

Cold Mix: A Sustainable Technology Innovation for Road Construction Labourers of Northeast, India

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Abstract

This paper begins with explaining the need for sustainable technology innovation as need of the hour. Further, the paper proceeds to evaluate need of sustainable technology innovation in road construction segment, thereby highlighting adoption of “Green Roads” as a step towards adopting sustainable development. The paper examines specific case of “cold mix technology” as a viable option for road construction in a geographically uncertain and politically unstable North-east region of India in place of traditional road construction technologies which use hazardous heating processes. “Cold mixing” is a simple process of mixing unheated mineral aggregates with suitable grade of cationic bitumen emulsion having suitable workability during mixing at plant or site and the roads that result are called “Green Roads.”¹

“For each mile of traditionally constructed roads, thousands of tons of materials such as aggregate rock, concrete, asphalt, steel are needed, let alone off the diesel fuel required to power the construction equipment. One mile of 2 lane asphalt road with aggregate base can require upto 25,000 tons of aggregate rock (aggregates are the most mined resource in the world and are entirely almost non-renewable). In terms of green house emissions between the pavement and sub-base-all the mining, transporting, heating earthwork and paving work- the average single-lane-mile of freeway will emit enough pollution to equal upto 1200

¹. Green technology optimizes the use of non-traditional materials and methods for road building and reduces the use of natural resources. It stands for reducing the environmental impact of traffic and infrastructure on the sustainable society. By means of design, construction and use of materials, road-engineering sectors can contribute to environmentally friendly (green) infrastructure. With the objective to go green, cold mix technology is coming out as an environment - friendly technology in construction of roads.

tons of CO₂”, states Omri Dahan and Alex Goykhman which evidences that traditional road construction technologies will not be a preferred choice in long-run.

In wake of such a situation, the paper highlights how “cold mix technology” is a sustainable technology innovation especially, for native construction labourers of North-East in general and Assam in particular. The excerpt of interview with road construction site Incharge from Assam further reinforces the fact that cold mix as a sustainable technology innovation for the region.

Keywords: Sustainable Technology, Cold Mix, Road Construction Labourers, Northeast.

1. Introduction: Need for Sustainable Road Technology Innovation in Northeast

The connectivity of Northeastern states with main land India as well as the rural-urban connectivity within Northeast is inadequate. There are various reasons for poor infrastructure development in this region. These are related to technologies, labour, political will, climate, environment and availability of funds. Therefore, there is a need to review the present practices, the problems faced by use of traditional road construction technologies and way forward for sustainable technologies like cold mix technology in development of the region to alleviate socio-economical, political and health status of construction workers in North eastern States.

Presently, the traditional hot mix technologies involving use of hot aggregate (160°C) and melted bitumen (175°C) are used in construction and maintenance of the roads in Northeast. Such constructions, though relatively cheaper are hazardous for the environment and especially, for the labourers working on road construction sites. The transnational migrant labourers from Bangladesh, Myanmar, Nepal and Burma, have become threat to employment opportunities of native construction labourers. The reason for same is that transnational migrants are more skilled to take construction work, wherein traditional methods of road construction are used requiring heating processes.² Since, native population of northeast is reluctant to undertake construction work done in traditional manner, they are rendered unemployed, thereby invoking need for a sustainable technology innovation.

2. Problems of Labourers Associated with Asphalt Road Construction Technologies

According to the statistics of Ministry of Petroleum and Natural Gas, India published elsewhere 4.61 million tonne of bitumen was produced during 2011-12. It is estimated

² Asphalt cement more commonly referred by Engineers as bitumen in India, is a black, cement, which is solid or viscous liquid produced by the fractional distillation of crude oil during petroleum refining.

that out of 52 lakh tonne bitumen demand during 2012-2013 and 2014 in India, 47 lakh tonne is used for road construction activities. Approximately, 4 lakh tonne is consumed in spray applications like tack coat and prime coat. Therefore, 42–43 lakh tonne bitumen is used for making bituminous premix (approximately 850 lakh tonnes). The production and placement of 850 lakh tonne bituminous premix mix requires input of huge man days of asphalt construction workers. The production and laying of 1000 tonne premix for construction of one km four lane road requires about 20-25 laborers.

When bitumen is heated, vapours are released; as these vapours cool, they condense. As such, these vapours are enriched in the harmful volatile compounds present in the bitumen, those are expected to be chemically and toxicologically distinct from the parent material. Bitumen fumes are the cloud of small particles created by condensation from the gaseous state after volatilization of bitumen. However, because the components in the vapour do not condense at once, workers are exposed not only to bitumen fumes but also to vapours at hot mix construction sites.

Symptoms of eye, nose, or throat irritation are reported by workers during paving. Generally, when bitumen is heated in bulk or mixed with hot aggregate, fumes are emitted. The fumes contain H₂S, and hydrocarbon vapors. The United Kingdom occupational exposures standards are 5 mg/ m³ for 8 h and 10 mg/m³ for 10 minutes. In case of H₂S, standard is 14 mg/m³ for 8h and 21 mg/m³ for 10 minutes. Bitumen fumes contain Polycyclic Aromatic Compounds (PAC). Also, there is a possibility of long-term health effects following chronic exposure by inhalation or skin contamination in bituminous road paving workers and highway maintenance workers. Author did studies at various sites of hot mix construction. In these sites, construction workers were found to suffering from burns, TB, jaundice problems frequently, as reported during the interview.

3. Cold Mix: A Sustainable Road Construction Technology for Northeast

Assam and other North Eastern States have long spells of monsoons and distributed job packages in interiors. Along with national highways and expressways, providing connectivity to the rural population becomes national priority in last decade through flagship programme Pradhan Mantri Gram Sadak Yojna (PMGSY). Then more works were the need of the people and execution has become a challenge leading to escalation, slow progress and disbanding of packages by contractors due to its financial impact on them and availability of labour. The conventional site hot mix construction process is found to be time consuming, slow in progress, hazard to workers, highly polluting and requiring more investment in plant and machinery than cold mix construction. This reality became a readily available gap for pilot scale of cold mix technology in Assam.

Cold Mix technology (Photos 1-2) can be done at site level with simple concrete mixers or modification of hot mix plants and the non-hazardous nature of work instantly attracts village youth to take up the construction activities rather than leaving it to migrant workers from Nepal and Bangladesh and can easily convert existing hot-

mix plants without the need of any heating in producing mix from same HMP and laying can be done through existing pavers. In India, the Indian Road Congress (IRC) in assistance with Central Road Research Institute's (CRRI) rich research expertise has released the latest codes (IRC:SP:100:2014) for large scale adoption of cold mix technology in the country.



Photo. 1



Photo. 2

Construction Work Using Cold Mix Road Construction Technology

4. Concluding Remarks

To conclude, it would be interesting to share experiences of Rantu Das, road construction Site Incharge in one of the villages of Assam called Gaureswar in Bagesar District. He switched over to Cold Mix 4-5 years back when villagers raised objection to pollutants emitted from construction of roads through hot mix technology. He has no plans to switch over to hot mix technology again now as he gets good feedback from both labourers and villagers about the new technology.

According to Rantu, whereas in other sites, women are engaged just for cleaning/brushing the roads, under his sites, women labourers are involved in mixing bitumen also apart from carrying water, cleaning, carrying bitumen, etc. Out of 40 labourers working on cold mix sites, 20 are women who are happily engaged in cold mix construction. These women labourers are paid Rs. 100-120 per day almost equivalent to men, thus, providing them sustainable livelihood options.

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