

# **THE LOSS OF VOLATILE COMPOUNDS OF ASPHALT BINDER IN HOT ARID CLIMATES**

**M O IMBAREK, B YUDONO, D J ROBERTS AND J W SMITH**  
University of Bristol, UK

## **SUMMARY**

Premature surface cracking of asphalt concrete pavements is known to be a problem in hot arid climates such as the Middle East, Australia and the Southern USA. Cracking often occurs within as little as two years after construction even in absence of significant traffic loading. A possible reason for this behaviour is early hardening of the asphalt binder due to rapid evaporation of the volatile components, together with daily thermal stress cycles under the diurnal temperature fluctuation.

Samples of asphalt concrete were obtained from highways in the southern part of Libya; a region with particularly hot climate. The samples were taken from pavements ranging from 0 to 8 years old.

The bitumen was extracted from each specimen of asphalt concrete using a Soxhlet extraction apparatus with normal heptane solvent. The bitumen was then separated into four major fractions by using solid phase extraction. Finally, each fraction was analysed by gas chromatography.

The results of the Soxhlet extraction indicated that the bitumen content of the samples reduced from 6.1% to 3.9% over the age range of 0 to 8 years with most rapid decrease occurring in the early years. The chromatography showed that the bitumen contained some very complex compounds, the major components being alkanes. The heptane fraction of the binder lost 62% of its volatile compounds in 1 year and 98% in 4 years.

The viscosity and stiffness of the bitumen was also found to increase with time. This is consistent with the observed loss of volatile compounds and increases the vulnerability of the asphalt mix to cracking under diurnal thermal stress cycles.