DEVELOPMENT OF ROAD SURFACE FREEZING PREVENTION MEASURES APPLYING ITS TECHNOLOGY

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Winter road management in MLIT

Freezing prevention measures (Before snow)
- Salting (anti-icing-agent) work

Snow-removal (After snow)
- Rotary snow-remover
- Snow-removal grater
- Snow-removal truck
Background

Freezing prevention work becomes more important

Volume is also increasing.
Research purpose

- Operational cost reduction.
- Advanced winter road management in Salting (anti-icing-agent) work.
Strategy (1)  
Operational cost reduction  
- (1) Automated control of agent scattering  
- (2) Automated collection of patrolling data  

Reduction of single person
Strategy (2)
Advanced winter road management

- (1) Online data collection and visualization about work history.
- (2) Quick response for decision working on operations.
System Overview

Service vehicle

- Operator
- Temperature sensor
- Onboard PC
- Positioning device
  - GPS gyro
  - Lane-maker

Eliminate assistance

Agent dispersal device

Automatic dispersal

NITLIM

- Weather/image GIS server
- System server

Terminal system

Road manager

Operational assistance

Branch Office
Experiment

Place: Nagaoka City
route No.8
Miyamoto snowplow
work section(17.3km)
Date:  2004.2~3
(about 2month)
Devices

Service vehicle

On-board PC

D-GPS

Lane marker sensor

gyro (3 axis)

Speed sensor

Positioning device

Scattering device
Guidance during operations

- Temperature
- Weather
- Surface condition
- Operation condition
- Current location
- Recorded data in patrolling
Visualization of working data on road map

Display using GIS

Work history
**Cost-benefit analysis**

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit price</th>
<th>Amount of money</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Installation and maintenance cost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Device cost</td>
<td></td>
<td>1</td>
<td></td>
<td>8,450</td>
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<tr>
<td>(GPS, Gyro, Vehicle speed sensor, Lane-marker,</td>
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<td></td>
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<tr>
<td>Temperature, Onboard PC, Device in vicinity)</td>
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<tr>
<td>Facility and tuning cost</td>
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<tr>
<td>Infrastructure cost</td>
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<tr>
<td>Software / map</td>
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<td>(GIS engine, Residential area map)</td>
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<tr>
<td>Data generation cost</td>
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<tr>
<td>(Map data conversion, Application data generation)</td>
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<tr>
<td>Maintenance cost</td>
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<td>2,000</td>
<td>20,000</td>
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<td><strong>Total</strong></td>
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<td>81,750</td>
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<td><strong>Benefit identified</strong></td>
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<tr>
<td>A decade of cost reductions in total</td>
<td>Year</td>
<td>10</td>
<td>11,020</td>
<td>110,200</td>
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<tr>
<td><strong>Total</strong></td>
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<td>110,200</td>
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<tr>
<td><strong>B(Benefit identified total) / C(Installation and maintenance cost total)</strong></td>
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<td></td>
<td>1.35</td>
</tr>
</tbody>
</table>

Calculation condition: Miyamoto work section in 10 years.
Conclusion

- Reduction to single man using ITS Technology on Salting work can be realized.
- When this system is introduced, cost-effectiveness (Benefit/Cost) can be estimated “1.35”.
- Generalization of this system to be applied to other road management vehicle.