Innovations in Winter Maintenance in Lithuania

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1. WINTER ROAD MAINTENANCE IN LITHUANIA

2. INNOVATIONS IN WINTER ROAD MAINTENANCE IN LITHUANIA
Introduction

Lithuania lies in the northern part of temperate climate zone and the climate is described as moderately cold with snowy winter.

Due to special climate, Lithuanian roads are operated in winter conditions up to 5 months per year.

Winter road maintenance becomes the most principal part of routine maintenance in this region.
WINTER ROAD MAINTENANCE IN LITHUANIA
Lithuanian Road Network

Length of state significant roads, 2013

<table>
<thead>
<tr>
<th>Groups of roads</th>
<th>Length, km</th>
<th>Total length, km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td>1 746</td>
<td></td>
</tr>
<tr>
<td>National</td>
<td>4 929</td>
<td>21 242</td>
</tr>
<tr>
<td>Regional</td>
<td>14 567</td>
<td></td>
</tr>
</tbody>
</table>

ROAD NETWORK IN LITHUANIA

- State: 69%
- Municipal: 23%
- Private: 6%

GROUPS OF STATE SIGNIFICANCE ROADS

- Main: 69%
- National: 23%
- Regional: 8%

PAVEMENT TYPES OF STATE SIGNIFICANCE ROADS

- Asphalt: 34%
- Gravel: 0.34%
- Sett paving: 65%
- Cement concrete: 0.04%
The Structure of Road Maintenance Management

CONTRACTING TERRITORIES

- THE MINISTRY OF TRANSPORT AND COMMUNICATIONS
  - LITHUANIAN ROAD ADMINISTRATION (LRA)
  - 10 Regional State Enterprises
  - 1 Motorway State Enterprise

- 11 profit-seeking state-owned companies, which are awarded with one-year road maintenance contracts in the non-tender manner.

The green bold line shows the contract of motorways
Maintenance Levels of State Roads

Map of winter road maintenance according to maintenance levels

<table>
<thead>
<tr>
<th>Road Group</th>
<th>Maintenance level*</th>
<th>Road length, km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td>I</td>
<td>360.5</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>1391.9</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>4211.0</td>
</tr>
<tr>
<td>National</td>
<td>III</td>
<td>718.5</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>1379.7</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>1165.0</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>12021.9</td>
</tr>
</tbody>
</table>

*- given maintenance levels are specified for road maintenance in winter and only for the roadway.
## Maintenance Levels of State Roads

### Requirements for winter road maintenance according to maintenance levels

<table>
<thead>
<tr>
<th>Road Group</th>
<th>Maintenance level</th>
<th>Road maintenance service works</th>
<th>Road must be cleaned and spreaded*</th>
<th>Traffic may be interrupted</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main</td>
<td>I</td>
<td>24 h</td>
<td>within 2 h</td>
<td>not more than 2 h</td>
<td>Vilnius-Kaunas, VIA BALTICA</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>4 – 22 h</td>
<td>within 3 h</td>
<td>not more than 3 h</td>
<td></td>
</tr>
<tr>
<td>National</td>
<td>II</td>
<td>6 – 19 h</td>
<td>within 4 h</td>
<td>not more than 8 h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>9 – 18 h</td>
<td>within 8 h</td>
<td>not more than 8 h</td>
<td>National roads with traffic volume ≤ 700 veh./day</td>
</tr>
<tr>
<td>Regional</td>
<td>I</td>
<td>6 – 19 h</td>
<td>within 5 h</td>
<td>not more than 8 h</td>
<td>Regional roads with traffic volume ≥ 1000 veh./day</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>9 – 18 h</td>
<td>within 24 h</td>
<td>not more than 8 h</td>
<td>Only dangerous sections of high traffic regional roads</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>9 – 18 h*</td>
<td>only after main and national roads</td>
<td>not more than 48 h</td>
<td>*only after main and national roads</td>
</tr>
</tbody>
</table>

### Extreme weather conditions:

- more than 6 hours of uninterrupted snow and/or blizzard,
- more than 24 hours of snow and/or blizzard with intervals,
- frozen road is covered with ice after rain or freezing rain,
- frozen road is covered with ice more than twice in 24 hours,
- daytime temperature does not rise above 8°C.

At extreme weather conditions approved hourly charts are invalid. In this case, work is rearranging depending on the situation to ensure optimum driving conditions on major roads.
Winter Service

Winter service machinery:
- **550** cleaning machines (tractors, graders);
  - **340** spreaders;

Usually there is spread about **80-85** thousand tons of salt during the winter (up to 10% of this amount is CaCl2);

During one spreading cycle normally **20–40** g/m² of salt is spreaded on the road surface, it is about **2** kg/m² for all winter season.

