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# METHODS OF INCREASING THE DURABILITY OF ASPHALT CONCRETE COATINGS IN ANDIJAN

**Mirzaev Abdikhannon**
Andijan State Technical Institute
Teacher, Department of Transport logistics

**Abstract**

Andijan city experiences a continental climate with hot summers and cold winters, leading to rapid deterioration of asphalt concrete pavements, including rutting, cracking, and moisture-induced damage. This article examines methods to enhance the durability of asphalt concrete coatings in the Andijan region. Key approaches discussed include the use of polymer-modified bitumen (PMB), optimized mix design with additives, high-quality compaction, and effective construction technologies. These methods reduce deformation in high temperatures, cracking in cold conditions, and water-related damage, potentially extending pavement service life from 10–15 years to 20 years or more. Implementation of these techniques in Uzbekistan's road construction projects is recommended.

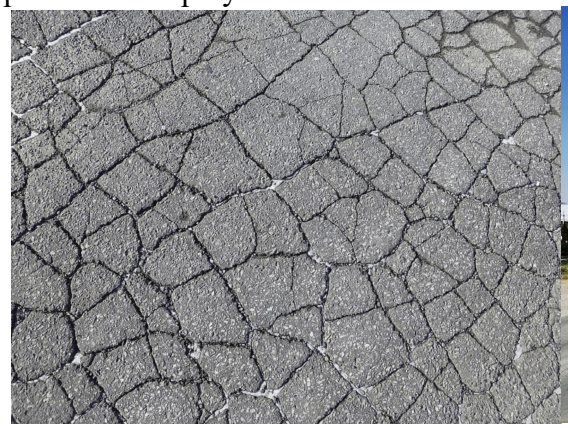
**Keywords**

asphalt concrete pavement, durability, Andijan climate, polymer-modified bitumen, PMB, pavement deformation, compaction, additives, road construction, Uzbekistan.

Andijan, located in Uzbekistan's Fergana Valley, experiences a continental climate with hot summers (up to 35–40°C) and cold winters (down to -5°C or lower), along with moderate precipitation mainly in spring. These conditions challenge asphalt concrete pavements: high temperatures cause rutting and softening, while freeze-thaw cycles lead to cracking and moisture damage.

Common pavement distresses include rutting from heavy traffic and cracking from temperature fluctuations.

Uzbekistan's growing road network, including projects in the Fergana Valley, requires durable pavements to reduce maintenance costs and extend service life. This article explores methods to enhance asphalt concrete durability tailored to Andijan's conditions, drawing on global best practices like polymer-modified bitumen and improved compaction.



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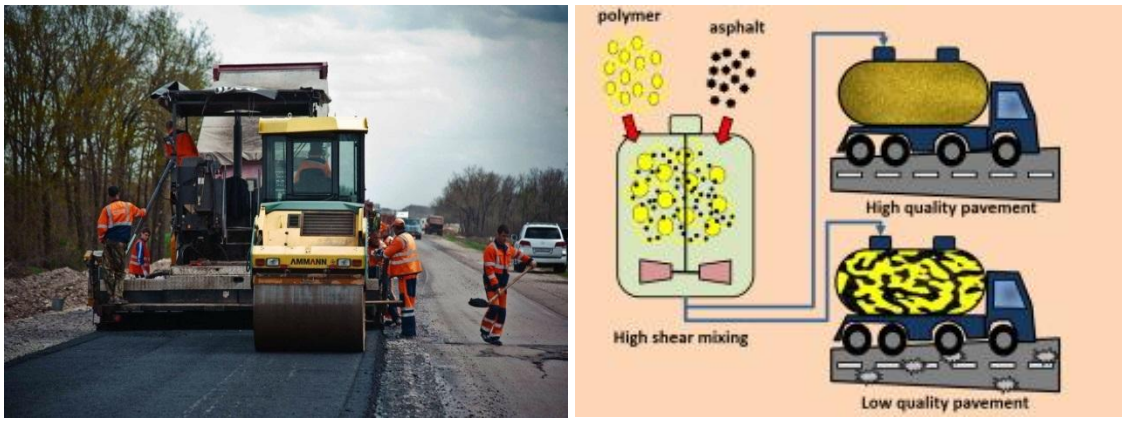



**Fig 1.** Research of road milding

Modern road construction in Uzbekistan emphasizes longevity through advanced materials.

Key Factors Affecting Durability in Andijan

Andijan's climate accelerates asphalt aging: UV radiation and heat oxidize the binder, increasing stiffness and brittleness, while winter freezes exacerbate cracking. Heavy agricultural traffic and urban growth add loads, causing rutting.

Poor drainage in spring rains allows water infiltration, leading to stripping. Traditional asphalt mixes often fail prematurely here, necessitating enhancements like reduced air voids (each 1% reduction extends life by ~10%) and better binder performance.

Methods to Increase Durability

1. Use of Polymer-Modified Bitumen (PMB)

Polymer additives, such as SBS (styrene-butadiene-styrene), improve elasticity, rutting resistance in heat, and cracking resistance in cold. PMB raises the softening point, reducing deformation in Andijan's summers, and enhances low-temperature flexibility.

