RailKonsult

Office of Rail Regulation

Further Assessment of Approaches to Improve Efficiency

Study Overview

Reference BBRT-2071-RP-0000a

Executive Summary

RailKonsult was commissioned by the Office of Rail Regulation earlier this year to produce a report that provided an improved understanding of best practice maintenance and renewal techniques used elsewhere in Europe. This is a follow-up report that covers a further four subject areas.

As previously, the review of each individual activity included consideration of the differences in approach, potential benefits which arise from adopting best practice and any issues associated with implementing the revised approach including identification of safety concerns and timing of implementation. Varying progress has already been made in the introduction of these approaches to Britain.

The table below summarises the maintenance and renewal activities selected together with an assessment of the potential opportunities to improve efficiency if each practice was to be widely applied in Britain. The ability to provide estimated potential savings is constrained by the level of information available.

It is not the intent of these papers to provide a detailed, bottom-up, financial analysis. The efficiency assessments are simple analyses that provide an indication of the financial advantages if best European practice was adopted in preference to current British practice.

	Activity	Source	Potential Savings
8	Enclosed Barriers	Austria, Netherlands and France	£3.1m (protection costs only)
9	Ballast Distribution and Redistribution systems	Austria and North America	£6.3m per annum
10	Use of Bespoke Plant to Undertake Track Renewals	Various	Circa 30% per composite metre
11	Efficient European Rerailing Technique	Switzerland	£19m (40% of cost Category 2 type renewals)

Acknowledgements

RailKonsult wish to acknowledge the support and assistance received from the following organisations in compiling this report:

- Geismar
- Robel
- Herzhog
- Plasser and Theurer UK
- Swietelsky International
- SBB (Swiss Federal Railways); and
- Sersa.

Contents

1.0 BACKGROUND

1.1 Introduction

As part of its research into the Periodic Review 2008, ORR commissioned RailKonsult in March 2008 to review current European track engineering best practice. The objective was to identify typical approaches that RailKonsult considered to be examples of European best practice that are well suited for adoption by the British rail industry. This report was issued in May 2008.

ORR subsequently commissioned RailKonsult to undertake a short review into a further four areas. The output from these studies is published here.

Throughout this report, reference is made to current British practice. As previously, in the context of this report, this terminology refers to Network Rail controlled infrastructure and not other railway systems within Great Britain such as London Underground.

1.2 Study Methodology

The approach adopted for the study was similar to that used for the initial exercise. The initial phase was to select the elements for review.

Following identification of suitable areas, information was gathered from a number of sources. Contact was made with a number of European organisations in order to obtain the necessary information. The contact was either by phone or email. The nature of this exercise inevitably limits the amount of information that can be gathered in the time available.

During the course of the review, RailKonsult have contacted the following organisations:

- Geismar
- Robel
- Herzhog
- Plasser and Theurer UK
- Swietelsky International
- SBB (Swiss Federal Railways); and
- Sersa.

2.0 SCOPE OF STUDIES

2.1 Activities Reviewed

The following activities were selected for analysis in this Report.

	Practice	***As observed/applied in***
8	Enclosed Barriers	Austria, Netherlands and France
9	Ballast Distribution and Redistribution Systems	Austria and North America
10	Use of Bespoke Plant to Undertake Track Renewals	Various
11	Efficient European Rerailing Technique	Switzerland

2.2 Structure of Reports

The structure of the individual reports follows the same structure as previously:

- Explanation of the activity under review;
- Description of European best practice;
- Description of current British practice;
- Analysis of the differences between the two including, where possible, quantification of the benefits offered by adopting European best practice;
- Identification of any safety implications; and
- Analysis of the issues surrounding adoption of the practice into the British railway environment.

Note that, whilst references are made to specific products and systems that are in use in particular countries, there may be other products available that provide a similar functionality. The reports do not review all available alternatives, or consider their comparative merits. The case studies are included as being indicative of alternative approaches in asset management.

It is not the intent of these papers to provide a detailed, bottom-up, financial analysis. The efficiency assessments are simple analyses that provide an indication of the financial advantages if best European practice was adopted in preference to current British practice.