For 1 mechanism about **30 km** of roads.
Winter Road Maintenance Funding

Winter road maintenance funding and spreading roads length

<table>
<thead>
<tr>
<th>Year</th>
<th>Winter Maintenance Funding (2013)</th>
<th>Spreading Roads Length (2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>34,2</td>
<td>10,23</td>
</tr>
<tr>
<td>2007</td>
<td>35,9</td>
<td>11,04</td>
</tr>
<tr>
<td>2008</td>
<td>42,6</td>
<td>11,04</td>
</tr>
<tr>
<td>2009</td>
<td>35,4</td>
<td>10,40</td>
</tr>
<tr>
<td>2010</td>
<td>32,5</td>
<td>9,26</td>
</tr>
<tr>
<td>2011</td>
<td>35,4</td>
<td>9,49</td>
</tr>
<tr>
<td>2012</td>
<td>34,8</td>
<td>9,46</td>
</tr>
<tr>
<td>2013</td>
<td>36,2</td>
<td>9,32</td>
</tr>
<tr>
<td>2014 Plan</td>
<td>37,1</td>
<td>9,40</td>
</tr>
</tbody>
</table>

The structure of road maintenance financing (2013)

- Summer maintenance: 23%
- Winter maintenance: 23%
- Other routine maintenance works: 49%
- Periodic road maintenance (Road marking included): 5%
It is planned that in 2014 a **NEW ROAD MAINTENANCE MANUAL** version will be formally approved and put into use in the field of winter road maintenance.

A new **Study of EFFECTIVE WINTER ROAD MAINTENANCE IN LITHUANIA** ordered by the LRA is being prepared by Vilnius Gediminas Technical University.
part 2

INNOVATIONS IN WINTER ROAD MAINTENANCE IN LITHUANIA
Road and weather information application

System contains information about:
- condition of the road, traffic;
- road surface temperature;
- air temperature;
- visibility;
- wind speed and so on.

103 automatic road weather stations
238 video cameras.

Alert system was installed. It reports about dangerous meteorological events and road condition.
Road maintenance machinery route application

Allows to keep track all road maintenance machines.

Contractors can control their employees more effectively or to keep fuel consumption records and organize work.
Road maintenance machinery route application

Graph of routes of spreaders and RWIS station friction measurements

Very functional system:
- determine what parameters will be shown on the map;
- set the alarm for the appearance of extreme weather conditions;
- select road maintenance mechanisms;
- define parameters of mechanisms;
- form graphs and reports.
Measurements of road surface friction

In 2012 first mobile friction meters RCM 411 and µTec were purchased and begun to use in daily road maintenance inspections. 15 optical friction measurement devices RCM 411.

<table>
<thead>
<tr>
<th>Color</th>
<th>Surface state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Dry</td>
</tr>
<tr>
<td>Light blue</td>
<td>Moist</td>
</tr>
<tr>
<td>Blue</td>
<td>Wet</td>
</tr>
<tr>
<td>Violet</td>
<td>Slushy</td>
</tr>
<tr>
<td>White</td>
<td>Snowy</td>
</tr>
<tr>
<td>Red</td>
<td>Icy</td>
</tr>
</tbody>
</table>
Measurements of Road Surface Friction

The report of special road inspection performed with mobile optical friction meter RCM 411

Data from the measurement devices are sent to the central server of the Traffic Information System.

System allows to form graphs and reports.

LRA have realised the Manual of Friction Measurements and Winter Service Road Master Guide
Winter maintenance cost indexing

Winter Severity Index:

\[ \tilde{\text{SI}} = a \frac{K_{\text{fact.}}}{K_{\text{av.}}} + b \frac{P_{\text{fact.}}}{P_{\text{av.}}} + c \frac{T_{0 \text{ fact.}}}{T_{0 \text{ av.}}} + d \frac{L_{\text{fact.}}}{L_{\text{av.}}} \]

- \( K_{\text{fact.}} \) - factual values of precipitation over the period, mm;
- \( K_{\text{av.}} \) - average perennial values of precipitation over the period, mm;
- \( P_{\text{fact.}} \) - factual number of days with snowstorms and drifting snow over the period, days;
- \( P_{\text{av.}} \) - average perennial number of days with snowstorms and drifting snow over the period, days;
- \( T_{0 \text{ fact.}} \) - factual number of days with air temperature conversations over 0 °C, days;
- \( T_{0 \text{ av.}} \) - average perennial number of days with air temperature conversations over 0 °C, days;
- \( L_{\text{fact.}} \) - factual number of days with freezing rain, days;
- \( L_{\text{av.}} \) - average perennial number of days with freezing rain, days;
- \( a, b, c, d, e \) - weight factor.
Conclusions

Over the past few years in the field of road maintenance information technology has reached a breakthrough.

LRA pays a great attention to researches of new technologies, materials, standards and work methods in the field of road maintenance.

These new implemented measures helped to ensure more operative and efficient execution of maintenance activities, their control and save funds, and as a result reasonable quality of winter road maintenance was maintained.

However, it is necessary to improve the information technology base and to integrate more deeply into the winter road maintenance system, to train operators, road masters and other related personnel and to promote contractors to use IT in the wider area of winter road maintenance works.
Thank you!