Session 3: New Technologies available for worldwide Trolleybus Markets (Tendency of Market Segments)

Arnulf Schuchmann, Managing Partner
Worldwide trolleybus markets can currently be segmented - tendency

- Traditional systems on "high" level
- Traditional systems on "low" level
- Innovations like BRT
  - e.g. Lyon

New Technologies available for worldwide Trolleybus markets (Market segmentation)
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Overview

Current market segments within Europe

- Russia total: 90 11,300
- Total: 55 3,581
- Total: 47 1,850
- Total: 61 6,493

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28th February 2008
Key indicators for segmenting the market

"High" level
- traditionally trolleybus
- no big investment backlog
- environmental aspects of concern
- advanced technology
- stable demand focused on corridors

"Low" level
- traditionally trolleybus
- big investment backlog
- environmental aspects are neglected
- robust technology
- high demand in peaks, disperse

Innovative systems
- partly no tradition in trolleybus
- investment money available
- environmental aspects of concern
- innovative technology
- high demand focused on corridors

Segmentation

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Main market differences

- Price
- Technology
- Design
- Service

"High" level

"Low" level

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Relevant aspects for trolleybus cities and operators in traditional "high" level markets

**Aspects**

<table>
<thead>
<tr>
<th>Life cycle cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>long term cost pressure</td>
</tr>
<tr>
<td>investment budgets available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>articulated low floor buses</th>
</tr>
</thead>
<tbody>
<tr>
<td>try to focus on corridors</td>
</tr>
<tr>
<td>stable or increasing demand</td>
</tr>
<tr>
<td>passenger comfort</td>
</tr>
<tr>
<td>investment (capital cost) are less than 20% of the cost structure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>environmental aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td>zero emission, noise issue becomes crucial</td>
</tr>
<tr>
<td>super caps instead of diesel for auxiliary</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>auxiliary drive or super caps</th>
</tr>
</thead>
<tbody>
<tr>
<td>higher flexibility (for politicians often an argument)</td>
</tr>
<tr>
<td>no overhead line in depots needed</td>
</tr>
</tbody>
</table>

Segmentation

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Trolleybus market overview - 2007

... the use of large scale vehicles is dominant in the Swiss market. Solo vehicles have an average age of 20 years

Current Trolleybus Structure
Switzerland

<table>
<thead>
<tr>
<th>Articulated Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double articulated</td>
<td>74%</td>
</tr>
<tr>
<td>Articulated (not Fribourg)</td>
<td>19%</td>
</tr>
<tr>
<td>Bimode articulated</td>
<td>3%</td>
</tr>
<tr>
<td>Solo (in La-Chaux-de-Fonds, Lausanne and Lucerne)</td>
<td>4%</td>
</tr>
<tr>
<td>Trailer (64 pcs. - 54 in Lausanne and rest in Lucerne)</td>
<td>1%</td>
</tr>
</tbody>
</table>

Trolleybus Numbers and Age Structure
Σ 541 Trolleybuses

- Double articulated: 16
- Bimode articulated: 21
- Articulated: 400
- Solo: 20

Switzerland - example for a traditional market on "high" level

Segmentation

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New Technologies available for worldwide Trolleybus markets (Market segmentation)

Source: Interviews with PT-Companies; S2R Database 2007
Relevant aspects for trolleybus cities and operators in traditional "low" level markets

Aspects

- **investment cost**
  - scarce investment budgets available
  - loss making business (less subsidies)

- **solo buses**
  - disperse demand structure
  - decreasing demand
  - cheaper than articulated
  - more flexibility

- **robust technology**
  - easy to operate and maintain
  - no foreign spare parts needed
  - spare parts to be self made
Trolleybus operators in "low" level markets need to overcome its investment backlog

**Average price:** 400 thousand Euro
**Average age:** 8-10 years

- increase service quality by low floor, AC, etc.
- optimise LCC

**Average price:** 80-100 thousand Euro
**Average age:** 63% more than 10 years

- first: renew fleet within given budget
- second: think about typical optimisation topics (like in W.E.)
Main decision within traditional markets on "low" level is the price of the bus ...

**Market analysis for trolleybuses**

<table>
<thead>
<tr>
<th>Decision criteria</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Price of the bus</strong></td>
<td>~55%</td>
</tr>
<tr>
<td><strong>2. Life cycle cost:</strong></td>
<td>~25%</td>
</tr>
<tr>
<td>- spare part prices</td>
<td></td>
</tr>
<tr>
<td>- maintainability</td>
<td></td>
</tr>
<tr>
<td>- maintenance cycles/intervals</td>
<td></td>
</tr>
<tr>
<td><strong>3. Additional criteria:</strong></td>
<td>~20%</td>
</tr>
<tr>
<td>- workplace driver</td>
<td></td>
</tr>
<tr>
<td>- passenger benefits</td>
<td></td>
</tr>
<tr>
<td>- second hand price</td>
<td></td>
</tr>
<tr>
<td>- availability of spare parts</td>
<td></td>
</tr>
</tbody>
</table>
... whereas in mature ("high" level) markets additional services become more crucial

Market analysis for trolleybuses

<table>
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<th>Decision criteria</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Life cycle cost</td>
<td>~30%</td>
</tr>
<tr>
<td>Availability of spare parts throughout vehicle life time</td>
<td>~20%</td>
</tr>
<tr>
<td>Experiences, quality and references</td>
<td>~20%</td>
</tr>
<tr>
<td>Workplace drivers</td>
<td>~10%</td>
</tr>
<tr>
<td>Passenger benefits</td>
<td>~10%</td>
</tr>
<tr>
<td>Maintainability</td>
<td>~10%</td>
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Markets are different currently, from products perspective markets will be unified in future.
If you have any questions or if you would like to receive further information, please do not hesitate to contact us!

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