3.0 SUMMARY OF TECHNICAL REPORTS

3.1 Enclosed Barriers

Use is made in Europe of mobile barriers. Effectively, a rail vehicle is provided to form a barrier between the staff working on one line and trains operating on adjacent lines. The types of rail vehicle available range from a simple set of trolleys with an integral barrier through to an enclosed self-powered unit complete with tools and materials.

In Europe, these vehicles have been used to enable the following maintenance activities to be undertaken:

- Detailed asset inspection;
- General inspection and maintenance in high risk areas (long tunnels);
- Welding and maintenance replacement of rails; and
- Component replacement activities such as repadding and removal of slurried ballast.

It is recognised that the European vehicles will require minor design alterations in order to fit the British structure gauge, whilst maximising the area within which maintenance can safely be undertaken.

Savings identified include:

- Eliminate need to set up automatic warning systems or site fencing;
- No requirement for protective speed restrictions on adjacent tracks;
- No requirement for additional possessions to work on middle tracks;
- Improved productivity as a result of protection from weather; and
- Improved productivity as a result of tools and materials being to hand.

In Austria, OBB have obtained productivity improvements of up to 70% through use of these systems as a consequence of eliminating losses due to poor weather and providing an environment where tools and materials are easily to hand.

The vehicles enable a protected green zone to be easily and quickly created. Asset stewardship would be improved as the availability of this technique could enable more timely intervention to occur when asset deterioration is identified.

Safety improvements are achieved through improved protection of staff undertaking maintenance duties.

3.2 Ballast Distribution and Redistribution Systems

Experience from Europe and elsewhere has indicated that significant financial savings can be achieved by ensuring that only the required additional maintenance ballast is dropped to achieve a compliant ballast profile. Traditional methods rely on low technology solutions to determine the quantity of stone required and to control the unloading of the ballast.

The approach recently adopted both in Europe and North America is to firstly use high-speed laser scanning devices to accurately determine the existing situation. Software is then used to calculate:

- How much surplus stone exists;
- How much additional stone is required to return to a compliant profile; and
- Where any new stone should be dropped.

The stone can then be either re-distributed, using bespoke machinery or new stone can be accurately delivered using automatic ballast discharge systems fitted with GPS locators.

Experience has shown that adoption of this approach provides the following benefits:

- Reduction in quantity of new maintenance ballast required;
- Reduction in size of wagon fleet and number of locomotives required;
- Improved management of hot weather precautions through better identification of sites requiring treatment; and
- Facilitates better integration of tamping and ballast management operations.

The initial efficiency improvement obtained from adoption of these processes to manage ballast profiles is estimated at £6.3m per annum.

Safety improvements are obtained by reducing the number of staff required to be on or about the line whilst surveying the existing ballast profiles, unloading the additional stone and manually producing the required profile.

3.3 Use of Bespoke Plant to Undertake Track Renewals

Over the last twenty years, British track renewals methodologies has been reliant on the use of multi-purpose road rail machinery (RRM). During this period, an increasing array of attachments has been developed. These enable the RRMs to undertake more of the on-site activities. The British track renewal industry has seen the removal of reliance on a single piece of machinery as a key benefit, i.e. reduction in the risk of a possession overrun due to plant failure. However, this is at the expense of cost and time.

In Europe during this period there has been a trend in the opposite direction. Bespoke machinery has been developed that is designed to maximise the production output of a specific activity. These pieces of equipment deliver high quality output and generally enable renewal to be undertaken on a single line. Examples of this equipment already in use in Britain include the high-output trains recently successfully introduced by Network Rail.

It is estimated that the deployment of bespoke plant onto track renewals activities instead of RRM machines will produce efficiency savings of circa 30%.

The use of RRMs on site introduces risks that need to be controlled. These include:

- An increase in the number of vehicles on site;
- Ability of machines to swing around across several tracks; and
- Machines moving in both directions, i.e. with and against production flow.

Introduction of bespoke machines instead of RRM's will assist in reducing and controlling these risks.

