



## Redipave

### The Redipave Slurry Surfacing & Micro-asphalt System for low acid binders

#### Introduction

The performance of conventional Slurry Surfacing and Micro asphalt emulsion systems is usually dependent upon use of a high acid bitumen, normally derived from a Venezuelan crude oil. In cases where this is not readily available it can be difficult to produce emulsion formulations that perform well.

The Redipave emulsifier has been specially developed to produce an emulsion for fast set - fast traffic Slurry Seal and Microasphalt systems with low acid bitumen derived from paraffinic crude. However, Redipave works equally well with high acid binders.

#### Recommendation for usage

To be effective with low acid binders, Redicote EM44 must be used in conjunction with phosphoric acid ( $H_3PO_4$ ). The concentration of Redicote EM44 required in the emulsion depends on the "activity" and grading of the aggregate being used and the mixing temperature. Dosages from 0.8 to 1.5% are recommended to cater for most common aggregates under most conditions. Examples of suggested dosages for a range of aggregate types are shown in Table 1 as a guide, but experimentation is required to verify correct dosage.

**Table 1: Examples of Redicote EM44 dosages for several aggregates**

Aggregate	Redicote EM44 dosage (% on emulsion)
Granite (Skarlunda ex Sweden)	0.9 – 1.2
Gritstone (ex UK)	0.8 – 1.0
German Moraine	1.0 – 1.25
Basalt (High activity ex Middle East)	1.5 – 1.7

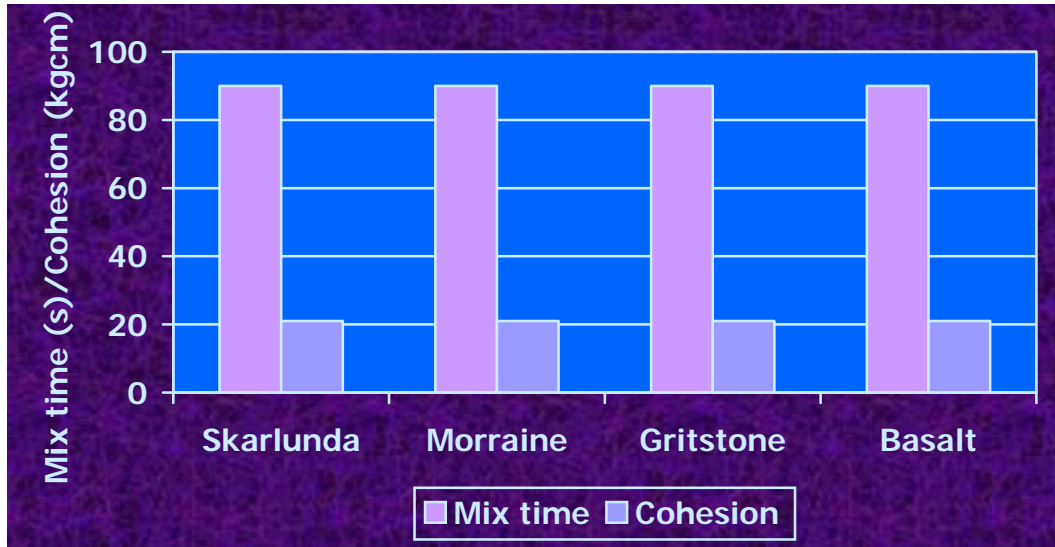
The pH required for Redicote EM44 emulsions is not critical and should be in the region of 2.0 to 2.5. In order to be effective with low acid binders it is essential to use phosphoric acid. In the case of high acid binders, phosphoric acid is necessary to achieve a suitable mix time.

Emulsions containing phosphoric acid are more susceptible to foaming so it is recommended that a foam suppressing agent is incorporated into the emulsion formulation. Foamaster NXZ from Nopco has been found to be an effective option when added to the water phase at a level of 0.1% on the emulsion.

**Performance**

Very good slurry mix, set and cohesion results can be obtained with Redicote EM44 emulsions with a wide variety of aggregates - some of which are problematic or incompatible with more conventional slurry emulsions (Figure 1).

**Figure 1: Performance with range of aggregates**



It is also possible to obtain a relatively long mix time of around 180secs by adjusting the emulsifier content which gives the slurry a long open time and yet a highly cohesive set >20 kg cm occurs, normally within 15 minutes. Even with mix times of up to 300 s and longer the mixtures can still set within 15 to 30 mins. This facilitates the design of a slurry with a very long workability window which will still allow early trafficking (Figure 2).

Redicote EM44 gives rise to high quality emulsions with a wide range of bitumen sources with or without polymer modifiers. Natural or synthetic, cationic rubber latices can also be incorporated into Redicote EM44 emulsions prior to manufacture via the water phase or following emulsion production. These emulsions demonstrate good aggregate mix and set properties.

Slurries made with Redicote EM44 emulsion have a wide mix temperature tolerance and by adjusting the emulsifier concentration cohesion values of 20+ on the cohesion meter after 15 mins at a temperature of 8°C can be obtained (Figure 3).

Ordinary Portland Cement (OPC) is essential to the mix and the addition of 1 +/-0.5% is recommended (Figure 4). The cement addition level is critical and affects the mix and set times. Without cement the mix and set time is determined by evaporation only as the emulsion will not break properly.

