

## Aging and asphalt recycling agent action outlined

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### Abstract

Introduces the aging process of asphalt, mechanism of waste asphalt recycling agent can be divided into three categories: solubilization dispersion mechanism, diluted reconcile mechanism and wax crystal dispersion mechanism. Asphalt recycling agent should have three levels of functionality, asphalt coordination structure, restore road performance, durability and weather resistance. Regenerated catalyst not only to meet the asphalt coordination structure, restore road performance requirements, but also to ensure that the construction process safety, environmental protection and regeneration of the weather and other aspects of the road.

**Keywords:** Asphalt Aging Regeneration agent Mechanism of action

### 1. Introduction

Asphalt Pavement complex changes occur in a variety of natural factors (such as oxygen, temperature, ultraviolet light, water, etc.) long-term effects, asphalt to aging, lose their road performance. Aging asphalt recycling agent can be added to restore its good old road use function.

### 2. Aging asphalt

Aging is a process bitumen from the refinery after being refined out occurs gradually, due to the long contact with air, under the influence of external environmental factors such as the action of heat, air, ultraviolet radiation and water, a series of physical, chemical reaction, so that colloidal pitch internal structure changes, its physical and chemical properties change, leading to deterioration of the asphalt pavement performance.

#### 2.1. Asphalt aging process

##### a) Bitumen aging in the transport, storage process

Asphalt aging process mainly refers to the asphalt before mixing, because the need has been installed in the asphalt tank insulation asphalt storage, asphalt, etc. in a high-temperature process, and this process tends to go through a long period of time, during this period, due to the asphalt at high temperature, the thermal motion of molecules faster asphalt, gas oil quality continuously reduce volatile and cause a series of chemical reactions such as polymerization.

##### b) The construction process of aging asphalt

Asphalt in the construction process to be experiencing a more serious aging process than the transport, storage process, mainly because of the general construction method is hot mix asphalt hot shop. In the process of mixing the asphalt temperature is generally between 160-180 °C, and attached to the asphalt wrapped mineral aggregate, forming a thin film of asphalt, more like asphalt heating area. Then more serious aging asphalt.

##### c) Pavement during aging

Asphalt pavement aging process is a long slow process,

factors that cause aging during the main environmental factors and load factors.

### 2.2. The main factors affecting the degree of aging of asphalt

#### a) The pavement life

With the growth of useful life of asphalt pavement, asphalt subjected to natural factors and the impact of load factors of the longer, more powerful and therefore the degree of aging asphalt pavement.

#### b) Different depth asphalt pavement

With increasing depth asphalt pavement, which gradually slow aging. Since the role of RCC road, the severity of the general aging of the top layer of asphalt pavement, and in the upper layer or less, the aging to a lesser extent, its asphalt penetration compared with the original pitch, the same has decreased, but it's main due to aging in the asphalt mixture mixing process.

#### c) Different locations of asphalt pavement

Asphalt pavement in the same lane and shoulder of the road, which will vary the degree of aging. Shoulder of the road, rather than the speed of aging asphalt lane to be faster, mainly due to fewer road shoulder of the road traffic loads, density is not improved by the role of oxygen, water and light more reason.

### 3. The mechanism of regeneration agents

The aging process can be seen in its asphalt bitumen branch migration occurs mainly as an aromatic Finland into gum, gum further converted into asphaltenes, which would make the original asphaltene bitumen system significantly increased the original structure of asphalt colloid system changes, leading to changes asphalt penetration, ductility, softening point asphalt performance deterioration.

Mechanism of waste asphalt recycling agent is currently divided into solubilization dispersion mechanism, diluted reconcile mechanism and wax crystal dispersion mechanism.

### 3.1 Solubilization dispersion mechanism

Solubilization mechanism is the dispersion of the regenerant through hydrogen bonding polymer type surfactant, acid-base interaction, charge transfer, etc. asphaltene particles adsorbed on the surface of the regenerant lipophilic chain can not only enhance the colloidal space stabilizing effect, but also through the composition of the solvent to form a good solvent adsorption layer by the action of these two aspects can well enhance the stability of the colloidal system of asphalt.

### 3.2 Dilution mechanism to reconcile

According to the process of aging asphalt into Finland aromatic gum, gum further transformed into the asphaltene component, making the colloidal stability of asphalt caused decline. Add to asphalt-solvent components rich heavy mineral oil, especially the increase in the content of aromatics, which are conducive to the regeneration agents around the asphaltene particles form a good solvent layer of asphalt aging dilutive to reconcile effect.

### 3.3 Wax crystal dispersion mechanism

Dispersants on wax crystal aging paraffinic bitumen through nucleation and eutectic effects, the wax crystals dispersed into smaller particles, this will help improve the plasticity and deformation resistance of asphalt.

Third, the technical requirements for recycling agent

Technical requirements for regenerated catalyst mainly based on years of practical experience at home and abroad, not only to satisfy the compatibility of asphalt structure, restore the asphalt road performance requirements, but also to ensure that the old asphalt recycling and construction process safety, environmental protection durability and regeneration pavement and so on.

a) Functional areas: Functional regeneration agent mainly the following two aspects, (1) Coordination of aging asphalt colloidal structure: migration caused by the aging of the asphalt bitumen component mainly aromatic Finland into gum, gum further conversion as asphaltene, asphaltene content relatively large increase, resulting in poor performance of asphalt. Therefore, to be capable of regenerating agent capable of dissolving the asphaltenes well dispersed. The study results show, aromatics to asphaltene dispersed and dissolved ability to good effect, first of all due to the relatively small molecular weight of the aromatic division, able to penetrate into the asphaltene micelles, blocking asphaltene molecules long chain; secondly aromatics asphaltenes affinity and capacity better, is good asphaltene dispersant. Regenerated catalyst should pay particular attention to saturate the wax content, high temperature performance and low temperature performance of asphalt will increase the wax content deteriorates. (2) Improving Recycled Asphalt Mixture Performance considerations: type of asphalt pavement disease more now high temperature rutting example, asphalt aging asphaltene content increases to a certain extent, improve the rutting resistance of asphalt pavement, the regeneration process in the rheological properties of bitumen recovery and should pay attention to maintaining its high temperature performance, this can increase the recycled asphalt mixture rut road performance.

- b) To meet the construction workability: During practical application, the old asphalt and asphalt recycling agent Stir uniformity is not as good as laboratory tests, asphalt recycling agent is added directly to the waste asphalt mixture after heating, the mixing time is short, the need for regenerant which has good workability, e.g., low viscosity, good diffusion capability.
- c) Durability: regeneration agent is added to the mix recycled asphalt after mixing, paving as well as use of the process, the same should be subjected to thermal aging process of mixing short-term and long-term pavement during aging. Therefore, anti-aging properties of regenerated catalyst should be good, asking them by the thin film oven aging, regeneration agent mass loss rate and viscosity ratio should not exceed the specification requirements.
- d) The construction safety: Asphalt thermal regeneration process old asphalt mixing needs regeneration and used at high temperature conditions, the regenerated catalyst in the use of the process should not produce smoke or sparks, cannot produce harmful substances, and called regenerated catalyst has a higher flash point.
- e) Environmental protection: waste asphalt thermal regeneration process requires high temperature conditions, so the regenerant some light volatile components or cleavage, and in the future use of the process, will also be some physical and chemical changes, if these the product on the surrounding environment unfriendly, it can cause serious environmental problems in the role after a long time.

## 4. References

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