Eco procurement guidelines - proven in use

InfraGuider workshop in Paris 2010-06-08

Sara Paulsson
Manager Centre of Competence in Design for Environment (CoC DfE)
Bombardier Transportation
2010-06-08
Agenda

How does Bombardier deal with Design for Environment?
- History
- Important environmental aspects
- Main drivers
- Customer environmental requirements
- Organization
- Examples

UIC Leaflet no. 345
- PROSPER => UIC Leaflet
- How has Bombardier used this document
- Environmental Performance Indicators (EPIs)

Summary and Recommendations for InfraGuider
Design for Environment

Goal:
Minimise the environmental impact throughout the entire life cycle

Production

Use

End-of-Life

Resource Efficient

Low Emissions

Recyclable

Sustainable Materials

Energy Efficient
History - DfE at Bombardier Transportation

- Design for Environment at Bombardier started up in early 90s
  - Initiated by a customer with strong environmental requirements

- Today high environmental requirements requested by most customers in Europe

- Also outside Europe the environmental requirements have increased dramatically

- Standardization of products is required to cut costs and for this harmonized e.g. environmental requirements are a key!!
Environmental aspects of rail vehicles

- Emissions – CO₂, NOₓ, SO₂ etc.
- Noise
- Energy consumption
- Particles
- Chemicals
- Materials
- Electromagnetic fields
- Land use
- Recycling / deposit
Motivation / Drivers for DfE

- Forthcoming Legislation regarding products
- Forthcoming Customer Requirements
- Forthcoming Industry Agreements (e.g., UIC)
- Forthcoming Market, competition
- Forthcoming Relevant Standards
- Forthcoming Legislation regarding sites/processes
- Forthcoming Corporate Policies and other commitments (e.g., UITP)
- Forthcoming Process improvement

Bombardier Transportation
Common Customer Environmental Requirements

- **Environmental Management System**
- **Restrictions on Materials**
  - Prohibited & Restricted Substances
- **Specify all Materials used the vehicle**
  - To be used for homologation
- **Safety Data sheets (SDS)**
  - To be provided for harmful materials
  - Legal requirements according to REACH
- **Recycling highly prioritized**
  - Target values according to ELV Directive
  - Calculations applying ISO 22628
  - Specify recyclability of materials used
  - Use materials that are recyclable, and specify the amount
  - Marking of polymers to facilitate recycling
- **Recycling Description / Manual**
- **Life Cycle Assessment (LCA)**
  - According to ISO 14040
- **Environmental Product Declaration**
  - According to ISO 14025
- **Restrictions on Emissions**
  - Particulate e.g. brake pads, leakage of oil, greases etc
  - Air quality inside vehicles
    - Formaldehyde & VOC emissions verified
- **Take-back obligation**
- **Energy efficiency**
Global centre of competence in Design for Environment, with a company wide network - to ensure harmonized and high level of environmental competence.
Bombardier DfE Projects Experiences - worldwide

Metro Delhi - India

HH DT5 - Germany

Singapore DTL

SSL - UK

NAT - France

20 EMU China

Gröna Tåget - Sweden
Life Cycle Perspective
Monitoring and Improving the Environmental Impact and CO₂ Footprint

Features

- Life cycle perspective - an integrated part in the design process at Bombardier
- Life Cycle Assessment (LCA) is a tool to analyze the environmental impact of a product
- LCA is used to further improve the environmental performance of our product

Example:

**CO₂ footprint for Innovia ART 200**

~ 9 gram CO₂ for transportation per passenger km

Unique Benefits

- Takes all life cycle phases of a product into account;
  - Raw material production, manufacturing processes, vehicle operation as well as end-of-life treatment
- Applied according to the ISO 14040 standard
- Results preferable presented in an Environmental Product Declaration (EPD) according to ISO 14025
- Measurable product performance improvement
Improved Recyclability
Example from a French regional vehicle applying the ISO22628

- Composites: 2%
- Polymers: 5%
- Metals: 86%
- Chemicals: 1.5%
- Other Materials: 4%
- Electrical Components: 0.5%
- Renewable Materials: 0.5%

Recyclability: 97%

- Energy recovery: 6%
- Residues: 3%
- Material recycling: 91%
Environmental Product Declarations (EPDs)
Communication of Environmental Performance

Features

- Standardized way to communicate the environmental performance of a product
- Summarize the technical and environmental performance of a product covering all life cycle phases:
  - **Technical performance**: Energy consumption, noise emission, material composition, recyclability, PM$_{10}$ and NO$_X$ (for diesel vehicles)
  - **Environmental performance** *(based upon a Life Cycle Assessment)*: Use of resources, waste generation and environmental impact expressed as e.g. CO$_2$ footprint

Unique Benefits

- Bombardier Transportation was first within the rail industry to produce an EPD
- EPDs are produced for both vehicles and components
- Application of ISO 14025 as well as commonly agreed Product Category Rules for Rail Vehicles (PCR 2009:05)
- Third party validation of information and results included
- Bombardier is acting with full transparency to the benefit of our customers

More information available at: [www.environdec.com](http://www.environdec.com)
Energy efficient solutions

- EnerGpian Simulation Tool
- MITRAC Energy Saver
- ThermoEfficient Climatization System
- AeroEfficient Optimized Train Shaping
- EBI Drive 50 Driver Assistance System

