

Research Experience Placement (REP) Scheme Project

The REP scheme offers funding to support summer placements for undergraduate students studying quantitative disciplines *outside of NERC's scientific remit*, during which they will undertake research within the environmental sciences.

Project Supervisors:

Professor Mark Robinson

Project Title:

Sustainable Railway Sleepers – Environmental Performance Comparison



Project Description:

<p>A sleeper is a cross tie that provides support for the rails as shown in the figure above.</p>

<p>Novel materials, such as synthetic-composites, are already in use across Europe and provide a sustainable and environmentally friendly alternative to timber sleepers and bearers (shown above). They also provide a solution to help mitigate the upcoming European ban on the use of Creosote as a timber preservative. However, to date, the application of synthetic-composite sleepers has generally been limited to specific pilot sites and to tracks applications with relatively low speeds and tonnage. At the same time, in response to the sustainability challenges, there have been significant advances in:</p>

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| <ul style="list-style-type: none">• the carbon footprint of existing sleeper materials, and• novel materials used in other sectors that may be suitable for use as sleepers. |
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<p>This is an important project that addresses a key societal challenge for the rail sector. This subject is of concern to Network Rail and knowledge is needed to be able to discuss the environmental credentials of novel sleepers in comparison to conventional sleepers. This project will support further development for environmentally friendly sleepers.</p>
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The project will determine:

- planned use of novel materials in sleeper construction;
- existing novel sleeper materials already in use and present some case studies on their environmental performance in comparison to conventional sleeper materials.

A literature review shall include evidence of developments in existing sleeper materials, such as; low carbon concrete, cement free concrete and alternatives to creosote treatment to develop an environmental performance evidence base to allow trade off analysis to be undertaken to compare further use of traditional materials versus the development and use of novel materials. Such trade off analysis would include an assessment of the energy consumption and carbon production during manufacture.

The final report will include the estimated quantified life cycle benefits (including carbon) of novel sleeper materials compared with current sleepers.

Project Timeframe:

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