Traffic Technology
تكنولوجيا حركة المرور

Drive Assisting Delineators (DADs)

DADs contribute to traffic congestion mitigation

- DADs provide the lighting flows along the road
- Drivers instinctively maintain steady speeds or restore their speeds with the DADs flows

Unique Features

- Minimize or restraint congestion occurrences when traffic is busy
- Facilitate restoring traveling speed when traffic is congested
- Automatic control on best suitable lighting patterns based on (real-time) traffic conditions
- Applicable to congestion multiple bottlenecks

<table>
<thead>
<tr>
<th>Traffic volume</th>
<th>Before installation</th>
<th>After installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(vehicles/day)</td>
<td>48,100</td>
<td>49,200</td>
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</table>

<table>
<thead>
<tr>
<th>Traffic congestion volume per case</th>
<th>Before installation</th>
<th>After installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(km-hr/case)</td>
<td>18.8</td>
<td>13.7</td>
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</table>
Sodium chloride has been used for deicing. However, it could shorten the service life of road structures.

Alternatives!
“Sodium Propionate”

Unique Features
✓ A 1:9 ratio of sodium propionate to sodium chloride
✓ As effective as sodium chloride
✓ Causes as little damage to road structures as rainwater may cause
✓ Can be used for any road structures, including bridges, with existing wet-salt spreaders or brine spreaders

A joint study by Toyama Prefectural University and the Civil Engineering Research Institute for Cold Region
Pavement Inspection and data analysis

PDAS (Pavement Data Analysis Service)

Unique Features

✓ Helps road operators make data-driven decisions based on pavement condition data

✓ Estimates the average pavement performance deterioration rate and remaining lifetime

✓ Compares pavement performances by pavement type, section, traffic and climate

APDIS (Automated Pavement Distress Identification Service)

Unique Features

✓ Helps road operators & engineering companies grasp overview of pavement distress conditions of their highway networks using image recognition technology

✓ Reduces pavement condition survey time and cost definitely
Tunnel Inspection

High-Speed Visual Inspection Vehicle

Our new technology records the tunnel cracks while traveling at a high speed.
- Labor-saving in regular inspection
- With high accuracy and efficiency in detailed inspection
- Enables early and timely repairs by identifying the condition of the structure

Unique Features
- Accurate detection 0.2-mm cracks while travelling at 100 km/h
- No need of large-scale lighting
- The recording device is compact in size

A joint study by the University of Tokyo.
Current situation and problem of expressways

- At least 40% of the total expressway-length has been operated for more than 30 years and because of this, the expressways are seriously deteriorated.

- At least 40% of the total bridge-length and 20% of total tunnel-length were also constructed more than 30 years ago and they are facing increased risk by the aged deterioration.

- The total vehicle weight is increasing with the increase in the number of large-scale vehicle on the expressways. The expressways are under severe conditions such as increasing in the usage of anti-freezing agent (NaCl) and the increase in the amount of extreme rainfall for a short time.
Expressway Renewal Project
التجديد

Severe deterioration on slab lower surface

Large-scale renovation for bridges

- e.g. Replacement of RC concrete slab with PC precast slab

Two-way traffic regulation
Bridge renovation work

**Road Surface**

One of unique road surface inspection vehicles, not only can measure rutting, cracking, and flatness (σ10ft, IRI) but also longitudinal and transverse pavement measurements without making contact with the pavement. It can smoothly and safely perform all 6 functions at 100km/h without impacting the flow of other traffic.

![High-Speed Road Surface Measuring Vehicle (Road Tiger)](image)

**Tunnel Liner**

Tunnel liner inspection vehicle:

It is now possible to obtain a clearer image at a speed of 100km/h by adopting the line sensor camera instead of the conventional video camera. In addition, because the photographing illumination using LED infrared illumination is not visible to the naked eye, it no longer influences on the passing vehicles on the opposite direction. Moreover, this vehicle automatically identifies the cracks by the captured image.

**Bridge**

**Digital camera/video camera system - Crack inspection:**

High definition images taken by digital camera or video camera makes it possible to inspect the surface of a structure in the same way as the close visual inspection. Through a computer analysis of the images, the cracks are automatically detected.

**Infrared Camera System - Delaminations / spill inspection:**

The infrared camera system takes images which is analyzed automatically and displays the damage level in three stages. Because damages are objectively analyzed by software, bias or oversight in measuring caused by skill difference can be prevented. In addition, this system helps to create a research report since the detected results are easily captured on spreadsheets or word processing software. This system has gotten track records in the U.S.
Great Hanshin-Awaji Earthquake occurred in January 1995, took precious lives and destroyed cherished livings of local communities. Earthquake Museum conveys how Hanshin Expressway responded in the 623 days to complete the restoration of the expressway system. It displays damaged structures and introduces new technologies and various activities which put into practice based on the lessons including disaster management support and educational assistance for disaster prevention.

Immediately after the Surugawan earthquake, NEXCO-Central started emergency checkup and stopgap recovery, and 4 days later, finished temporary recovery for general traffic.

The recovery of the Tomei expressway in Makinohara area

Disaster Prevention

- Ground anchor
  - New type of anchor installation filling up traditional anchor with inadequate anticorrosion function

- Slope Protection Work
  - Measures against land slide

Use of rest areas as disaster-management bases

In the Great East Japan Earthquake, the Self-Defense Forces and firefighters heading to stricken areas used expressway rest areas as relay and support bases. Based on this experience and various issues, authorities are bolstering their disaster-response capabilities across Japan to respond effectively and efficiently to emergencies, using Moriya SA on the Joban Expressway as their model.

- Moriya Service Area (Southbound) on Joban Expressway, as a disaster management base

Disaster caused by extreme rainfall for a short time

Earthquake Museum for educational assistance on disaster prevention

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Japan’s Expressways are built and operated by six companies. The total length in operation is 10,351 km, and 331 km is under construction.

- **West Nippon Expressway Company Limited**
  - Head Office: Osaka
  - Expressways in Operation: 3,533 km
  - Traffic Volume: 2.95 million vehicles/day
  - Toll Revenue: US$ 7.1 billion
  - Expressway under construction: 72 km

- **East Nippon Expressway Company Limited**
  - Head Office: Tokyo
  - Expressway in Operation: 3,943 km
  - Traffic Volume: 2.95 million vehicles/day
  - Toll Revenue: US$ 7.82 billion
  - Expressway under Construction: 75 km

- **Hanshin Expressway Company Limited**
  - Head Office: Osaka
  - Expressway in Operation: 250.4 km
  - Traffic Volume: 0.72 million vehicles/day
  - Toll Revenue: US$ 1.7 billion
  - Expressway under Construction: 34.2 km

- **Central Nippon Expressway Company Limited**
  - Head Office: Nagoya
  - Expressway in Operation: 213.2 km
  - Traffic Volume: 1.98 million vehicles/day
  - Toll Revenue: US$ 6.3 billion
  - Expressway under Construction: 132 km

- **Honshu-shikoku Bridge Expressway Company Limited**
  - Head Office: Kobe
  - Expressway in Operation: 172.9 km
  - Traffic Volume: 0.12 million vehicles/day
  - Toll Revenue: US$ 0.6 billion

- **Metropolitan Expressway Company Limited**
  - Head Office: Tokyo
  - Expressway in Operation: 320.1 km
  - Traffic Volume: 1.02 million vehicles/day
  - Toll Revenue: US$ 2.4 billion
  - Expressway under Construction: 17.5 km

As of July 1st, 2019

Note: Revenue is for year ended March 31, 2019 and calculated by the exchange rate of 110 JPY for 1 US$