

An ambitious project taken up by Kerala PWD (National Highways)- Cold in Place Recycling of bituminous pavement

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Introduction

We were talking much about for a long regarding adopting modern technologies in road construction viz: using waste plastic, application of geosynthetics, coir geotextiles, pavement recycling etc. But, now the time has come to begin a new project which is going to change the face of Kerala PWD among all State PWD's in the country. For the first time in the history of State PWD's in the country, we are taking up a project using Cold in Place recycling of bituminous pavement, an environment friendly green technology for road construction. The Kerala PWD National Highways took up the project for implementation in National Highway-66 between Pathirappally and Purakkad in Alappuzha district.

The technology and its selection

Cold in Place Recycling (CIR) is a rehabilitation technique of pavement in which the existing pavement materials are reused in-place. The materials are mixed in-place at ambient temperature without heating. The Reclaimed Asphalt Pavement (RAP) material is obtained by milling, planning or crushing the existing pavement. RAP material alongwith fresh aggregate are mixed, laid and then compacted. The use cold in place recycling can restore old pavement to the desired profile, eliminate ruts, restore the crown and cross slope and eliminate potholes, unevenness and rough areas.

IRC 120-2015 recommends mainly four types of recycling:

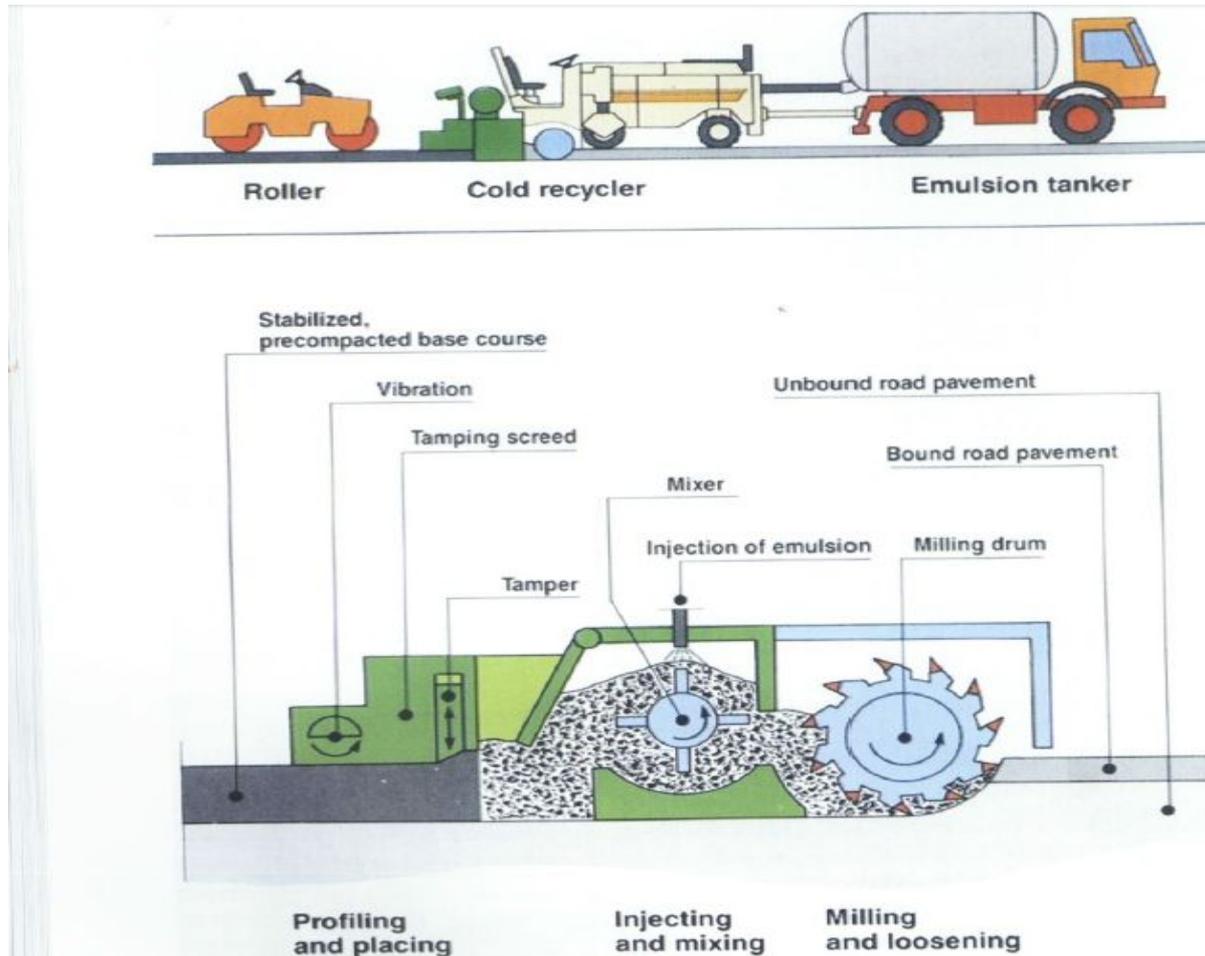
- i) Hot in Place
- ii) Hot in Plant
- iii) Cold in Place
- iv) Cold in Plant

