

WHEEL/RAIL WEAR

1. FUNDAMENTALS OF FLANGE WEAR AND LUBRICATION

The wear of wheels and rails costs BR several million pounds per year. However, the importance of wheel/rail wear is not merely economic; vehicle dynamics, adhesion and safety are among the many spheres of railway operation that are also affected. The many previous studies of wheel/rail wear failed to provide a sufficiently deep understanding of the wearing processes, or provide a satisfactory way of estimating the wearing qualities of steels proposed for wheels or rails. This project was therefore initiated to provide a basic understanding from which economic methods of reducing wheel/rail wear could be developed.

Broadly there are two types of wear mechanism. Mild, possibly corrosive, wear occurs on all railheads and wheel treads. A more severe wear mechanism can be involved between the side of rails (sidecutting) and wheel flanges. This report considers the latter, more severe, type of wear that usually occurs on curved track.

The relative movements and pressures that can exist between flange and rail during sidecutting are described. The wearing phenomena associated with a finite area sustaining a range of relative movements and stresses are explored in the laboratory. A stress criterion is established, relating normal and tangential forces with the initiation of severe, metallic wear. Flange lubricants reduce tangential surface forces and thus raise the critical normal force at which severe wear is initiated. Effective flange lubrication thus reduces the proportion of wheels causing severe wear.