3.4 Efficient European Rerailing Technique

Rail is replaced either as a maintenance activity or a renewal activity. In the former case it involves the removal of discrete defects, whilst the objective of the renewal activity is to replace longer lengths that have been identified as having reached their optimal life cycle in

that location. This latter process lends itself to being undertaken using production flow processes.

The Swiss have developed such a process that maximises output in short possessions, using dedicated teams and plant selected to support particular activities. The process makes use of mobile flash butt welders and heater stressing techniques as described in RailKonsult's initial report. Benefits are obtained from undertaking both rerailing and stressing activities in a single visit. This reduces the cost of the job and reduces the potential risk of damaging track components as a consequence of unclipping and clipping the rails a second time.

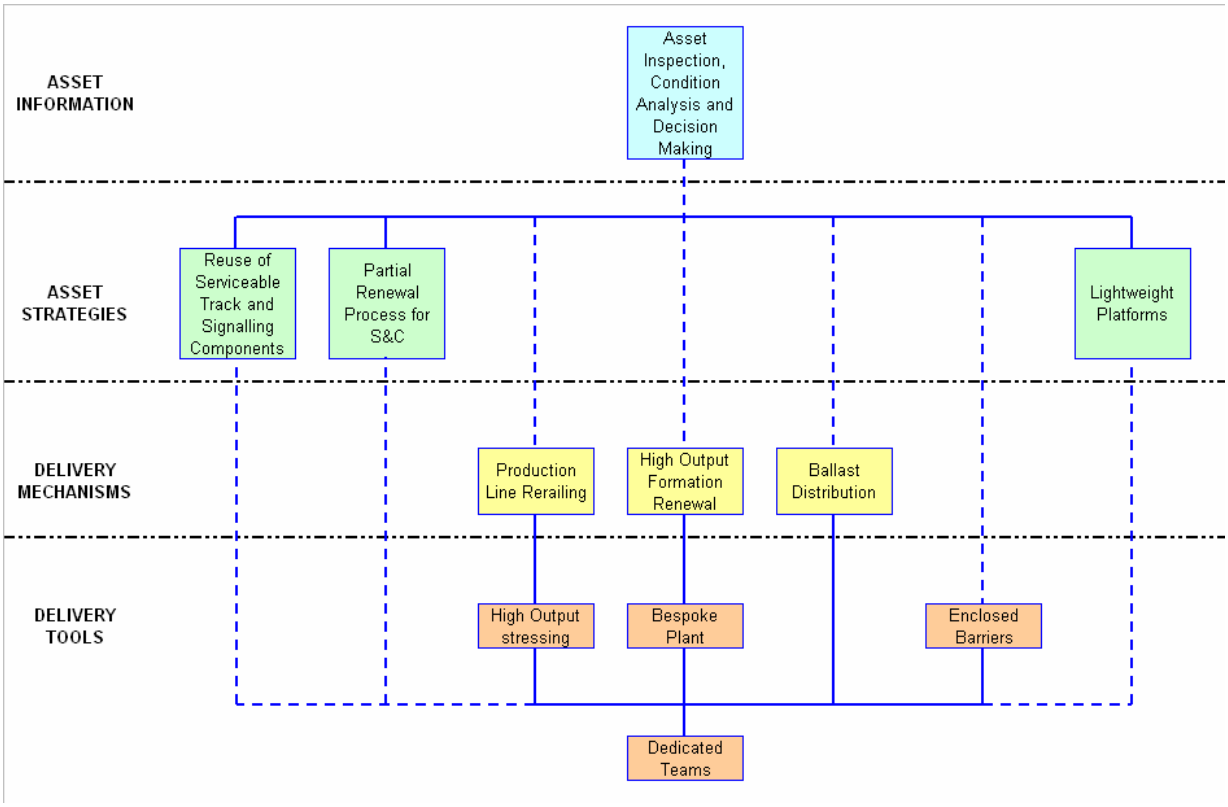
It has been estimated that the Swiss production line approach produces an efficiency saving of 40% in comparison with the traditional British rail renewal methodology.

The success of this methodology is under-pinned by having dedicated teams who deliver the process using a manufacturing approach to continually improve. This requires the generation of a suitable work bank to fully employ the team.

