

MODIFIED BITUMEN

WHAT IS MODIFIED BITUMEN?

Roads are the 'lifeline' of the modern world. In order to withstand harsh environment and heavy traffic conditions their construction and maintenance require flexible and economical materials. Hot bitumen is mixed with aggregates, fillers and additives to create a range of surfaces suited for their individual requirements. In asphalt production bitumen plays a key role. The properties of paving bitumen and bituminous mixes can be improved by addition of certain additives or blends of additives. These additives are called "Bitumen Modifiers" and the bitumen premixed with these modifiers is known as "Modified Bitumen".



Types of Modified Bitumen:

- Natural Rubber Modified Bitumen (NRMB) : using latex or rubber powder.
- Crumb Rubber Modified Bitumen (CRMB) : using crumb rubber powder from discarded truck tyres further improved by additives.
- Polymer Modified Bitumen (PMB) : using polymers like Ethylene Vinyl Acetate (EVA) or Styrene Butadiene-Styrene (SBS) etc.

Advantages of Modified Bitumen:

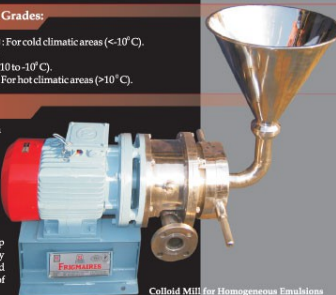
- Lower susceptibility to temperature variations.
- Higher resistance to deformation at elevated pavement temperature.
 - Better age resistance properties.
 - Higher fatigue life of mixes.
 - Overall improved performance in extreme climatic conditions.
 - Reduction in overall lifecycle cost of overlays.
 - Higher stiffness modulus.
 - Better resistance to creep.

Selection Criteria For Various Grades:

- PMB/NRMB 120 / CRMB 50: For cold climatic areas (<-10° C).
- PMB/NRMB 70 / CRMB 55:
For moderate climatic areas (10 to -10° C).
- PMB/NRMB 40 / CRMB 60: For hot climatic areas (>10° C).

Applications:

Bituminous mix prepared with modified bitumen are quite suitable for renewal course and overlay material on surfaces which are badly cracked and subjected to heavy traffic. They perform better than ordinary bitumen in high rainfall areas and in situations where aggregates are prone to stripping. Due to better creep resistance they can be used at busy intersections, bridge decks and roundabouts etc. for increased life of the surfacing.



Colloid Mill for Homogeneous Emulsions

EMULSIONS AND CUTBACK

WHY USE BITUMEN EMULSIONS?

Standard flexible road structures consists of layers of manufactured materials laid onto an roadbed soil. The upper portion of the roadbed soil is commonly exposed to harsh environmental and heavy traffic leading to distortion and subsequent cracking of the upper surface layers. It is not economically viable to excavate the complete structure and therefore emulsion mixes are used successfully to follow roadbed soil movement without cracking. It has been proven that emulsion mixes have membrane-like mechanical properties rather than the slab-like properties of standard hot bituminous mixtures. Furthermore, emulsion mixes are not as susceptible to thermal cracking as regular standard hot bituminous mixtures.



PRICIPALS OF EMULSION MIXES:

An emulsion is a mixture of two immiscible liquids, one of which is dispersed in the other in the form of very fine particles. The process of emulsification is accomplished by use of an emulsifier and a stabilizer.

Emulsion mixes are used as a base layer in a pavement structure as well as a surfacing course. They are obtained by dispersing a cationic bitumen emulsion in an aggregate and can be produced in cold mix plants as well as with mix-pavers. The application rates vary from 50 mm to 200 mm in thickness.

The binder within an emulsion stabilized granular material selectively coats smaller particles. The stiffness of emulsion mixtures is lower than Hot Mix Asphalt. Unlike Hot Mix Asphalt, the manufacturing of emulsion mixes does not require heat.

The surface of emulsion mixes is relatively fragile when compared to the surface of Hot Mix Asphalt. Unsealed emulsion mixes do not provide waterproofing and the cohesion at the surface may not be sufficient to withstand surface tangent stresses. By sealing the surface emulsion mixes, waterproofing is achieved and the inherent performance of emulsion mixes is not compromised by premature stripping, oxidation and raveling.

Types:

- **Anionic Type** : In which the bitumen particles are negatively charged and the emulsifier is fatty acid metallic soap. These are suitable for use with calcareous aggregates like limestone.
- **Cationic type** : In which the bitumen particles are positively charged and the emulsifier used is a long chain amine. These are suitable for use with siliceous aggregates like quartzite, sandstone, granite etc.

Use as per Setting Characteristics:

- **Rapid Setting (RS)** : Used in surface dressing and patch repair work.
- **Medium Setting (MS)** : Used in premix with low quantity of fine aggregates and pothole repair works.
- **Slow Setting (SS)** : Used in premix with appreciable quantity of fine aggregates such as slurry seal and fog seal.

Cutback Bitumen:

Are used for cold weather construction as well as maintenance under all weather conditions. The petroleum distillate generally used for obtaining cut back bitumen is kerosene.

Types:

- **Rapid Curing (RC)** : Used for surface dressing in cold weather and patch repair work.
- **Medium Curing (MC)** : Used in premix with less quantity of fine aggregates.
- **Slow Curing (SC)** : Used in premix with appreciable quantity of fine aggregates.
- **Bituminous primer** : used for prime coats.