The UIC Project PROSPER - Harmonised Environmental Specifications for new Rolling Stock

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Abstract

To maintain and even enhance the environmental advantage of rail transport continuous environmental improvements without compromising functionality or cost is needed. This can only be achieved if a harmonised approach exists to handle these aspects consistently during the procurement and manufacturing process. The UIC funded project PROSPER (Procedures for Rolling Stock Procurement with Environmental Requirements) facilitates such a harmonised approach. The results will become available in the UIC leaflet “Environmental Specifications for New Rolling Stock” which will be published in spring 2006.

In this respect PROSPER combined and integrated existing knowledge serving as a guideline for implementing environmental requirements into the procurement process. PROSPER actively sought the expertise and feedback from a broad range of actors and stakeholders, especially from members of the various international working groups of UIC and UNIFE dedicated to the different aspects of the four environmental key areas Energy Efficiency, Materials/ Recycling/ Waste, Noise and Exhaust Emissions.

Introduction

Enhancing the environmental performance of new rolling stock is one of the ways in which the railways can be made more competitive compared to other modes of transport. In this respect UIC initiated the PROSPER project (Procedures for Rolling Stock Procurement with Environmental Requirements), which was finalised in July 2005. The main outcome of the project is the UIC leaflet “Environmental Specifications for new Rolling Stock”, which will contribute to harmonisation of the environmental procurement framework in the rail sector at European, and in the long-term global level. By doing so the process of procurement will become more efficient, enabling railways to procure new rolling stock with a sound environmental performance more cost effectively.

The PROSPER project was carried out in close cooperation by UIC and UNIFE members and employed a feedback process which was open to the whole railway industry.

The UIC leaflet “Environmental Specifications for New Rolling Stock” will be published in spring 2006 and can then be purchased from the UIC at \url{www.uic.asso.fr}.

PROSPER Project Design

The PROSPER project was designed towards developing a commonly agreed approach for handling environmental aspects at procurement level within the whole rail industry – including both rail operators and rail vehicle manufacturers. To this aim a consensus oriented communication and feedback process was launched. The establishment of this process is in itself one major result of the PROSPER project as it provides a working basis for further activities in this field.

The PROSPER project was conducted in two phases. Outcome of phase one was a guideline for eco-procurement. This guideline was concretised and enhanced in phase two of the project to become the UIC leaflet “Environmental Specifications for new Rolling Stock”.

The results of previous projects were duly taken into consideration, like the Nordic Environmental Manual, the RAVEL\textsuperscript{1} project, the REPID\textsuperscript{2} project, and the EVENT\textsuperscript{3} project. This information was enhanced by interviews and further research. \cite{2}

The stakeholder engagement process

Using a comprehensive three-phase consultation process, all relevant stakeholders were involved in the project. By means of written documentation, interviews and discussion forums such as reference group meetings (RGM) and network meetings (NM) the expertise of operators, manufacturers, sub-suppliers and other experts was incorporated in the development of the UIC leaflet. \cite{2}

![Figure 1: PROSPER project design](image)

The UIC Leaflet “Environmental Specifications for New Rolling Stock”

The UIC leaflet Environmental Specifications for New Rolling Stock addresses all relevant aspects for the integration of environmental aspects into the procurement process. It is designed to enhance the procurement of rolling stock for both setting up invitations to tender and evaluating tenders with regard to their environmental performance.

It is the aim of the leaflet to contribute to harmonisation of the environmental procurement framework in the rail sector at European, and in the long-term global level. The leaflet will facilitate an efficient procurement process in terms of environmental requirements and enables railways to procure new rolling stock with a sound environmental performance more cost effectively. \cite{1}

The UIC leaflet “Environmental Specifications for New Rolling Stock” will be published in spring 2006 and can be purchased from UIC at www.uic.asso.fr.

The following key questions in the process of procurement of rolling stock are addressed in the leaflet:

\begin{itemize}
  \item \textbf{What are the key environmental areas to be addressed in invitations to tender?}
  
  The key areas of energy consumption, noise emissions, exhaust emissions and materials/recycling/waste are considered and have been included in the leaflet.

