Timisoara Pilot Applications
- Test objectives, methodology and results-

Integral Consulting R&D
București

SNTFC CFR Calatori S.S
Regionala de Transport
Feroviar de Călători Timişoara
General presentation of Timisoara region

This particular region was selected because:

- it contains some of the most important Romanian cities (Timisoara, Arad, Oradea, Deva)
- it includes one of the most important national and international transport routes (to Hungary, Serbia)
- it’s connected to the fourth Pan-European Corridor, Berlin/ Nuremberg – Praga – Viena – Bratislava – Gyor – Budapesta – Arad – Bucharest – Constanța/Craiova-Sofia – Thessaloniki – Istanbul, divided in Romania in two ramifications:
  - Arad – Simeria – Brașov – București – Constanța
  &
  - Arad – Timișoara – Craiova – Calafat / Vidin – Sofia – Thessaloniki
ECORailS proposes a new concept for awarding rail vehicles and services that promotes:

- Energy Efficiency
- Environmental Friendliness
- Cost Efficiency

by using

The ECORailS Guidelines

**WP4 Tests**
Simulation of the awarding process based on the Guidelines
Verification of the Guidelines’ manageability and quantitative targets

**Test Sites**
- Berlin
- Lombardy
- Øresund
- Timisoara
Objective of Timisoara Pilot Application

- Elaboration of an awarding documentation with the inclusion of EE and Env criteria with the view to procuring:
  - 10 DMU
  - 10 EMU

  *This was considered as the minimum level of acquisitions needed in order to continue and to improve the rail passenger transportation*

- Testing the performance of the Guidelines and of the ECORailS project
Steps of Timisoara pilot application

→ Simulation of a competitive tendering procedure for the acquisition of 10 DMU & 10 EMU:

Step I
- Analysis of the current situation:
  - Currently used rolling stock (10%)
  - Recent tenders - awarding documentation (5%)

Step II
- Preparation of the acquisition project:
  - Awarding documentation without the ECORailS concept/criteria
  - Awarding documentation drawn up using the ECORailS Guide

Step III
- Draw up of simplified offers for the new requests
- Evaluation of offers
- Result of the evaluation

Step IV
- Analysis and quantification of the results obtained through the new awarding procedure
- Recommendations with regard to the elaboration of the awarding documentation and to the offers’ evaluation modality
Test methodology - Principles and stages

1. Draw up of Awarding Documentation:

- **Specification**
  - Operational conditions
  - User’s technical requirements
  - Reference to norms
  - ECORailS requirements and criteria
    - reduction of costs (LCC)
    - reduction of consumption
    - reduction of emission levels
  - Technical data forms
    - measurable
    - comparable

- **Acquisition sheet**
  - Calendar, including the period for clarifications for the tenderers
  - Point rating grid (offers’ evaluation)

- **Contract**
  - Acceptance conditions/ field tests on the test track and in exploitation
  - Clauses referring to the responsibilities and accountability of the contractor
Test methodology - Principles and stages

2. Simulation – Division by components method

→ out of the 83 technologies and operational measures indicated in the ECORailS project, 10 were selected and tested through the pilot application:

1. Rolling stock configuration
2. Diesel Engine
3. Regenerative braking and utilization of the energy for auxiliaries supply
4. Regenerative braking and reusing of the regenerated energy at start-up
5. Train Control and Management System (TCMS)
6. Optimized control of equipment
7. Heating- Ventilation- Air Conditioning (HVAC) System Optimization
8. Driver Assistance System
9. Control of comfort functions in parked train
10. LCC analysis driven procurement

- Actual line tests with existing rolling stock
- Calculations and simulations
- Data from ECORailS catalog, related projects, good practice examples, norms, manufacturer data, specialized literature, etc.

