TRACTION BETWEEN ROLLING STEEL SURFACES. A SURVEY OF RAILWAY AND LABORATORY EXPERIMENTS

A survey is presented of the many studies undertaken to measure the friction between railway wheels and rails, and of laboratory investigations aimed at understanding the frictional processes involved. The wide variations in rail friction is caused, according to laboratory tests, by changes in the rheological properties of solid railhead debris as modified by water and small amounts of oil. The major source of debris is identified as rust. Surface layers reduce the initial slope of the friction force/creepage curve, though experience with locomotives suggests that friction is increased by a sufficiently severe sliding/rolling action before being reduced by thermal softening under more extreme slip.

In conclusion, present day methods still largely rely on sanding of the rails, where, presumably, the crushed silica suitably modifies the flow properties of the wet railhead contamination. Krause comments that it is impossible to separate silica from rust debris by mechanical means. Japanese and some European railways employ abrasive filled scrubber blocks or auxiliary cast iron brakeblocks to scrub the wheel tread but, again, the reason for their success is unclear; either they condition the tread or they supply solid debris which acts in a manner similar to sand. Meanwhile, ways of preventing the formation of rust/water films on the rails are being considered; they include the installation of non-corroding railheads, chemical methods of resisting corrosion, and the warming of rails just above dew point to maintain dry surfaces. Were any such technique proved reliable and economic, then the operating constraints on railways could be widened dramatically.

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