Threshold Values of Pavement Characteristics at the Initial Stage of a Road Lifetime

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Pavement Performance and Maintenance Needs Issues

- Economizing funds and, at the same time, offering a performant road
- Occurrence of a road closure, either complete or by lanes
Pavement design

• Design of the pavement in a rational way, so that the deterioration is equally distributed to all parts and characteristics
• Balanced deterioration of the pavement, distributed among skid-resistance, evenness, surface integrity and structural condition
Rehabilitation Options for Pavement Defects

- **Skid-Resistance**: Antiskid layer or micro surfacing
- **Evenness**: Local reshape + surfacing
- **Cracking**: Sealing + surfacing
- **Rutting**: Surface treatment + surfacing
- **Ravelling**: Bituminous spray + surfacing
Criteria for Defining Limit Values of Pavement Characteristics

- Qualitative determination of limit values
- Quantitative determination of limit values
Criteria for Defining Limit Values of Pavement Characteristics

- Accidental rate vs. SFC
  - Inflection point of accident rate
  - Three curves with different minR values: minR=100, minR=250, minR=500
Criteria for Defining Limit Values of Pavement Characteristics
Traffic Relating Equations of Pavement Features

• PSR = PSR\textsubscript{0} \times [1 - a \times \ln(1 + T)]

• SFC = SFC\textsubscript{0} \times (1 - \kappa \times T)

• IRI = IRI\textsubscript{0} \times e^{0.059 \times b \times A} \text{ or } IRI = IRI\textsubscript{0} \times e^{\lambda T}

• RD = RD\textsubscript{0} + \beta \times h\textsubscript{0} \times T^{0.25}
Long service life of pavement

- Rare maintenance operations
- Lower cost of upgrading works
- Minimum disturbance to traffic
Basic concept

• Definition of suitable values of pavement characteristics at the “opening-to-traffic” stage establishing high level-of-service for a long time
• Time schedule - the timing of future maintenance
Basic structure

• Definition of limit values at the operational stage

• Establishment of traffic – dependent equations
Basic structure

• Assuming RD=0, at the initial stage of a road lifetime

• Time elapsed and traffic volume introduced in traffic – dependent equations
Common practice vs proposed methodology

Separate rehabilitation operations for each feature:

- Skid-resistance upgrading
- Evenness repair
- Rutting treatment

Number of operations and road closures in common practice: 6

Overall rehabilitation by adjusting initial values for SFC and IRI:

Number of operations required and road closures by adjustment of initial values: 2

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Not uniform deterioration
## Commonly used limit values of pavement features

<table>
<thead>
<tr>
<th>Pavement feature</th>
<th>Indicator or factor used</th>
<th>Limit values at the operational stage of road life</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>National network</td>
</tr>
<tr>
<td>Skid-resistance</td>
<td>SFC</td>
<td>0.40 - 0.50</td>
</tr>
<tr>
<td>Evenness</td>
<td>IRI (m/km)</td>
<td>2.65 - 3.00</td>
</tr>
<tr>
<td>Rutting</td>
<td>RD (mm)</td>
<td>6 - 15</td>
</tr>
</tbody>
</table>

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Benefits for the Road Operator - Conclusions

- Minimum required maintenance operations
- Useful tool for a rational policy of managing road assets with direct retributive profit in terms of maintenance expenses, users cost and ride discomfort