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Dindar, Serdar; Kaewunruen, Sakdirat

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Investigation of Risk-based Maintenance Strategies for Turnout Geometry Restoration

Serdar Dindar[1] and Dr Sakdirat Kaewunruen[2]

[1]*Birmingham Centre for Railway Research and Education, School of Engineering, The University of Birmingham, Birmingham, B15 2TT UK,* SXD319@bham.ac.uk, *Postgraduate Researcher*

[2]*Birmingham Centre for Railway Research and Education, School of Engineering, The University of Birmingham, Birmingham, B15 2TT UK,* s.kaewunruen@bham.ac.uk, *Senior Lecturer*

ABSTRACT

Railway turnouts are a critical railway infrastructure with a unique complex geometry. As a consequence, they induce a diverse nature of risk during railway operation. A large number of accidents, collision and derailment in particular, occur on or near railway turnouts. Not only do the accidents result in operational downtime and financial losses, they may also yield the casualties and, occasionally, the loss of life. As a result of such complexity, the maintenance burden of turnouts is remarkably high. To reduce the cost, casualties and faults, a risk-based maintenance strategy for geometry problems of turnouts has been developed. In addition to the model, the paper deals with various geometry-related failures and assesses the relationship between the failures and their contributing factors.

INTRODUCTION

Railway turnouts are designed to enable a rolling stock to move from one track onto another. It is a structural grillage system that assembles a variety of differently aimed rails (e.g. stock, guard and closure rails), switches, crossings, rail braces, steel plates, fasteners, rubber pads, insulators, screw spikes, rail blades, plates, ties, ballast and formation. A turnout needs special care for being well-operated to ensure all components work properly altogether within accepted criteria. As a result of the large number of components in a turnout, its geometry is a crucial element for consideration by the owners and infrastructure managers of rail networks. It should also be taken into account that a large variety of reasons, e.g. natural impacts and poor maintenance, give rise to making turnouts difficult to maintain (Dindar & Kaewunruen, 2017).

Each turnout has a unique design and complexity, which means that all cannot be handled altogether. On the other hand, it is almost impossible to devise a maintenance strategy considering them individually on account of financial reasons and the lack of explicit data. Therefore, it is suggested that many aspects of turnouts, e.g. geometry-based faults and environmental-based problems, be reviewed each by each (Dindar, et al., 2016). In this paper, possible natural impact-based maintenance strategies for the geometry of railway turnout is discussed and some recommendations are provided for the railway industry.

GEOMETRY PROBLEMS

Turnouts often represent a singular installation in the industry. Compared to other railway installations, they are of materials with high track stiffness because of altered sleeper dimensions and arrangements, additional rail elements, etc. Moreover, the conditions of the wheel-rail interface differ notably through a

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REFERENCES

Dindar, S. & Kaewunruen, S., 2017. Assesment of Turnout-Related Derailments by Various Causes. Sharm El-Sheikh, Egypt, in Press, Springer-DE.

Dindar, S., Kaewunruen, S. & An, M., 2016. Identification of Appropriate Risk Analysis Techniques for Railway Turnout Systems. Journal of Risk Research, in Press.

Dindar, S., Kaewunruen, S., An, M. & Bin Osman, M. H., 2016. Natural hazard risks on railway turnout systems. Procedia Engineering, pp. 1-6, in Press.

Hassankiadeh, S., 2011. Failure analysis of railway switches and crossings for the purpose of preventive maintenance, Stockholm, Sweden: KTH Royal Institute of Technology.

IPART, 2011. Review of Efficient Maintenance, Sydney: Booz & Company.

Kaewunruen, S., 2014. Monitoring structural deterioration of railway turnout systems via dynamic wheel/rail interaction. Case Studies in Nondestructive Testing and Evaluation, Volume 1, p. 19–24.

Lin , . C.-Y., Saat, M. R. & Barkan, C. P. L., 2013. Causal Analysis of Passenger Train Accident on Shared-Use Rail Corridors. Submitted for consideration for presentation and publication at the Transportation Research Board 93rd Annual Meeting, 13 Nov, p. 2015.

NetworkRail, 2014. Asset Management Strategy, London: NR.

ORR, 2014. Strategy for regulation of health and safety risks: Infrastructure asset safety, London: RSSB.