- Energy Savings: 20%
- Energy Savings: 30%
- Energy Savings: 26%
- Energy Savings: 12%
- Energy Savings: 15%

- Visual Improvement: 100%
- Reduced Particle Emissions: 87%
- Energy Savings: 5%
- Increased Efficiency: 2%
- Energy Savings: 10%

- PRIMOVE Catenary-Free Operation
- C.L.E.A.N. Diesel Power Pack
- FLEXX Tronic Technology
- MITRAC Permanent Magnet Motor
- Energy Management Control System

© Bombardier Inc. or its subsidiaries. All rights reserved.
PROSPER project

Objectives:
- To increase the overall "eco-efficiency"/ sustainable performance of new rolling stock
- To assist railways in setting up environmental requirements and assessing tenders
- To initiate a dialogue with users (railways) and stakeholders (UNIFE, manufacturers)

Results of the Project:
- a guideline to assist in setting up environmental requirements and evaluating tenders
- a set of recommended qualitative environmental specifications (defining performance values)
- a reference document for experience, examples and state of the art of environmental relations and their economic cost/benefit aspects

Output: Environmental Guideline for the Procurement of Rolling Stock (UIC leaflet)
Key Environmental Areas for Railways
- identified by PROSPER

- TSI’s for high speed and conventional rail
- Helps to cut LCC and strengthen the competitive advantage

- Noise
- Energy Efficiency
- Diesel Exhaust Emissions
- Materials/Recycling/Waste

- Defined by the Non-Road Machinery Directive
- Defined by e.g. the EU WEEE and RoHS Directive
PROSPER Key Environmental Areas

**Noise**
- Passing by noise
- Stationary noise
- Measurement procedure

**Material/Rec/Waste**
- Black list, Grey list
- Recycling rate

**Exhaust Emissions**
- NOx, CO, HC, Particles

**Electromagnetic Fields**

**Energy Efficiency**
- Traction efficiency
- Vehicle mass
- E-management comfort
- Diesel consumption
- On-board energy calculation
- Traction energy calculation

**Other Emissions**
- Brake pads
- Prevention of shedding
Implementation of indicators within Bombardier completed

**Mandatory Legislation**

Priority 1

- Energy Recovery
- On-board Energy Consumption
- Traction Energy Consumption
- Hazardous Waste

- Diesel Exhaust Emission Factors for Specific Load Conditions
- Emissions from Brake Pads and Spilling
- Restricted Materials

Priority 2

- Specific Mass
- Diesel Exhaust Emissions at Standstills
- Electromagnetic Fields
- Recycling Rate
- Renewable Materials

Voluntary

PROSPER

UIC Leaflet no. 345 “Environmental Specifications for New Rolling Stock”
Environmental Performance Indicators – EPIs
- further elaborated at Bombardier

Bombardier have developed based upon PROSPER our own interpretation of the Indicators

1 Background
2 Key features
3 Business Impact
4 Typical Application Fields
5 Material EPIs
   5.1 CE-Mat
   5.2 Prohibited & Restricted Substances
   5.3 Recycling
   5.4 Renewable materials
   5.5 Hazardous waste
6 Process EPIs
   6.1 DfE training
   6.2 DfE publications
7 Energy EPIs
   7.1 Simulations
   7.2 Energy EPIs
      7.2.1 Mass
      7.2.2 Running resistance (RR)
      7.2.3 Energy recovery
      7.2.4 Onboard energy consumption
      7.2.5 Traction energy consumption
   7.3 Complementary report
EPI – Recycling
- applying the ISO 22628

Recyclability

Vehicle

Energy recovery
Material recycling

90%
5%
0%
20%
40%
60%
80%
100%
Functions: Reports

Filter for:
• Project
• Supplier
• System
• Level of detail
• plus specific factors, e.g. Renewable materials only

Reports:
• End-of-Life
• EPI:
  • Hazardous Waste
  • Prohibited
  • Recycling
  • Renewable
  • Restricted
• Material
• Material Group
• Prohibited & Restricted
• Weight

Save as:
• pdf
• Word
• Excel
Functions: Reports, Example of an EPI report
EPI – Traction energy consumption
Energy EPIs used as input to RailEnergy

kWh (consumed minus regenerated) for
• a certain track
• a certain speed profile including brake
• characteristics with a certain weight of the train
• a certain aux. power

Energy index = \frac{\text{Energy}}{\text{Size} \cdot \text{Distance}} \Rightarrow \frac{kWh}{\text{passenger} \cdot \text{km}}

Number of passengers at a certain load factor
1 km
Summary and recommendations to InfraGuider

- **UIC Leaflet**
  - Highlight the areas of importance
  - Target values are missing
  - Algorithms are missing, makes the requirements difficult to work with
  - Only reference to legislation - no added value!

- Harmonized environmental requirements shall identify and explain the differences compared to legislation

- Clear defined environmental requirement from “customers” are needed since this is an important driving force
Key success for harmonized environmental specifications are:
- Clear definitions and available algorithms
- Only “shall” requirements
- Identify differences to legislation, challenge
- Target values defined
- Measurable requirements
- Regular update / review

Availability of harmonized environmental specifications:
- Provide transparency and common understanding of focus areas
- Promote standardization of products
- Reduce the work for especially smaller companies, “copy & paste” exercise
- Key success to improved environmental performance on products!
Thanks for your attention!

E-mail: sara.paulsson@se.transport.bombardier.com
Phone: +46 (0)10 852 7494