

Lijiu HI RAP Core Technology

AF-BOX Micron-Level Asphalt Foaming System



Shandong Kangdefumei Greenway Co., Ltd.

I. Product Overview

AF-BOX is a highly integrated, modular foaming system independently developed and designed by our company for High-Intensity Regeneration (HIRAP) and hot-mix asphalt technologies. Utilizing its core micron-scale foaming technology, this system enables superior diffusion and encapsulation performance of asphalt at lower temperatures, making it a key technological solution for modern "green pavement" construction. 3C6N Technical Architecture:

The precision design featuring a three-chamber and six-nozzle configuration ensures thorough mixing of the foaming agent and asphalt at the microscopic level; both the foaming ratio and half-life exceed industry standards.

Micron-level atomization precision:

Through high-pressure precision metering, bubbles with micrometer-scale diameters are generated, which significantly reduces asphalt viscosity, enhances the wettability of recycled aggregate (RAP), and ensures pavement quality even when a high proportion of RAP is incorporated.

Product positioning: Addressing the "pain point" associated with large-scale recycling.

In high-recovery thermal recycling scenarios where the recycled aggregate (RAP) content exceeds 30%, traditional processing methods often face critical challenges such as uneven coating of recycled aggregates (known as "flaky aggregate"), high brittleness of aged asphalt, and segregation caused by aggregate gradation variations. The **AF-BOX System**, utilizing micron-scale foaming technology, optimizes the asphalt's "expansion—dispersion—coating" process – making it a key solution for achieving high recycled content ratios.

Core technological advantage (based on foaming principles)

1. Micron-Level Uniform Coating – Completely Eliminates "material Irregularities"

Expansion and dispersion: Through high-pressure water injection and high-temperature asphalt vaporization, the asphalt volume is instantly expanded by more than 15 times, resulting in a dramatic increase in its surface area.



Thin-film penetration: After cracking, the asphalt penetrates into the interface between the aged asphalt and the aggregates as an extremely thin film(5–10 μm), forming a continuous bonding layer; this ensures 100% coating even when the mixture contains a high proportion of recycled material.

2. Activated Aged Asphalt – Enhances Composite Performance

Softening Effect: The Local Shear Forces During the Foaming Process Can Slightly "soften" the Structure of Aged Asphalt, Thereby Reducing Its Brittleness.

Deep integration: Promotes the thorough mixing of old and new asphalt to create a "composite binder" with superior performance, thereby enhancing low-temperature crack resistance.

3. Flexible Adaptation to Gradational Fluctuations – Reduces Segregation

Intelligent Distribution: The high dispersibility of foamed asphalt allows for the flexible adjustment of the coating range based on gradation variations (fine aggregate binding or coarse aggregate agglomeration), thereby reducing the segregation rate of the mixture.

III. Asphalt用量 Optimization Logic: From "Passive Reduction" to "Active Design"

AF-BOX is not merely about adjusting the amount of asphalt used; rather, it achieves an optimal balance between performance and cost by **enhancing utilization efficiency**:

Efficiency Improvement and Dosage Reduction: Whereas the original formulation required a "passive" reduction in dosage due to the low conventional asphalt coating rate, the use of AF-BOX – leveraging the ultra-thin film principle – enables a **5%–10% reduction in dosage** while still meeting performance requirements (void ratio, stability).

Performance Enhancement: Even when the original dosage is already minimal, the AF-BOX enables a significant improvement in water stability (with a 5%–10% increase in residual stability) and high-temperature rutting resistance through a more uniform distribution.

Precision Customization:The final dosage is verified through the Marshall test, ensuring **optimal road performance with the minimum amount of asphalt required.**

IV. AF-BOX System Composition and Specifications

Module	Key Features	Technological value
3C6N Foam Processing Main Unit	Three-chamber, six-nozzle patented design	Ensure the consistency and stability of micron-scale bubbles
Intelligent CNC Unit	Real-time monitoring of foaming ratio and half-life	Digitalization ensures that the quality of every ton of mixture can be precisely controlled.
Integrated Design	Modular AF-BOX Cabinet	Quickly compatible with mixing plants from various brands; easy to install.

V. Conclusion: The Balance Point Between Environmental Sustainability and Performance Assurance

More efficient: Increase the upper limit for recycled material incorporation.

More reliable: Increases compactness and reduces porosity.

More cost-effective: Through precise usage-based design, helps businesses achieve "cost reduction and efficiency improvement."

**The Green Road – Ever Evolving— Shand-
ong Kangdefumei Greenway Co., Ltd.**