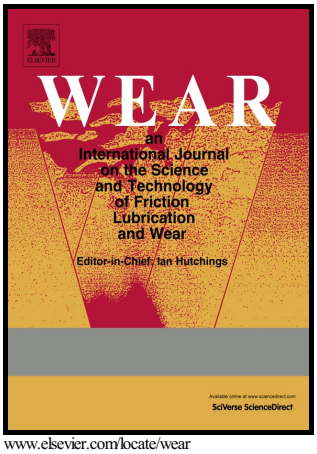

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THE EFFECTS OF FRICTION MANAGEMENT MATERIALS ON RAIL WITH PRE EXISTING RCF SURFACE DAMAGE

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Abstract

Management of rolling contact fatigue (RCF) risk is a critical maintenance activity in railway operations. Practical means of RCF mitigation involve: 1) preventative and corrective grinding to remove RCF cracks; 2) management of wheel and rail profiles to minimize peak contact pressures; and 3) selection of appropriate rail metallurgy. In addition, reduction of traction forces by application of dry film Top of Rail friction modifiers (FM) has recently been shown to reduce crack growth and extend grinding intervals.

Hydro-pressurisation and crack face lubrication are processes by which liquid materials (e.g., water), enter pre-existing RCF cracks and under wheel/rail contact pressure and cause accelerated crack growth, leading to spalling and shelling on rail and wheels. Thus, any liquid material added deliberately to the wheel/rail interface should be considered carefully in terms of the potential for aggravating RCF damage. This study compares the impact on hydro-pressurization and crack face lubrication of different types of materials designed for application to the top of rail using twin disc testing. One type of FM material is water-based, drying providing solid particles to the rail-wheel contact. Two other types are oil or oil-plus-water-based (hybrid material) that do not naturally dry and have been introduced more recently to the market. In addition, a commonly used gauge face lubricant (grease) was evaluated.

Keywords: RCF, Friction Modifier, Lubrication, Hydro-pressurisation

1 INTRODUCTION

Management of Rolling Contact Fatigue (RCF) is associated with high capital spending for all railway operators globally. The key motivation for managing RCF is related to extending rail life and associated with overcoming safety risks like rail breakages. Successful mitigation strategies include a combination of selecting the appropriate RCF resistant rail grade, applying a preventive (if necessary also corrective) maintenance strategy including optimised wheel and rail profiles and introducing a friction management program [1]. The term friction management refers to a combined application of gauge face (GF) lubrication and top of rail (TOR) friction control. Numerous studies into the cause and effect of RCF have been carried