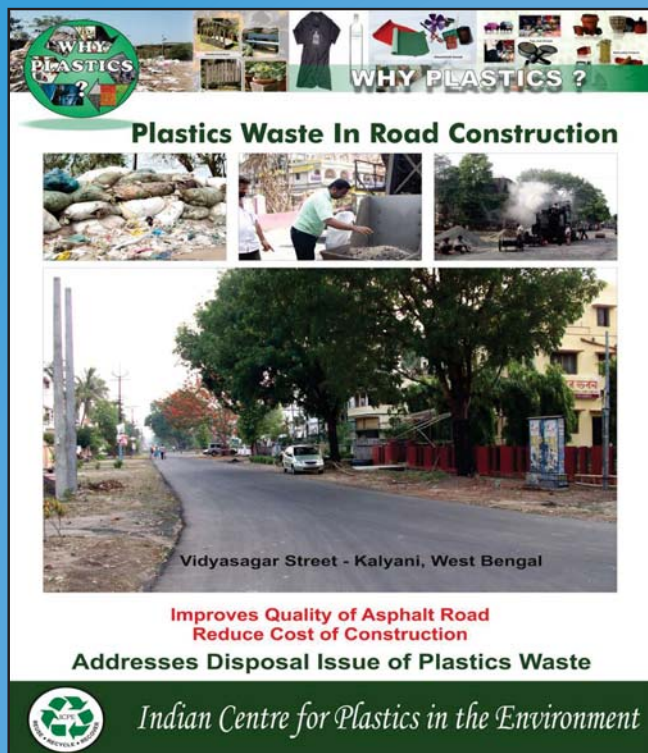


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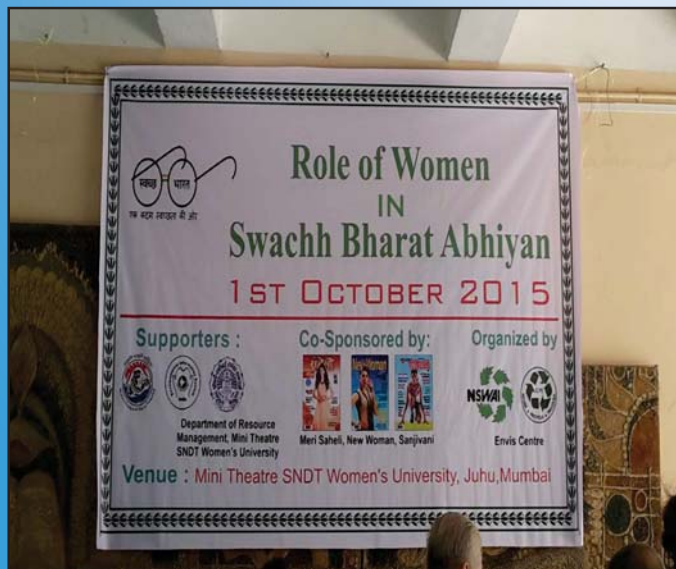
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USE OF PLASTICS WASTE
IS A DEFAULT MODE IN
CONSTRUCTION OF
ASPHALT ROAD IN INDIA NOW



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ROLE OF WOMEN IN SWACHH
BHARAT ABHIYAN
SEMINAR AT
SNDT WOMEN'S UNIVERSITY,
JUHU, MUMBAI



Use of Plastic Wastes in the Construction of Bituminised Road

India Makes it Mandatory: Aims for Quality Roads and Cleaner Environment

Road engineers have been experimenting with use of certain synthetic polymers to improve the binding property of asphalt roads. Polymer blended bitumen shows higher softening point, lower penetration value, and better ductility. Polymer coated aggregates blended with bitumen gives higher Marshall Stability value – a key property in asphalt road. All these aspects improve the performance criteria of asphalt road. However, the high cost of virgin synthetic polymers limited their use only in higher cost application area.

It was while looking for a cheaper and viable alternative to virgin synthetic polymers that Indian scientists stumbled across plastic waste as an effective substance. Simultaneously, it was also proved to be a scientific and environment-friendly method of disposal of low-end plastics waste, especially the thrown away carry bags and some varieties of one-time used flexible plastics packaging waste materials. Though plastics waste are recyclable and are collected for appropriate recycling process for conversion into various products of non-critical and secondary applications, these low-end plastics waste are generally abandoned by the waste pickers due to difficulty in cleaning and segregation. Collection process of these light weight plastics waste become an unviable proposition. On the other hand, these low-end plastics waste can be used for road construction without elaborate cleaning and segregation. By simple conventional techniques, these are shredded into small sizes and are mixed with hot bitumen and / or hot aggregate.