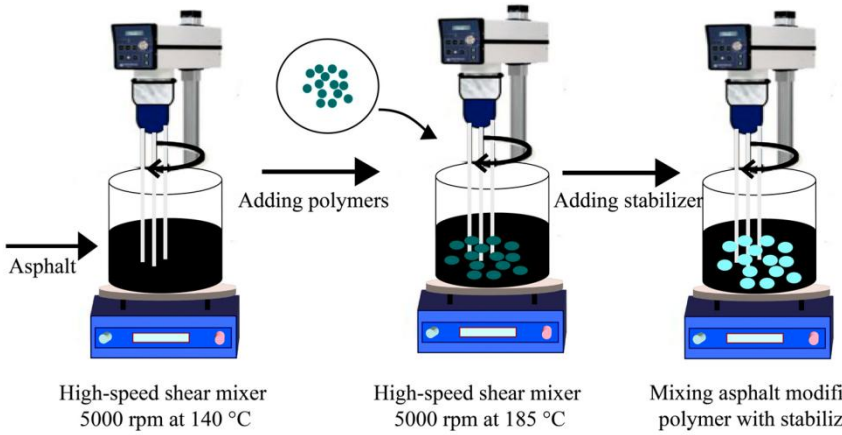



**Fig 2. Asphalt testing**

Polymer modification during mixing creates a network for better viscoelasticity.

Studies show PMB extends pavement life significantly, ideal for high-traffic areas in the Fergana Valley.

2. Optimized Mix Design and Additives

High-quality aggregates and gradation — Dense-graded mixes with finer aggregates reduce permeability and water damage.

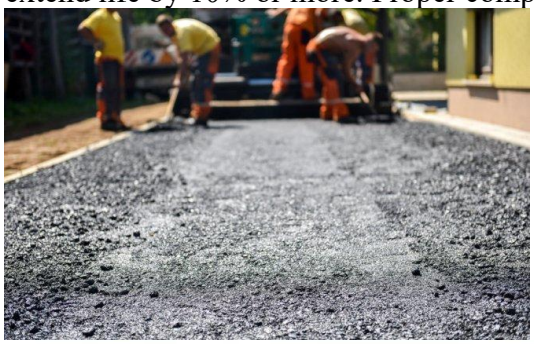
Additives — Anti-stripping agents improve adhesion; warm-mix additives lower production temperatures, reducing oxidation.

Rejuvenators for RAP — Allow higher recycled asphalt pavement content while restoring binder properties.

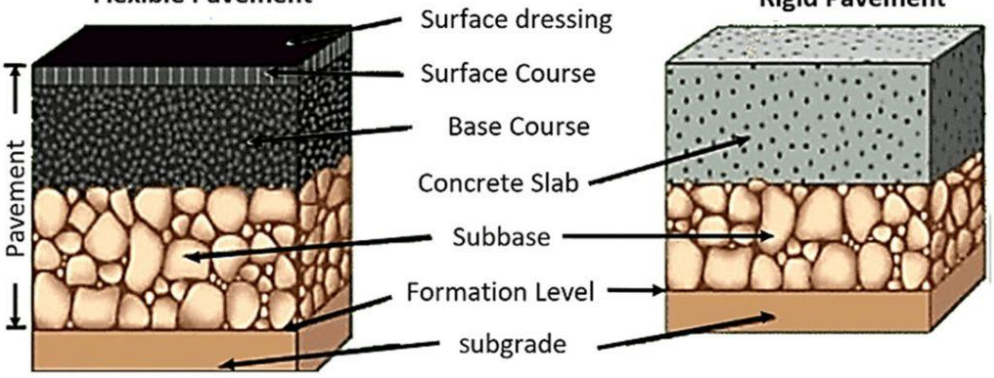
Superpave designs, tailored to local traffic and climate, optimize performance.

3. Improved Compaction and Construction Practices

Achieving higher in-place density (reducing air voids) is critical—one percent increase can extend life by 10% or more. Proper compaction prevents moisture ingress and rutting.



Flexible Pavement Rigid Pavement




Layered construction with proper compaction ensures structural integrity.
Good drainage design and timely sealing further protect against Andijan's seasonal rains.

4. Maintenance and Preventive Measures

Regular sealcoating and crack filling prevent water damage. In hot climates, reflective coatings or lighter aggregates can reduce heat absorption.

Case Studies and Recommendations for Andijan

Uzbekistan's road projects increasingly adopt advanced mixes. Implementing PMB and high-density compaction in Andijan could mirror successes in similar climates, extending life from 10–15 years to 20+ years.

Recommendations:

Adopt PG-graded binders suited to local extremes.
Train contractors on PMB handling and compaction.
Pilot PMB sections on high-traffic roads.

Conclusion

Enhancing asphalt concrete durability in Andijan requires material innovations like PMB, optimized designs, superior construction, and proactive maintenance. These methods address rutting, cracking, and oxidation, ensuring longer-lasting, cost-effective pavements amid Uzbekistan's infrastructure growth.

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