

CHAPTER 1

COLD MIX ASPHALT- AN ALTERNATIVE METHOD TO PAVEMENT REHABILITATION

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Failure or distress on pavement surface such as pothole, alligator cracking and shear cracking that commonly occurred and required pavement rehabilitation for maintenance proposes. Regarding the cost of reconstruction and the cost of transport and storing removed pavement materials, paying attention to recycling strategies for asphalt pavements has been considered extremely by transportation agencies [1]

Pavement rehabilitation is considered as cost efficient instead of reconstruction for new pavement. Pavement rehabilitation is a structural or functional enhancement of a pavement which produces a substantial extension in service life, by substantially improving pavement condition and ride quality. The characteristic of existing pavement conditions is an important component of any rehabilitation design methodology.

In order to identify the causes of distress, structural adequacy of pavement and will be collected including traffic pattern, thickness of layers and environmental condition. There are some techniques for rehabilitation of pavements such as reconstruction, hot mix asphalt overlay, and recycling. Cold Mix Asphalt recycling, hot recycling, and full-depth reclamation are the example of recycling techniques [1].

Cold Mix Asphalt consist of bituminous binder, either cutback asphalts or emulsified asphalts, and aggregates that are unheated [2]. The range of manufacturing temperature for Cold Mix Asphalt from 0 to 40° [3]. For patching process, Cold Mix Asphalt can be compacted at ambient temperatures and directly open for traffic which considerably reduces energy requirements. Cold mix patching has technical, economic and environmental advantages for pavement rehabilitation as it is extending cost efficient, pollution free and energy saving. Table 1 shows the numerical representation of pavement condition index (PCI) and its quality condition.

Table 1: Numerical representation of PCI and pavement quality condition

Pavement Condition Index	Condition Category	Pavement Quality Condition
85 – 100	Excellent	Adequate
70 – 85	Very Good	
55 – 70	Good	Degraded
40 – 55	Fair	Unsatisfactory
25 – 40	Very Poor	
0 – 10	Failed	

Cold Mix Asphalt as shown in Figure 1 also environment friendly with approximately zero pollution, lower emissions and easy availability. However, Cold Mix Asphalt has its downside such as higher voids and higher moisture susceptibility [3]. According to Sarsam & Samor [4] Cold Mix Asphalt has low initial strength and cohesion. Therefore, it is good as temporary patches for patching over potholes and cracking.

Binding material in Cold Mix Asphalt such cutbacks or emulsions are acting as to reduce asphalt viscosity for mixing in lower temperature. Cutbacks consist of bitumen mixed with suitable solvent such as, kerosene, diesel oil, and furnace oil. Aggregates are bind by bitumen and the solvent will evaporates. Cutbacks are divided to slow curing, medium curing and rapid curing. Meanwhile, bitumen emulsion with lower viscosity is in the form of aqueous consist of oil and water. Emulsifier separate two layers of oil and water [3].

Asphalt emulsion take a long period for cure and build its strength process. During curing process, Cold Mix Asphalt strength increases slowly as emulsion breaking in the curing process. Therefore, the applications of Cold Mix Asphalt are restricted for the low and medium-traffic pavements, base courses or thin overlayers [5]



Figure 1: Cold premix available in the market; (a) Cold-Premix; (b) Advanced Patch Mix and (c) Viking Easylay Cold Tarmix

The lack of awareness in both research and evaluation on cold mix technology that slightly observable in Malaysia is the primary motivation underlying selection of proposed study. The properties of CMA material had been characterized based on sieve analysis and specific gravity. The result of the laboratory tests will indicate that the gradation for all the specimen were within the aggregate gradation requirements for the AC10 mix as per JKR Malaysia's specification.

Based on the ranking performance criteria of 3 different cold mix patching materials, Viking Easylay Cold Tarmix specimen obtained the highest score of compliance with the requirements of the specification. Therefore, it is suggested that Viking Easylay Cold Tarmix specimen are the most suitable cold mix materials to be used in patching maintenance work.

The following suggestion are outlined for future improvement for any study related to this field considering CMA is at its weakest state right after placement, moisture is the weakness to its strength. Therefore, the performance of CMA can be evaluated by emphasizing moisture damage using Indirect Tensile Strength Test as CMA is temporary patching that easily loss strength due to moisture.

With the aim to improve CMA performance, additives such as cement, lime, fly ash, fibers, and chemical additives are all commonly utilized. There are two phases to add additive suggested which is during production of CMA (dry method) and combine with emulsion at manufacture process (wet method).

Chemical additives such as polyvinyl acetate also can be applied to improve the properties of CMA which were indicated by increases Marshall Stability and Indirect Tensile Strength values.

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