

Foster Rail – Infrastructure Roadmap

21 June 2016 – Prague
Leoš Horníček (CTU in Prague)

Orig. 7 April 2016 - Brussels

Ulf Bohlin
Trafikverket

Kevin Blacktop
Network Rail



Potential for improvements

Infrastructure continues to be the major cost driver for the railway system. Focus must be on achieving cost effectiveness, reliability, flexibility and availability.

To address this is needed to:

1. Increase track resilience and cost efficiency.
2. Reduce maintenance costs and maximise track availability.
3. More modularization and well defined interfaces.
4. More automated condition monitoring and maintenance.

Potential for improvements

Inspection, maintenance and renewal are currently time and labour intensive. Increasing customer demand for longer operating hours will only drive down the opportunity to gain track access, whilst the increase in capacity will drive up degradation rates, both combining to drive up cost.

1. New designs and materials e.g. self healing. Results in reduced preventive maintenance.
2. Targeted timely maintenance interventions.
3. Reduced time for tests, homologation and time on the track for renewal of components.
4. Autonomous monitoring, inspection and repair. Less track workers and less accidents.
5. Infrastructure, capacity management and vehicles optimised to deliver minimum wear and tare on fixed and mobile assets.

Expectations from Shift2Rail

Expected are:

- 1. Development and refinements of existing infrastructure designs.**
Must function together with legacy technology.
- 2. Development of modelling tools for virtual prototyping and testing.**
Virtual modelling instead of costly mock ups and extensive field testing – zero on site testing vision.
- 3. Search for and application of new materials.**
Such as self adjusting track components, elimination of hazardous track works, non intrusive condition monitoring and predictive maintenance ...
- 4. Capitalization of opportunities that digitalization and automation offers.**

Expectations beyond S2R

1. Implementation of S2R results – full scale implementation 2025 and beyond.

Such as better infrastructure designs, modelling tools for virtual prototyping and testing, application of new materials. S2R II needed.

2. Use of Artificial Intelligence for handling of and acting upon vast amounts of data.

Artificial Intelligence is in its infancy. The potential for savings are huge.

3. Non disruptive condition monitoring.

In service train track monitoring systems.

4. Automation/robotization of maintenance.

Robotic inspection and repair tools between trains or in difficult access areas.

5. Realization of the Digital Railway ...

Everybody is talking about the digital railway but there is no comprehensive unanimous picture of what it is and its impact on the railway system. We believe that there will be big changes but no one is able to imagine the full extent of these changes.

Visual Roadmap, milestones and deliverables overview

SRRIA Priority	2015	2020	2025	2030	2035	2040	2045	2050
Improved design and materials to increase track resilience and cost efficiency	Shift2Rail + H2020 (MGE) Infrastructure + Others							
	Optimised track TRL1-3	Optimised track TRL4-6	Optimised track TRL7-9+	New resilient materials and improved conventional designs etc.				
	Self healing or extreme long life materials for structures		Self healing or extreme long life materials for structures		Self healing or extreme long life materials for structures		Includes life extension repair techniques	
	Optimise structure repair and life extension techniques	Optimise structure repair and life extension techniques	Optimise structure repair and life extension techniques	Bridge, tunnel and station repair and life extension processes and materials				
	Improved design for climate change resilience	Improved design for climate change resilience	Improved design for climate change resilience	Tolerance to poor drainage / flooding				
Non-disruptive inspection and targeted timely maintenance interventions to reduce costs and maximise track availability	Optimised S&C		Optimised S&C	Improved support conditions and reliability				
	Inservice train track monitoring systems	Inservice train track monitoring systems	Inservice train track monitoring systems	Inservice trains to avoid path loss of dedicated measuring vehicles				
	Remote Condition Monitoring	Remote Condition Monitoring	Remote Condition Monitoring	Roll out of trackside RCM to monitor whole route				
	Develop new maintenance strategies based on improved asset data (RCM)	Develop new maintenance strategies based on improved asset data (RCM)	Develop new maintenance strategies based on improved asset data (RCM)	Develop right first time maintenance interventions based on improved asset data				
	Mobile maintenance / inspection vehicles with automation	Mobile maintenance / inspection vehicles with automation	Improved maintenance fleet for adjacent line working and high speed maintenance / inspection of track and structures					
New infrastructure technologies. This will include new track forms, switches and crossings, and their potential for commercial development	New concept S&C		New concept S&C	New concept S&C	Possible link to rolling stock design			
	New concept track		New concept track	New concept track	New track system design			
	Develop new standards and pursue legal change to support new technologies		Develop new standards and pursue legal change to support new technologies	Develop new standards and pursue legal change to support new technologies	Support the rollout of new technology			
	New concept level crossings		New concept level crossings	New concept level crossings	Level crossings that improve safety and capacity of rail and road			
	Modelling tools to analyse whole-life whole-system energy and carbon impacts. The application of new materials and construction techniques, modularisation for fast change components, pre-fabricated modules can offer significant improvements in performance and reductions in investment and operational costs	Modelling tools for earthworks management		Modelling tools for earthworks management	Modelling tools for earthworks management	Develop modelling tools to understand earthworks behaviour and best practice interventions		
Decision support tools for sustainable design and energy efficiency		Decision support tools for sustainable design and energy efficiency	Decision support tools for sustainable design and energy efficiency	Develop tools to support whole life approach and energy efficiency				
Modelling tools for structures management (bridges and tunnels)		Modelling tools for structures management (bridges and tunnels)	Modelling tools for structures management (bridges and tunnels)	NDT, proximity measurements, high speed assessment and modelling tools to determine bridge and tunnel behaviour and non-intrusive innovative repair				
Modelling tools to improve passenger management through stations		Modelling tools to improve passenger management through stations	Modelling tools to improve passenger management through stations	Develop tools to manage passenger flows to improve station capacity with safety				
Modelling tools for track system management		Modelling tools for track system management	Modelling tools for track system management	Develop modelling tools to determine track system condition and intervention support				
Modelling to support the development of smart power grids		Modelling to support the development of smart power grids	Modelling to support the development of smart power grids	Support the development of smart power grids including traction power feeds, energy harvesting and future rolling stock and infrastructure requirements				
Intelligent infrastructure maintenance and inspection and defect detection technologies carried out at commercial speeds		Self adjusting trackside components		Self adjusting trackside components	Self adjusting trackside components	Mechanics to provide self adjustment and / or self repair e.g. S&C		
	Autonomous infrastructure monitoring and decision support		Autonomous infrastructure monitoring and decision support	Autonomous infrastructure monitoring and decision support	Systems to monitor trackside RCM data to analyse trends and help plan timely maintenance interventions			
	Robotic / autonomous inspection & repair		Robotic / autonomous inspection & repair	Robotic / autonomous inspection & repair	Robotic inspection and repair tools between trains or in difficult to access areas to maximise work in limited access times			
	Real time asset monitoring		Real time asset monitoring	Real time asset monitoring	Real time asset monitoring	Real time asset monitoring	Real time asset monitoring using Autonomous systems to analyse data support intervention decisions	
	Integrated real time asset monitoring with traffic management System		Integrated real time asset monitoring with traffic management System	Integrated real time asset monitoring with traffic management System	Integrated real time asset monitoring with traffic management System	Integrated real time asset monitoring with traffic management System	Integrated asset management & traffic management to optimise route capacity	

Thank you for your attention!

Full Roadmap

<http://www.errac.org/foster-rail/deliverables/>