Appropriate methodology for recycling shall be selected based on the serviceability of pavement, extent of defects, the structural requirement, the depth of cutting, etc. In hot in place and cold in place technology 100% RAP can be utilised. Hence while selecting the appropriate technology, handling of rap both at site and at plant also need to be considered. In this instance, the existing pavement condition in the selected stretch warrant for almost a full depth reclamation as the damages extend upto the subbase at many locations. Investigations further reveal that the existing bituminous thickness along the stretch is having thickness more than 200mm. Hence full depth reclamation will be ideal as it can prevent reflection cracking. It was further decided to mill the pavement for a thickness of 160mm and relay using cold process. A wearing course of 50mm BC is suggested over recycled layer.

Cold in Place recycling involves reuse of existing pavement materials without application of heat. The recycling agent in cold recycling can be emulsion, foam bitumen, rejuvenator and cementitious materials either alone or combination. In this case, we are using foam bitumen in the cold milling equipment. Almost 15% fresh aggregate will be added alongwith cement. The exact mix proportions have to be designed by job mix formula after conducting tests on the RAP. The guidelines are available in IRC 120-2015.

Equipments

The equipment consists of preheated bitumen tanker, aggregate cement spreader, milling drum, mixing unit, paving and tamping tool and the rollers moving like train as shown in the schematic diagram. The process of cutting laying will be done in single go. The mixing and proportioning will be microprocessor controlled. The milling machines now available have most modern and highly sophisticated components that will give mix of uniform quality and consistency. In this project, machine supplied by Wirtgen Group WR 240 is proposed.



Schematic diagram of cold in place milling process

The equipment has facility to apply controlled spray of foam bitumen into the mix, lay and tamp the mix and initial compaction done with vibrated screed. Other equipments include the aggregate -cement spreader, rollers of different specification such as pneumatic, padded and smooth wheel rollers, motor graders etc as shown in figure.

	
<p>Milling equipment</p>	<p>Single-drum padded vibrating compactor</p>
	
<p>Single drum smooth vibrating compactor</p>	<p>Motor grader</p>

Equipments used for cold in place recycling

The process:

1. The existing road would be cleaned by air compressor and the around 15% aggregates and 1.5% cement would be pre-spread on the asphalt road.
2. The road would be rehabilitated by In situ pulverizing (milling) the top 160 mm of the existing pavement and at the time of pulverizing the asphalt road, the pre-spread aggregates, cement and hot bitumen would be injected into milled surface.
3. The bitumen of 2% of the mass of the asphalt mix would be of grade VG30 heated to 180 degrees.
4. The bitumen would be foamed in the equipment mixing chamber by spray bar.
5. The water too will be injected into system by water bar fitted on Wirtgen recycler and both water and bitumen tank are connected to machine by hoses.
6. The recycled or treated Mix is then compacted and graded to profile using roller and grader and eventually sealed by BC .

Advantages of the technology:

1. Cold in place recycling is the most environment friendly process among the pavement recycling techniques. As we are facing acute shortage of natural resources, we need to adopt recycling process if the pavement structure and composition permits the same. This will ensure that our hillocks and mountains will remain as such.

2. The cold milling process is energy efficient as it is not necessary to heat the aggregates as it is done in hot mix plant. Considering the difficulties faced for installing and running hot mix plants in heavily populated State like ours, this aspect has more significance.
3. In-place process does not require transportation of aggregates to the batching plant as well as to the site and thus taking off the additional pressure on the existing traffic and thereby reduce pollution.
4. Since the entire process is hi-tech machinery driven, quality control is a little easier.
5. Since we are using 100% RAP, it is more cost effective.

Conclusion:

The Cold in Place recycling of the pavement is the most appropriate technique for renewal of pavement surface that can also take care of almost all defects of existing pavement depending on the existing pavement thickness. RAP obtained from milling process can be utilised fully and is most cost effective.

This is an ambitious project taken up by Kerala PWD and could potentially be a model project if completed successfully. Engineers of PWD are requested to make use of this opportunity to know more about this project which is scheduled to commence very soon.