitumen. Natural rubber is produced in adequate quantity in India and available at reasonable price. In a developing country like India, optimum utilisation of resources available in the country deserves prime consideration. As such the authorities concerned with road construction at the State and national levels may take appropriate measures for the extensive rubberisation of roads. To begin with, it is suggested that one kilometre road may be rubberised in every municipality and 5 kilometres in every corporation. State PWDs may undertake rubberisation of 100 kilometres stretch road in every State and the National Highways Department 200 kilometres. The results from such trials will be enough to undoubtedly convince the decision making machinery about the long term advantages of rubberised roads and to go in for rubberisation of roads in a big way. □

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