  \item \textbf{How should the procurement process be organised to enhance the environmental performance of new rolling stock?}
  
  As the procurement of new rolling stock is influenced by a large number of different actors inside and outside the railways, it is crucial to have a clear view of the process steps needed and the categories of
\end{itemize}

\begin{footnotesize}
\begin{itemize}
  \item \textsuperscript{1} RAVEL – Rail Vehicle Eco Efficient design, EU funded project
  \item \textsuperscript{2} REPID - Rail sector framework and tools for standardising and improving usability of Environmental Performance Indicators and Data formats was a EU funded project which was very much interlinked with PROSPER
  \item \textsuperscript{3} EVENT - Evaluation of Energy Efficiency Technologies for Rolling Stock and Train Operation of Railways, UIC project
\end{itemize}
\end{footnotesize}
experts that must be involved in procurement of rolling stock and the role they must play in order to achieve a clearly defined environmental performance.

*Which environmental specifications should be used in invitations to tender?*

The focus of the leaflet is to harmonise a set of qualitative environmental specifications that cover the key aspects governing the environmental performance of railway operations. In the leaflet target values are given for those specifications for which they could be derived from the applicable legislation. For all other quantifiable and measurable specifications no values are defined. Instead, operators should set requirements for performance values in order to assess the environmental performance of new rolling stock under specific conditions and at the same time improve the information bases for the respective specification. In this respect it has to be pointed out that the leaflet is to be considered a first step towards a business standard regarding environmental aspects for the rail sector.

*What approach should be used to evaluate tenders?*

An approach to the evaluation of tenders should integrate assessment of the environmental as well as the economic performance with respect to Life-Cycle-Costs (LCC). A five-phase model for the evaluation process is proposed. [1]

**Scope and Approach of the Leaflet**

The leaflet is intended to provide assistance for the procurement of new rolling stock for passenger as well as freight transport (multiple units, locomotives, wagons and coaches). It addresses all relevant areas in the context of integrating environmental aspects into the procurement process. The leaflet adopts a functional approach using performance-related and not solution-related environmental specifications.

In general, a life-cycle perspective is favourable when assessing environmental impact. In this respect the recommendations given in this leaflet aim at improving environmental performance focusing on the most crucial issues within the whole life-cycle. In many cases the long life span of rail vehicles shifts the use phase into the centre of attention. On the other hand, operators are best equipped to improve performance during use at the procurement stage. [1]

**Target Audience**

The leaflet is aimed at users within the rail business who are involved in the procurement of new rolling stock, but who are not directly concerned with environmental aspects. Technical and purchasing experts in particular are therefore identified as the main user groups, but environmental experts will also find valuable information.

Although the leaflet is primarily geared towards assisting operators, it is also intended to be useful for engineering and purchasing staff of manufacturers in the supply chain (system integrators, system manufacturers, sub-suppliers, etc.). [1]

**Overview of all Specifications**

The core of the UIC leaflet Environmental Specifications for New Rolling Stock is a set of harmonised environmental specifications in the four environmental key areas Energy Efficiency, Materials/Recycling/Waste, Noise and Exhaust Emissions. Table 1 lists these environmental specifications which are defined and described in detail in the leaflet.
Table 1: Overview of all specifications

<table>
<thead>
<tr>
<th>Legally mandatory specifications</th>
<th>Performance mainly dependent on design</th>
<th>Performance mainly dependent on operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>key area</td>
<td>key area</td>
</tr>
<tr>
<td>Noise</td>
<td>specification</td>
<td>specification</td>
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<tr>
<td></td>
<td>Passing-by noise</td>
<td>Not applicable</td>
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<tr>
<td></td>
<td>Stationary noise</td>
<td>Not applicable</td>
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<td></td>
<td>Starting noise</td>
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<td>Diesel exhaust emissions</td>
<td>Diesel exhaust emissions</td>
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<tr>
<td>Materials</td>
<td>Legally restricted materials</td>
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<td>Others</td>
<td>Electromagnetic fields</td>
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<tr>
<td>Energy</td>
<td>Specific mass</td>
<td>Traction energy consumption</td>
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<td>Materials</td>
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<td>On-board energy consumption</td>
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<td></td>
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<td>Energy recovery/regeneration</td>
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<td>Energy management for parked vehicles</td>
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<td>Energy metering devices</td>
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<td>Others</td>
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<td>Diesel exhaust emissions – specific load conditions</td>
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<td>Diesel exhaust emissions at longer standstills</td>
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<td></td>
<td>Emissions from brake friction material</td>
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<td></td>
<td>Spillage/ leakages</td>
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</tbody>
</table>

**Legally Mandatory Specifications**

For the specifications in the first row, the environmental performance is legally regulated. A potential better performance than the legal baseline could represent a more sound long-term investment in rolling stock because it reduces the risk of future expenses and efforts to meet higher environmental legal standards.