In the batch process, the aggregates are heated to a range of 170 – 180 degree Celsius in a hot mix plant and the shredded plastics waste is added to it. The plastics become softened and get coated over the aggregate. The hot bitumen mixed or without mixed with plastics waste is then added to the plastic coated aggregates and mixed well. This mixer in hot condition is then transferred on to the road for laying. In the continuous plant, the shredded plastics waste is spread over the aggregate with the help of automatic dosing machine. The aggregate with shredded plastic enters the hot rotor, where the plastics get molten and is deposited on the surface of the aggregate in the first half of the rotor. Molten bitumen is then sprayed on the plastics coated aggregates, which is still under rotation inside the rotor. Such mix is then taken out and used for laying the road. In another technology, waste plastics are mixed only with hot and molten bitumen and this molten bitumen-plastics waste blend is then mixed with the aggregates and laid on the road.

Experiments have proved that use of waste plastics increases the life of roads and at the same time the cost of construction of such roads also comes down due to the fact that cost of plastics waste after proper shredding is less than that of bitumen. 10 to 15% replacement of bitumen by plastics waste is possible, beyond which the Marshall Stability values decrease and hence is not recommended. Even 10% replacement of bitumen by plastics waste reduces the overall cost substantially.

For 1 KM long road of 14 feet width, 2 MTs of bitumen can be replaced with equal quantity of plastics waste and the cost saving is approximately Rs 40, 000/. Life of the road also is extended. Lesser use of bitumen also implies that CO2 emission during its heating process is reduced to that extent. India is considered a pioneer in using plastics waste for the construction of asphalt roads. Central Road Research Institute (CRRI), Delhi – a CSRI Institute under Government of India, had developed the Wet Process and had obtained a Patent on the Technology. A private sector entrepreneur of Bangalore, with the arrangement with CRRI, Delhi, worked for popularizing the concept in Karnataka State and elsewhere. Almost simultaneously, Thiagarajar College of Engineering, Madurai had developed the Dry Process and the Institution too obtained a Patent on the process. All these happened in the early 2000. Hundreds of miles of roads have been constructed in the States of Tamil Nadu using the technology developed by Thiagarajar College of Madurai.

Initially ICPE encouraged the development and popularization of concept of using plastics waste for construction of asphalt roads by using both Wet and Dry process developed by in the country. ICPE and CRRI had jointly constructed a trial road in the Bawana area in Delhi. ICPE also had conducted trial using the other process. Dry Process being capable of utilizing more quantity of plastics waste, ICPE focused its interest in popularizing the technology. However due to the Patent Rights holding by the original developer, ICPE researched to innovate another Technology for utilizing the plastics waste for the construction of Asphalt Roads, so that there is no hindrance in using the process without any obligation of paying any royalty / fee to anyone. This process was first applied in constructing asphalt road at Mumbai. ICPE had worked with the Road Engineering Department of Municipal Corporation of Greater Mumbai – MCGM and applied this technology in constructing a very busy road near Dadar Railway Station – Prof. V. S. Agashe Road, in the early 2008. The condition of the road remained good even after five rainy seasons.

Construction of Asphalt Road with Plastics Waste Near Dadar Railway Station, Mumbai



Shredded plastics being prepared



Shredded plastics being added from dosing device over the Aggregates on conveyer belt



Aggregates with plastics waste enter the hot rotor



Use of Plastic Wastes in the Construction of Bituminised Road

India Makes it Mandatory: Aims for Quality Roads and Cleaner Environment

Continued....



Plastic Coated Aggregates blended with bitumen being loaded on the transporting vehicle



Road being Constructed



Prof. V.S. Agashe Road after construction: April 2008



Road after 6 months



**Roads after one season :
June 2009**



**Road after two rainy seasons:
July 2010**

Construction of Asphalt Road with Plastics Waste at Kalyani near Kolkata

After the construction of road in Mumbai, ICPE in collaboration with Indian Plastic Federation (IPF), Kolkata had taken up the projects to construct such roads in three locations near Kolkata in 2009 and 2010. ICPE provided the technology for constructing about 1.25 KM stretch Bidyasagar Street in the busy Kalyani city area, near Kolkata in 2009. In the following year two more roads were constructed in Chandan Nagar and Ashokgar Municipality area of the adjoining districts. Quality of the roads remains good even after five years.



