



PARTICLE SIZING OF ASPHALT EMULSIONS

Asphalt-aggregate roads have traditionally been made by an asphalt-coated aggregate that has been hot-mixed at a central plant. Asphalt emulsions have made the manufacturing, storage, and road construction a much simpler process. Asphalt emulsions are droplets of asphalt dispersed in water with the aid of an emulsifying agent. Particle size of the asphalt droplets is critical to stability and application performance.

Summary

Asphalt-aggregate roads have traditionally been made by an asphalt-coated aggregate hot-mixed at a central plant. Continued development of asphalt emulsions has increased the number of types available and improved applications knowledge, leading to a growing use in road building.

In contrast with the hot-mixed asphalt, asphalt emulsions can be stored and used at ambient temperature. Asphalt emulsions do not require a petroleum solvent to make it liquid and can be applied without additional heat. Both of these contribute to energy and cost savings and reduce atmospheric pollution.

An asphalt emulsion is droplets of asphalt (from 55 to 70 percent) dispersed in water with the aid of an emulsifying agent. The quality of water used is critical, as minerals or ionic species can affect the emulsion stability. The ionic charges of the emulsifying agent keep the asphalt droplets from coalescing, stabilizing the emulsion.

Emulsion Manufacturing

Asphalt emulsions are manufactured by a high-speed, high shear mechanical device (usually a colloid mill) that divides the asphalt into tiny droplets and disperses it in the water.

Typical products have a size range from sub-micron up to ten microns, with an average particle size in the one to five micron range. Variation in settings, raw materials, and requirements of the final product will vary both the average size and distribution width.

Horiba's LA-series particle size analyzers have proven to be very popular for this application. The LA-910 and LA-920 instruments are used by manufacturers to closely control the emulsification process. A number of LA-300 models are used as portable field units to test product at storage facilities or for field trials.



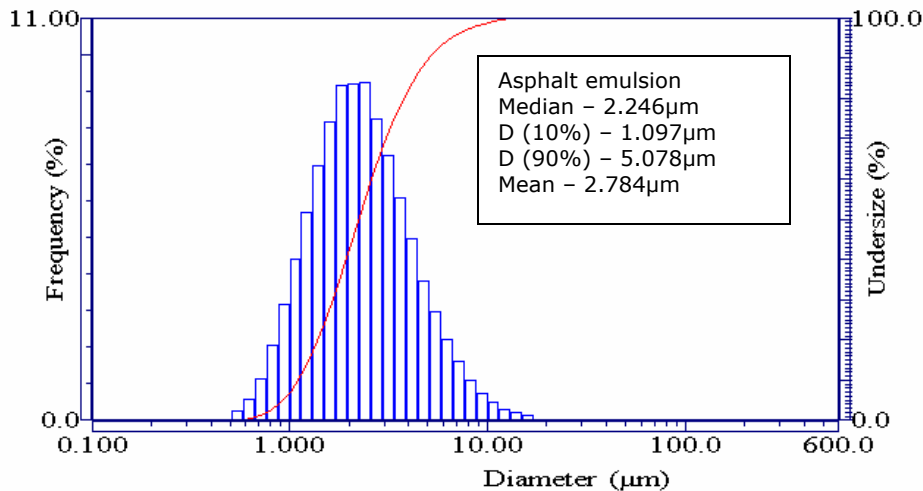
Horiba LA-300 Particle Size Analyzer



The object is to make a dispersion that is stable enough for pumping, prolonged storage, and mixing. Furthermore, the emulsion should break down quickly after contact with aggregate in a mixer, or after spraying on the roadbed. Upon curing, the residual asphalt retains all of the adhesion, durability, and water-resistance of the asphalt cement from which it was produced. A wide variety of grades are available that vary in strength, setting time, and viscosity.

Asphalt particle size is a vital factor in making a stable emulsion. Tight control at the manufacturing stage, during storage, and field checks prior to final application can aid in providing a stable, quality product.

The example shows a typical asphalt emulsion. Samples are usually dispersed in deionized water. Quick setting emulsions may require addition of a compatible surfactant to stabilize the diluted dispersion.



Analytical test method

RI of asphalt – 1.63 (RRI – 1.22 in water)

Dispersant fluid – Asphalt is dispersed in deionized water with some surfactant.

Pump speed – speed 2 or 3 are sufficient for all grades

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