**Voluntary Specifications**

The second row contains specifications which are not governed by legislation. These specifications can be used in invitations to tender according to the environmental strategy of the company, national requirements and priorities as well as economic assessments.

**Performance mainly dependent on design**

The first column comprises specifications which have a direct influence on the environmental performance of rolling stock basically independent of the operation of the rolling stock. As examples the rate of renewable materials and the specific mass are fixed by construction and do not change during the lifetime of the vehicle unless design changes are made to the vehicle.

**Performance mainly dependent on operation**

The environmental performance with respect to issues addressed in the second column depends to a high degree on how the new rolling stock is actually used in operation. The design is certainly a precondition to obtaining a good performance. But whether or not it is reached in practice depends to a large extent on operational patterns and the infrastructure on which the rolling stock is used.
meters for example will not yield any reduction in energy consumption by themselves, but are a prerequisite for energy efficient driving campaigns with which energy consumption can be reduced dramatically. [1]

Considering Environmental Aspects in the Procurement Process

The procurement process for new rolling stock is characterised by a range of different requirements to be fulfilled and a large number of actors involved (see figure 2).

**Procurement Process ↔ Environmental Tasks ↔ Input/ Output**

New rolling stock shall be procured

**Step 1**

Preparation of the procurement project

Frame requirements for the procurement of the rolling stock are defined

**Step 2**

Drawing up the invitation to tender

Invitation to tender is present, rolling stock manufacturer are invited

**Step 3**

Evaluation of tenders

The result of the evaluation is present

**Step 4**

Decision on a tender/contract

Rolling stock with defined performance parameters will be procured

**Tasks**

• Internal implementation of set of environmental specifications
• Market investigations – identification and assessment of good practise examples
• Assessing additional external and internal requirements
• Draft invitation to tender
• Draft for the evaluation of tenders

**Tasks**

• Determination of the environmental specifications including target values and detailed descriptions of the required environmental performance

**Input:**

• External requirements
• Environmental policy of the company
• UIC Leaflet Environmental Specifications for New Rolling Stock

**Output:**

• Draft invitation to tender
• Draft for the evaluation of tenders

**Tasks**

• Evaluation methodology to be chosen
• Evaluating the environmental performance of the tendered rolling stock
• Life Cycle Cost and Risk Assessment

**Input:**

• Draft for the evaluation of tenders
• UIC Leaflet Environmental Specifications for New Rolling Stock

**Output:**

• Detailed environmental specifications (target values, environmental performance)

**Tasks**

• Fixing defined environmental performance, milestones for the follow-up on environmental performance, verification procedures

**Input:**

• Results of the evaluation

**Output:**

• Rolling stock with defined environmental performance

Figure 2: Procedure for the integration of environmental aspects into the railway procurement process
For an efficient integration of environmental requirements into the railway procurement process, it is important to clarify and define the roles of the different players in the process and be aware of the interfaces involved and information required at the various process stages. [1]

**Outlook**

The environmental performance becomes an increasingly important factor for the competitiveness of railways in comparison to other modes of transport. To maintain and even enhance the environmental advantage of rail transport continuous environmental improvements without compromising functionality or cost are needed. This can only be achieved if a harmonised approach exists within the rail sector to handle these aspects consistently during the procurement and manufacturing process. The UIC leaflet “Environmental Specifications for New Rolling Stock” facilitates such a harmonised approach. However the leaflet is only a first step ahead. Further harmonisation of the framework and specifications seems appropriate from an environmental as well as economic perspective. If conducted adequately it can be of mutual benefit for railway operators as well as rail vehicle manufacturers.

**Acknowledgements**

The authors would like to thank UIC together with the contributing railways for funding the project and the partners of the Reference Group for their valuable contributions.

The members of the Reference group were:

Veronique Andries (Alstom)
Markus Halder (DB)
Rikke Naerra (DSB)
Patrick de Metz (SAFT)
Roger Müller (SBB)
Uta Maria Pfeiffer (Siemens)
Willy Bontinck (SNCF)
Thierry Loizeau (SNCF)
Raimondo Orsini, (Trenitalia)
Mads Bergendorff (UIC)
Susana Martins (UNIFE)
Michael Schemmer (UNIFE)

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