Safety improvements arise from the reduction of time spent on site to achieve the same output.

3.5 Relationship between Initiatives

As indicated in the preceding section, there is a relationship between several of the topics that have been reviewed. The diagram below illustrates this relationship.



3.6 Other Topics Identified

The scope of the studies undertaken has been constrained by both time and resources. Appendix A of this report contains a complete list of the topics considered, including those that were not pursued. Additionally Appendix B identifies further potential areas where

greater efficiency or output might be achieved. These topics were identified either from the Railkonsult reports or from the ORR 'Best Practice' tour undertaken in 2007.

4.0 CONCLUSIONS

As with the initial review, this study has reviewed European approaches to the delivery of several maintenance and renewal activities. Examples of good practice have been identified, which in all cases could be transferred to Britain.

In order to introduce the identified best practices into Britain, an implementation period of between one and three years would be required for each process. The estimated time periods do not take into consideration the quantum of any other changes being undertaken.

In overview, potential savings have been identified for each process examined. Additionally, many qualitative improvements in asset management have also been identified.

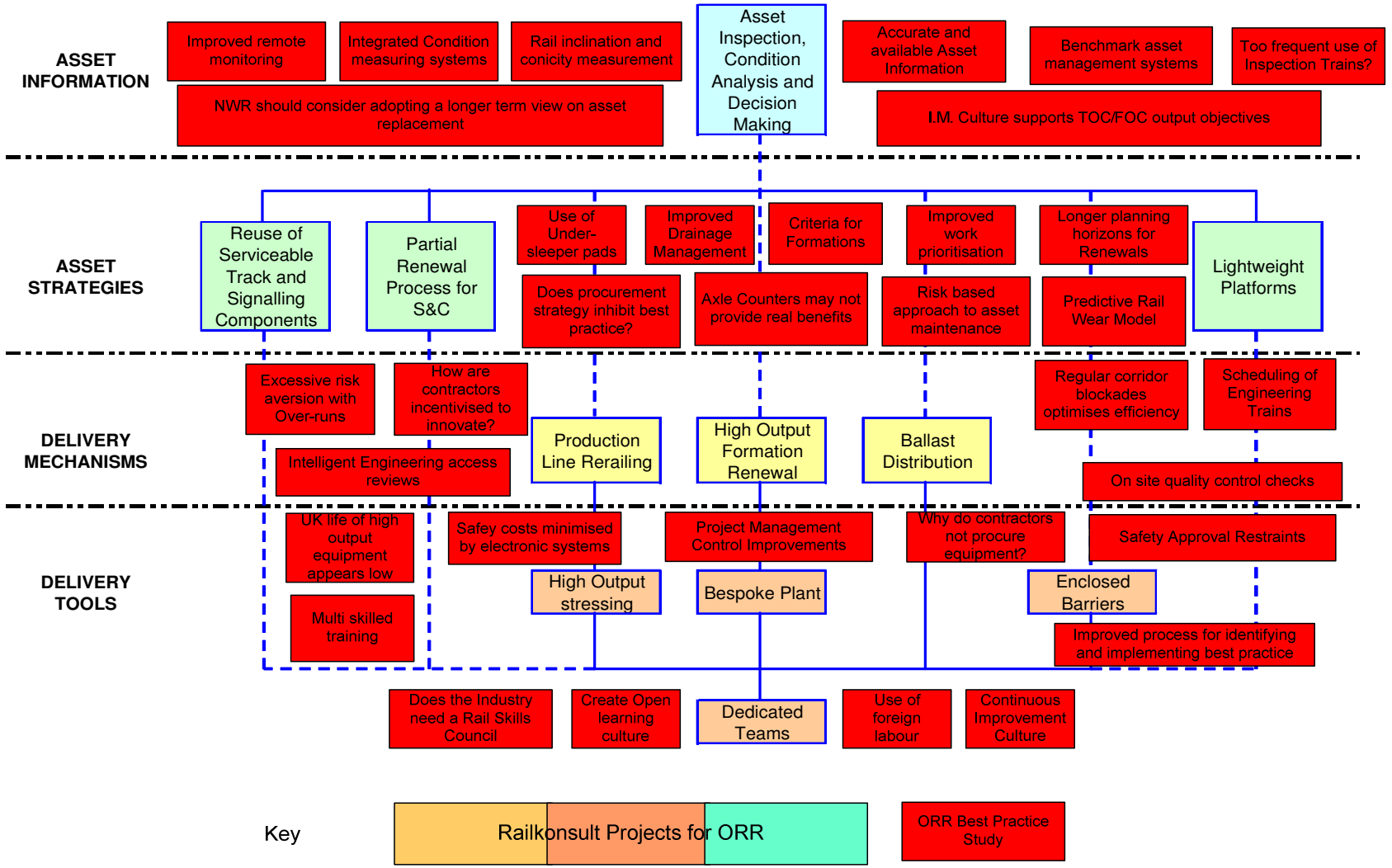
It has also been noted that although each of the study areas can be pursued individually, they each form part of an overall picture. As such, they are self supporting.

