Development of a novel component test to investigate railway switch slide baseplate tribology

A. E. Beagles, R. Lewis*, D. I. Fletcher
Department of Mechanical Engineering, University of Sheffield, S1 3JD, UK
*roger.lewis@sheffield.ac.uk

1. Introduction

The most mechanically complicated parts of the railway infrastructure are found in sections of switches and crossings (S&C). These include sets of points that allow trains to change tracks. This is achieved by the switch blades (see Fig 1) being moved to engage with one of the two rails. The movement is (in most instances) across slide baseplates. This paper describes a novel testing methodology that is being used to assess the performance of various combinations of lubricants and surface materials for these slide baseplates when subjected to the loads and movements associated with service conditions. Preliminary results are included.

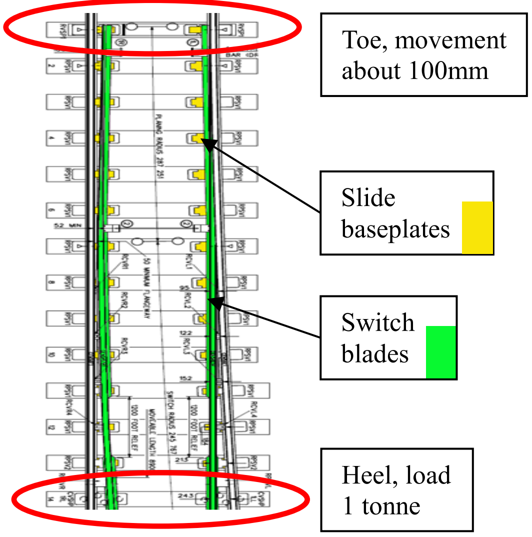

Fig 1: Slide baseplates in context, beneath switch blades

2. Service Loads and Lubrication

Slide baseplates are subjected to two different loading regimes:

1. Movement of switch blade when points operate
   - Can occur 200-300 times per day
   - Duration about 4 seconds
   - At toe (free end)
     - Moves about 100mm
     - Vertically loaded up to 363kg, depending on geometry, ancillary equipment etc.
   - Near heel (built-in end)
     - Moves about 5mm
     - Vertical loaded by about one tonne, depending on alignment and support force
2. Passage of train wheels moving switch blade
   - May occur up to about 2000 times per day
   - Duration about 50 milliseconds
   - Moves about 0.5mm
   - Vertical load up to about 100kN

To ensure the actuator is capable of operating the points the friction associated with moving the switch blade needs to be controlled; typically cast iron slide baseplates are sprayed with a Teflon compound or brushed with grease every four weeks.

3. Test Regime

The slide baseplate nearest the heel was selected for testing in this case. A novel method for mounting a slide baseplate and switch blade section in a 250kN biaxial test machine was developed. The vertical actuators applied the required compressive forces and the horizontal actuators provided the movement, see Fig **2**.

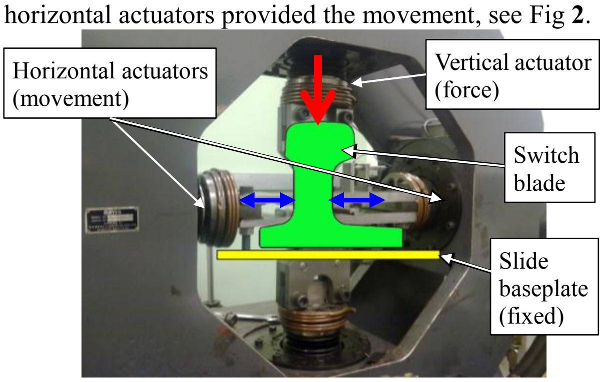

Fig 2: View of biaxial machine indicating loading

The realistic load/movement cycles (apart from rest periods) are shown in Fig **3**. Friction and wear analysis will be presented.

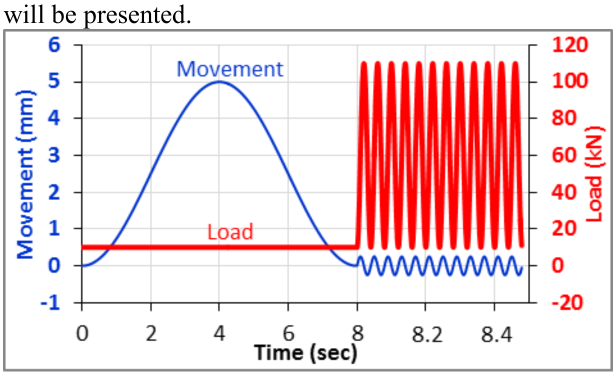

Fig 3: Test Regime (note non-linear abscissa)

4. Conclusions

By using loading corresponding to that expected in service the results can inform decisions on the lubrication regime/surface materials to be used on components in points on the railway.

This work was supported in part by the EC Framework 7 project SustRail: "The sustainable freight railway: Designing the freight vehicle – track system for higher delivered tonnage with improved availability at reduced cost", Grant 265740.