Rail and Wheel Flange Lubrication

Contrary to popular belief, railway rails have a limited life span. Where all railway vehicles are steered through curves by their wheel flanges, severe metal to metal contact and "scouring" occur in the steering interface, resulting in heavy wear in these contact areas.

If this wear is not addressed, the rail and wheel flanges are both worn away aggressively and prematurely, costing large amounts of money in maintenance and replacement. However, if the interface is lubricated, dramatic savings are achieved.

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Good lubrication in this wear interface, compared will no lubrication, was scientifically measured and documented as prolonging the life of rail on a curve as much as between 60 to 78 times (6 000 to 7 800%) and that of wheel flanges as much as 17 to 22 times (1 700 to 2 200%) The return on investment for rail only was recently calculated to be about $34,7 for every $1 spent.

External means

Since there is no reservoir of lubricant along the length of the rail, the lubricant has to be replenished at regular intervals by external means. To have efficient lubrication, enough lubricant has to be applied to enable a reservoir layer to build up on the rail. Locomotive-mounted lubrication systems, purpose-built lubrication wagons, trackside application systems as well as dedicated road-rail (or hi-rail) lubrication vehicles are used to apply lubricant to either the rail or the wheel flange.

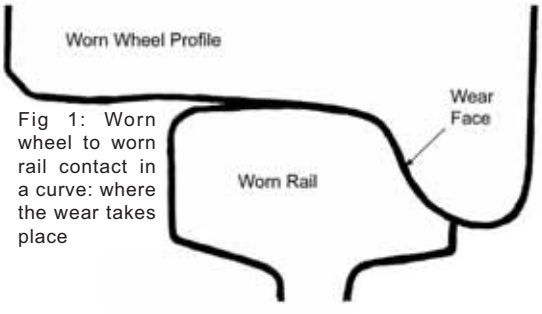

Fig 1: Worn wheel to worn rail contact in a curve: where the wear takes place

Most of the lubricant on the wheel flange and on the wear face of the rail is picked up and re-applied in a reciprocating action on the wear interface.

Level of tackiness

Since this is a total loss application, cheaper and easily manufactured lubricants are commonly used. The lubricant has to have water resistant characteristics as well as a measure of tackiness so as not to be easily flung off the wheel flanges. Calcium based, lithium based and calcium complex greases are generally used in this application.

The wear resisting elements (additives) commonly used are graphite and molybdenum disulphide. Because the lubricant is applied, used and consumed outside in the open where the environment can easily be contaminated by spills, environmentally friendly lubricants are specified with greater frequency in line with the increased application of environmental laws and regulations.

High lateral forces

Most of the factors governing consumption of lubricant in the rail-wheel interface can be traced back to the intensity, frequency and the duration of application of high lateral forces in this contact area between rail flanks and wheel flanges. Because of this relationship, it seems logical that the consumption would be easily calculated. It is, however, not as simple as it seems since the intensity of application of the lateral forces differ from point to point along the rail.

Trying to quantify the obstacles in establishing the optimum volume of spread for rail and wheel flange lubrication is the subject of a study at the University of Johannesburg.

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