Discussion with Engineer and Contractors of Kalyani Civic Body



Plastic Waste



**Shredded plastic waste being mixed with aggregates:
Batch Process**



Mixing With Bitumen



Batch Mixing Plant



**Bidyasagar Street made with
Plastics waste in 2009**

No damage in road condition after 3 years



Construction of Asphalt Road with Plastics Waste at Chandan Nagar and Ashok Nagar near Kolkata

Construction of road at Kalyani Municipality in April 2009 and its good performance report encouraged other Municipality authorities to take decision to replicate the same in their areas too. People of Ashok Nagar, having 100% literacy rate (it has 100 primary schools) and Chandan Nagar Municipality – a former French Colony, basically do not indulge in littering in general. IPF team's persuasion helped the civic authorities to take decision of disposing of the plastics waste in a scientific way by using those for constructing road. ICPE had provided all technical assistance before and during the road construction. The great enthusiasm showed by the Heads of the Civic Authorities and the conviction of the Executive Engineers of both the Municipalities helped in undertaking the trial constructions.

At Ashok Nagar Kalyangarh Municipality, total length of about 1 KM was selected by the Municipality authority for the trial construction of asphalt road with plastics waste. Municipality Chairperson, Mayor, Mayor-in Council, Chief Engineer, Leader of the opposition party – all attended and witnessed the trial. The Municipality Chairperson informed that after observing the performance of the road in the coming monsoon, all roads of the municipality would be constructed using waste plastics in future. They also informed that they were encouraged by the good performance of the road constructed at Kalyani municipality in the previous year. Formulation was similar to the one conducted at Chandan Nagar. Seal coat was used on the top layer.

It is hoped that the awareness programmes would help spread the message to other areas as well facilitating disposal of waste plastics in an environment friendly manner and at the same time enhancing the life of the Asphalt Roads at a lower cost.



Road workers are mixing plastics waste with aggregates



Blend is discharged at right temperature condition



Chairperson of Municipality carries the blend for laying



Completed road with seal coat. Ashok Nagar - Kalyangarh Municipality takes initiatives in this road construction using waste plastics for environment protection



More and more civic authorities in India took initiatives to utilise the technology for triple benefits – improvement of quality and life of the road, reduction of cost and scientific disposal of low-end plastics waste. Indirect benefit includes engagement of the waste pickers for earning livelihood. Industry Major – Reliance Industries Ltd has taken keen interest in the technology and has arranged to construct such roads within its own complexes in Hajira and Vadodara. Many other organizations and Institutes like CIPET, Shriram Institute for Industrial Research (SIIR) also used this technology. Road Department of Gujarat Government has approved construction of trial roads in Vadodara and Surat. Plastics that normally do not get recycled due to economic and other reasons would no longer go to the landfills. In this scientific method, plastics waste mainly flexible packaging waste, which remains uncollected by the waste pickers due to low demand by the recyclers due to difficulty in conventional recycling process, can be disposed of in an environment friendly manner and the same time improving the quality of the bitumen roads. All these efforts in popularizing use of plastics waste for road construction by CRRI, Delhi, Thiagarajar College of Engineering, Madurai and M/s K.K. Polyflex, Bangalore, ICPE and some other Institutions ultimately resulted in Government of India's taking decision for use of waste plastics for the construction of bituminized roads mandatory. This would pave the way for collection of abandoned plastics waste for road construction activity. This is considered as a BOLD STEPS BY GOVERNMENT OF INDIA.

No. RW-NH- 33044/24/2015-S&R (R)

Excerpts from the Circular dated 9th November, 2015 issued by the Ministry of Road Transport & Highways, Government of India:

QUOTE

The Ministry has decided to encourage use of plastic waste in the hot mix bituminous wearing coat. Accordingly it is decided that:

- Bituminous mix with waste plastic shall be the default mode for periodic renewal with hot mixes within 50 kms periphery of urban area having population more than 5 lakhs. Any relaxation on ground of non-availability of waste plastic, cost etc. shall involve approval of the Ministry.
- All the agencies responsible for preparation of project reports / estimates for the National Highways and Centrally sponsored works are expected to analyse and clearly bring out reasons of inclusion or otherwise of provision of use of waste plastic in wearing coats in the proposal.

UNQUOTE

