

## CRITERIA FOR MARTENSITE FORMATION ON WHEELS CAUSED BY GROSS SLIP IN BRAKING: COMPARISON OF THEORY AND EXPERIMENT

Previous work indicates that an increase in effective adhesion can be achieved by running wheels in slip during braking. It is known however that high flash temperatures are generated by this mode of operation. Martensite formation resulting from high service temperatures can cause wheel damage by spalling.

A test programme was therefore planned to establish the levels of slip and speed over which no martensite was formed. In addition it was hoped to determine at least one limiting case for martensite formation by deliberately causing tread damage. Testing took place using the Tribometer Train at the Old Dalby test track.

The results indicate that the 'homogeneous austenite limit' forms a satisfactory indication of the lower bound for flash temperatures that result in martensite formation. This would form a conservative criterion if used to prevent wheel damage as the thin martensite layers formed near the limit do not appear to result in gross damage to the wheel.

The calculation of this limit is however limited in accuracy due to two major factors: uncertainty over the representative contact patch dimensions, and inaccuracies in the diffusion model employed. The latter is largely due to limits on the extent of current knowledge.

The best estimates for the above factors, in which an elliptical contact is assumed and diffusion at the peak temperature is assumed to occur for 0.24 of the contact time, produced a prediction on the basis of theoretical flash temperatures that was in good agreement with the experimental results.