Development of ITS technologies in Japan

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1. Introduction - Electronic Toll Collection System (ETC)

- Approx. 30 million ETC on-board units have been shipped (as of May 2010).
- The nationwide utilization rate: 84.6% (as of May 2010).

Trends in the use of ETC

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of vehicles using ETC (10,000 vehicles/day)</th>
<th>Utilization rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>50</td>
<td>0.9%</td>
</tr>
<tr>
<td>2002</td>
<td>100</td>
<td>1.8%</td>
</tr>
<tr>
<td>2003</td>
<td>150</td>
<td>3.1%</td>
</tr>
<tr>
<td>2004</td>
<td>200</td>
<td>4.2%</td>
</tr>
<tr>
<td>2005</td>
<td>250</td>
<td>5.3%</td>
</tr>
<tr>
<td>2006</td>
<td>300</td>
<td>6.4%</td>
</tr>
<tr>
<td>2007</td>
<td>350</td>
<td>7.5%</td>
</tr>
<tr>
<td>2008</td>
<td>400</td>
<td>8.6%</td>
</tr>
<tr>
<td>2009</td>
<td>450</td>
<td>9.7%</td>
</tr>
<tr>
<td>2010</td>
<td>500</td>
<td>10.8%</td>
</tr>
</tbody>
</table>

- Apr 30 – May 6, 2010
  - About 7.31 million vehicles/day
  - Utilization rate: 84.6%
1. Introduction - Electronic Toll Collection System (ETC)

Percentage of ETC-equipped Vehicles (%)

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage of ETC-equipped Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>March '03</td>
<td>61</td>
</tr>
<tr>
<td>March '04</td>
<td>19.8</td>
</tr>
<tr>
<td>March '05</td>
<td>12.1</td>
</tr>
<tr>
<td>March '06</td>
<td>3.9</td>
</tr>
<tr>
<td>March '07</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Congestion (km/hr/day)

<table>
<thead>
<tr>
<th>Year</th>
<th>Congestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>March '03</td>
<td>56.2</td>
</tr>
<tr>
<td>March '04</td>
<td>21.2</td>
</tr>
<tr>
<td>March '05</td>
<td>12.1</td>
</tr>
<tr>
<td>March '06</td>
<td>3.9</td>
</tr>
<tr>
<td>March '07</td>
<td>2.8</td>
</tr>
</tbody>
</table>

March '03 to March '07, showing an increase in both congestion and percentage of ETC-equipped vehicles.
1. **Introduction** - Vehicle Information Communication System (VICS)

- Provide real-time road traffic congestion information on car navigation system which started in 1996

**Example of Display**

- Simple diagrams
- Map Display
1. Introduction - Vehicle Information Communication System (VICS)

- Over 26 million VICS-OBUs have been shipped (as of 2010.3)
Definition of Smartway

a road system which can exchange various types of information among cars, drivers, pedestrians, and other roadway users.

Roads — Communication — Vehicle

“Smartway”
A single ITS on-board unit (OBU) will provide various services according to establishment of common platform.
### 2. Development of Smartway — History

<table>
<thead>
<tr>
<th>Year</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-2006</td>
<td>Public - Private Joint Research (NILIM, 23 companies)</td>
</tr>
<tr>
<td></td>
<td>→ Smartway Demo 2006, Standardization</td>
</tr>
<tr>
<td>2007</td>
<td>FOT, Smartway Demo 2007 (Metropolitan Expressway)</td>
</tr>
<tr>
<td>2008</td>
<td>FOT (in the three large metropolitan regions)</td>
</tr>
<tr>
<td>2009 onwards</td>
<td>Practical service deployment</td>
</tr>
</tbody>
</table>
3. Field Operational Tests (FOT)
– Providing Information on Obstacles Ahead

- FOT were conducted at three major metropolitan regions and other regions in FY 2008.

[Osaka/Kyoto]
- Providing Information on Conditions Ahead (by audio)

[Osaka]
- Warning a driver against overshooting at sharp curve ahead
- Providing Information on Obstacles Ahead
- Merging Assistance

[Niigata]
- Vehicle behavior data collection
  (Road surface snow accumulation information)

[Tokyo]
- Providing Information on Obstacles Ahead / Conditions Ahead
- Providing Information on Road Traffic Conditions
  (by still images)

[Hiroshima]
- Warning a driver of excessive speed operations

[Nagoya]
- Providing Information on Obstacles ahead / Conditions Ahead
- Warning a driver of hazard along curve ahead
3. Field Operational Tests (FOT)
– Providing Information on Obstacles Ahead

Outline of FOT at Rinkai Fukutoshin Exit of MEX

Stopping car ahead. Drive carefully!
3. Field Operational Tests (FOT) – Providing Information on Obstacles Ahead

- Stopping car ahead. Drive carefully!
- No stopping cars

Intersection & signal

ordinary road

off ramp

Metropolitan Expressway

blind spot for drivers

DSRC

→ Provision of information
3. Field Operational Tests (FOT)

- Providing Information on Obstacles Ahead

![Graph showing cumulative distribution of relative frequency]

- **SEP:** speed evaluation point: driver can see stopping vehicles ahead right before
3. Field Operational Tests (FOT) – Providing Information on Obstacles Ahead

- It is good because I knew in advance that a car was stopped or that there was an intersection and prepared mentally. 87%
- It is good because I had leeway to avoid a rear-end collision and emergency braking. 50%
- It is good because it has a good impact on more cars. 13%
- It is good if the service is provided during rainfall or at night. 30%
- It is unnecessary because drivers travel slowly on the rising grade. 3%
- It is unnecessary because I always drive carefully. 0%
- Others 0%

N=30 (multiple answers permitted)
4. Summary

• ETC and VICS have been on operational stage and utilized nationwide.

• The second generation ITS service, Smartway, has been developed based on ETC and VICS technologies through a lot of FOTs.

• It has been confirmed through FOTs that Smartway works effectively and accurately.
Muito obrigado!
&
Thank you for your attention.