Analysis based on decisional matrices

Comparison with a large number of measurements and statistics related to train current service
Test methodology - Principles and stages

3. Comparison with current awarding and currently used rolling stock:
   - Similar conditions
   - Substantiation on the basis of calculations and statistical data processing
   - Comparisons and simulations in accordance with the data from ECORailS, Railenergy, Prosper, Event and other projects and specialized literature
   - Conclusions

4. Prediction of the EE/Env potential by 2020
   - Estimation of the increase in the volume of activity
   - Estimation of the increase in market share
   - Estimation of the increase in transport capacity
   - Estimation of the EE on system level
Test methodology - Principles and stages

6. Recommendations

- Method for filling-in the documents
- Evaluation weights promoting the ECORailS criteria
- Reference documents (ECORailS Guidelines, EU Directives)
- Standard Forms allowing an easy comparison and evaluation of offers
- Methodology

7. Consultations

- At regional level
- At national level
- At European level
Test Results: Accomplishment of the ECORailS performance indicators

✓ Quantitative indicators:
  ➢ 10,5% compared to current awarding
  ➢ 15,6% compared to the currently used rolling stock
  ➢ 27,56% at system level, by 2020

✓ Qualitative indicators - Manageability:
  ➢ Flexibility and adaptability to the needs and particularities of Timisoara test region
  ➢ Efficiency of the Guidelines for developing the awarding procedure in test site Timisoara
  ➢ Acceptability and participation by the Timisoara Site Stakeholders Group
Energy consumption vs. train configuration

No. of Pass. vs. Energy Consumption for Different Train Configurations

- ECorails
- DA
- MR1
- MR2
- MR3
- MR4

- (maxim) 300
- (average) 200
- (minim) 60

IEE/08/690, 06.05.2009 – 05.07.2011
Transport Logistic Fair Munich
Comparison of specific indicators for the analyzed diesel engines

**Fig.1** Distribution of specific fuel consumption over the analyzed engines

**Fig.2** CO₂, NOx and CO specific emissions of the analyzed engines
Conclusions regarding the analysis of the Diesel Engines

1) The fuel savings for Stage III B engines is between: 0 5% (Diesel Rail Study project)


3) The maintenance costs for Stage III B engines are reduced by: 5 15% (Diesel Rail Study project)

We obtained a decrease of specific fuel consumption and exhaust emissions level:

- in comparison with current awarding (ECORailS objective: 5%) of 8,5 %
- in comparison with currently used rolling stock (ECORailS objective: 10%) of 12,0 %
Energy Efficient driving tests

Trail run 1: consumption 9.6 kg

Trail run 2: consumption 11.7 kg
Energy Efficient driving tests

Consumptions along the Timisoara – Jimbolia – Timisoara route

- Trial run 1: 100%
- Trial run 2: 113%
- Trial run 3: 109%
- Trial run 4: 107%
- Year 2009: 133%

Optimized driving consumption vs. Average consumption per year 2009
## System wide improvement potential for 2020

<table>
<thead>
<tr>
<th>Calculated energy efficiency potential for Timisoara (compared to currently used rolling stock)</th>
<th>15,85%</th>
</tr>
</thead>
</table>

### Factors that lead to a system wide increase of energy efficiency

<table>
<thead>
<tr>
<th>Indicator target</th>
<th>Pessimistic</th>
<th>Probable</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in market share</td>
<td>5,16%</td>
<td>x</td>
<td>2,90%</td>
</tr>
<tr>
<td>Increase in volume of activity (train-km)</td>
<td>49,96%</td>
<td>x</td>
<td>7,92%</td>
</tr>
<tr>
<td>Average increase in capacity (seats)</td>
<td>5,62%</td>
<td>x</td>
<td>0,89%</td>
</tr>
<tr>
<td>Fully applicable ECORails criteria (compared to current awarding)</td>
<td>10,91%</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Total</td>
<td>15,85%</td>
<td>27,56%</td>
<td>42,69%</td>
</tr>
</tbody>
</table>
Conclusions

- The quantitative ECORailS indicators can be exceeded

- The application of the ECORailS methodology is advantageous for:
  - **Users** – important economic effects over the life cycle
  - **Suppliers** – the suppliers of innovative solutions are in advantage, the long term partnership with the user
  - **Public** - the quality of life increases and assures the basis for a sustainable transportation

- Conditions for the fast and efficient application of the ECORailS methodology:
  - National and EU level **political decision**
  - **Firm management** for the application and follow-up during exploitation and maintenance
Conclusions drawn from questionnaires

The Timisoara test showed that:

• the users are strongly convinced by the achievement of the quantitative targets

• the Guidelines can be successfully used to integrate energy efficiency criteria and environmental criteria in the awarding of rolling stock

• the users regard the awarding of rail vehicles based on energy efficiency, environment and cost criteria as difficult process but nonetheless important
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