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Alternative Railway Line/Points Heating using Thermoelectric Heating

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Abstract: Railway points and track without any form of heating can fail under challenging cold weather conditions due to freezing, leading to service disruption, train delays, cancellation and speed restrictions that impact on customer satisfaction with the railway network and train operator. This paper investigates the novel use of thermoelectric heating as an alternative to the most commonly implemented solution of electric strip resistive points heaters used by Network Rail in the UK. The design and practical implementation of a small-scale laboratory experiment set-up, test procedure, and test results are presented that demonstrate the heating and performance characteristics of a Network Rail approved electric strip heater, and a novel thermoelectric heating solution, to determine if thermoelectric heating is suitable for this industrial application. The results demonstrate the thermoelectric system successfully raises the temperature of a railway line test piece from ambient room temperature conditions, similar to an electric strip heater, with further work required to optimise the design and obtain practical test results at lower ambient temperatures where freezing prevention will be required. The application of thermoelectricity to heating and de-icing railway points and track is a new and novel area, and represents an opportunity to develop a different technological approach and solution.

Keywords: railway points heating, railway points de-icing, thermoelectricity, thermoelectric heating, electric strip heaters

Main highlights:

A novel thermoelectric heating system, and a standard Network Rail approved electric strip heater typically used for railway line points heating and freezing prevention, have been evaluated in a small-scale practical test set-up and both systems demonstrate a 1.2 metre railway line test piece can be heated above ambient room temperature. This is a new and novel application for thermoelectric heating systems and will be developed further to identify the relative advantages and disadvantages of the system when compared with the standard industry solution, and if the thermoelectric system is a viable alternative.