

AN ASSESSMENT OF THE PREDICTIVE CAPABILITY OF THE SMALL CREEPAGE RAIL CORRUGATION THEORY

The small creepage theory describes initial corrugation growth by a periodic wear process controlled by dynamic interactions at the wheel rail contact patch. The corrugation predictions are influenced by the dynamic behaviour of the track and the wheelset and by various factors which describe the geometry of the contact patch. The analysis shows that contact patch size fluctuations are dependent on the wheel geometry, the transverse rail head profile and the contact position along the potential corrugation wave, and that these fluctuations are important in controlling the corrugation behaviour.

Details of work to check this theory and the associated corrugation predictions produced by the computer program are given in this report. The predictive capability of the theory is assessed by comparison with observed corrugation behaviour in service.

The conclusions of the report are:

- The validity of the numerical integration routines used in the computer programming of the small creepage corrugation theory has been checked. Consistent behaviour is obtained as the effects of more complete modelling of the contact patch are included.
- The predictive capability of the small creepage corrugation theory has been demonstrated using unloaded track receptance measurements. No corrugation deepening is predicted at an un-corrugated site, whilst corrugations are predicted to grow at about the wavelengths measured at a corrugation site. The small creepage theory appeared to provide a better simulation of service behaviour than other BR corrugation theories. Poor agreement between measured and predicted corrugation behaviour was obtained when statically loaded track receptance measurements were used.
- There were considerable differences in the unloaded track dynamics at the corrugated and un-corrugated sites. An understanding of the dynamic behaviour at the un-corrugated site may provide an insight into the track features that suppress corrugation growth. This in the longer term may offer a means of modifying existing track to avoid or delay corrugation growth and allow corrugation suppressing effects to be incorporated into new track constructions.