Figure 2: Mix time v cohesion at 15 mins

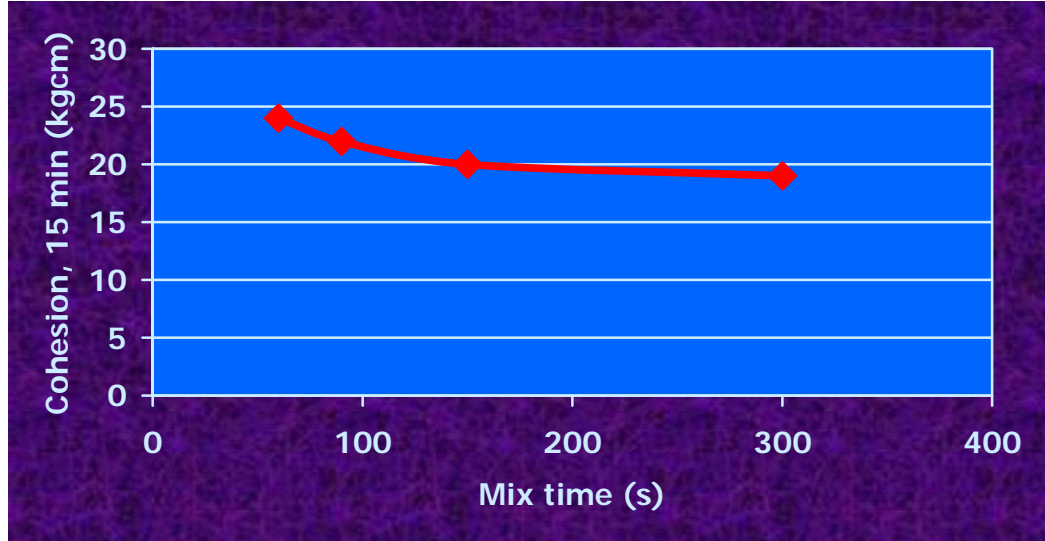


Figure 3: Cohesion and mix time v temperature

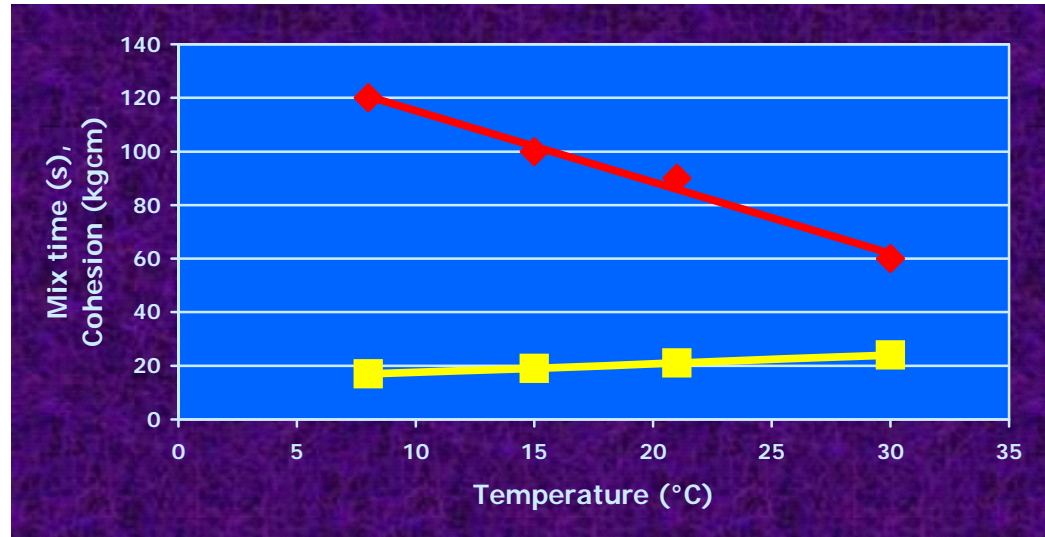
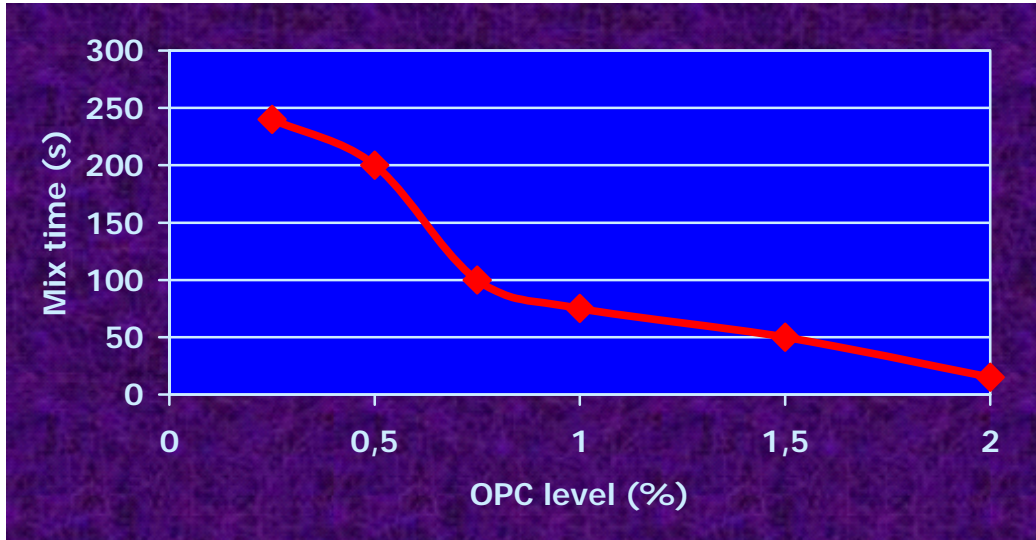


Figure 4: Effect of OPC



If required the mix time can be adjusted with a mix extending dope in the same fashion as a more conventional slurry. Recommended dopes include Redicote 611 and Redicote E11-HF.

### Summary

Redicote EM44 emulsions used with phosphoric acid offer the following benefits:

- High performance emulsions can be manufactured with both low and high acid binders
- Systems can be designed to have long open times and fast set
- Good mix and set times can be achieved over a wide range of temperature

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