

### Selecting CRS Emulsifiers for Emulsion Viscosity

A key specification item for CRS-2 emulsions is their viscosity. Emulsions for spray application must have a viscosity sufficiently low to give a good distribution of emulsion across the surface of the roadway, yet viscous enough to prevent run off. ASTM standards specify an emulsion viscosity in the range 100-400 SFS at 50°C.

Manufacturing conditions and the source of the asphalt can have a great effect on the emulsion viscosity. Studies have related emulsion viscosities to the particle size and size distribution of the asphalt droplets, to salt in the asphalt and of course the asphalt content of the emulsion. But how can problematically high or low viscosities be addressed in practice?

Problematic high viscosity may result from so-called viscosity-building asphalts, which typically have high acid values and contain high levels of salt. After reducing the asphalt emulsion content to the specification minimum, further viscosity reduction can usually be achieved by including 0.05-0.25% calcium chloride or sodium chloride in the formulation. The calcium chloride inhibits the osmotic transfer of water into the asphalt droplets. Preferably the salt is included in the soap phase.

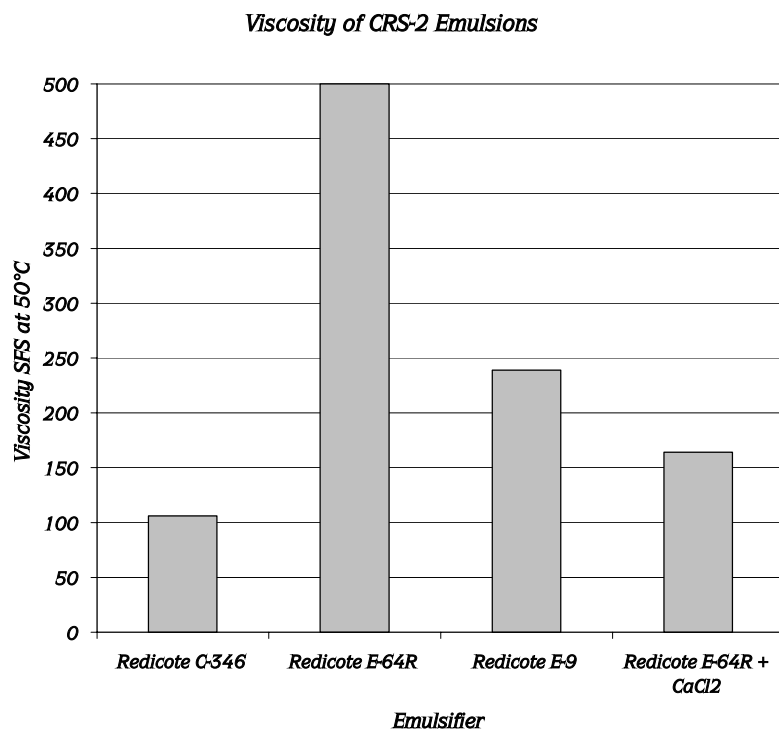
Problematic low viscosity may be associated with asphalts with low salt contents or with hard water. Polymer-modified emulsions may have a broad particle size distribution which tends to lead to lower viscosity. Changes in the manufacturing conditions may help and increasing the asphalt content is always a solution – but it may be an expensive one.

#### *Viscosity Building Characteristics of Redicote® CRS Emulsifiers \**

<i>Emulsifier</i>	<i>Physical Form at 25°C</i>	<i>Comments</i>
<i>Redicote E-4819-3</i>	<i>paste</i>	<i>Specially high emulsion viscosity</i>
<i>Redicote E-4819</i>	<i>paste</i>	<i>High emulsion viscosity</i>
<i>Redicote E-64R</i>	<i>liquid</i>	<i>High viscosity</i>
<i>Redicote E-9</i>	<i>paste</i>	<i>Average viscosity</i>
<i>Redicote E-35C</i>	<i>Paste/liquid</i>	<i>Average Viscosity</i>
<i>Redicote C-346</i>	<i>liquid</i>	<i>Low viscosity</i>

Often overlooked is the influence of the emulsifier. Selecting the right Redicote emulsifier can solve your emulsion viscosity problems without the need to make modifications to production parameters. For the very highest emulsion viscosity building effect we recommend Redicote E-4819-3, while to reduce emulsion viscosity use C-346. For the majority of U.S. asphalts Redicote E-4819 or Redicote E-9 offer the right balance of economy of emulsifier and asphalt usage and good performance characteristics for all CRS and CMS grades.

## Selection of CRS-2 emulsifiers



### References

1. "Solving Viscosity Problems by the Choice of Emulsifier", A. D. James, 24th AEMA Meeting, March 14-16, 1997, Cancun, Mexico.
2. "Water Enclosed Within the Droplets of Bitumen Emulsions and Its Relation to Viscosity Changes During Storage", S. Furlong, A. James, E. Kalinowski, and M. Thompson, Colloids and Surfaces (A), 152, 1999, pp147-153.

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