APPENDIX A: STUDY TOPICS

1. **Asset Inspection, Condition Analysis and Decision Making**. Automated inspection of track assets, with results fed into decision support tool that is able to provide frontline track staff with clear guidance on what and when to undertake maintenance and renewal intervention.
2. **Reuse of Serviceable Track and Signalling Components**. Assessment of renewed track and signalling items for potential further service life, possibly by cascading to lower category locations (i.e. locations where dynamic loadings are reduced.
3. **Partial Renewal Process for S&C**. Process of undertaking condition assessment and appropriate replacement of S&C components as required on a need basis, as an alternative to complete renewal of entire unit.
4. **High-Output Formation Renewal**. Dedication items of plant that provide the capability to renew track ballast and install a formation treatment, without the need to remove the track.
5. **High-Output Stressing System**. Stressing of significant lengths of rail in a single shift using of rail heaters in combination with mobile flash butt welding.
6. **Polystyrene Platform Extensions/Reconstructions**. Achieve a reduction in time and cost for new platforms through the use of lightweight modular platforms.
7. **Dedicated Teams**. Approach to management of on-site resources that results in teams becoming highly skilled and practised at a particular activity.
8. **Enclosed Barriers**. Use of rail vehicles to provide staff protection whilst undertaking minor works in single line working environment, e.g. floorless carriage that encloses working area and provides power take-off points directly to work location.
9. **Ballast Distribution**. Process that involves automated survey of ballast profile followed by a ballast redistribution system or by the operation of ballast train that use GPS technology to automatically deposit ballast at the locations identified in the survey.
10. **Bespoke Plant**. Review of advantages and disadvantages of using bespoke dedicated machines relative to the alternative approach of using multi-purpose RRV machines in order to understand why the former is the preferred method.
11. **Rerailing**. Rerailing of significant lengths of rail in a single shift using dedicated team delivering a lean process.
12. **Specialist Switch Changing Gantries**. System of gantries designed to provide the capability to undertake high output, exchange of switch and crossing components.
13. **Drainage renewal (and maintenance)**. Review of processes used in Europe to ensure that properly functioning track drainage is available.
14. **Plant Reliability**. Comparison of plant reliability levels across Europe, including identification of the root causes of any variation identified.
15. **One piece level crossings**. A modular system provides reduction in life cycle costs of level crossings
16. **Versatility of staff**. Efficiency improvements available from adoption of strategy of versatile of staff within delivery operations.

17. **Track Access Arrangements.** Variations in European approach to track access, including planning timescales, time to take possessions, single line operations, and working around live traction systems.
18. **Relationship between Contractor and Infrastructure Manager.** Nature of relationship between industry parties required to achieve optimal results from introduction of innovation and change.
19. **Project/Programme Management.** Review of management resources required to deliver integrated programmes, including location within supply chain.
20. **Measurement of Track Stiffness.** Use of portable equipment to confirm track stiffness achieved during track renewal processes.

APPENDIX B: POTENTIAL IMPROVEMENT AREAS RAILKONSULT & ORR 'BEST PRACTICE' STUDY



RailKonsult