Québec 2010
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XIII INTERNATIONAL WINTER ROAD CONGRESS

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SUSTAINABLE WINTER SERVICE FOR ROAD USERS

Feasibility study on the suitability of automated acetic acid cryoprotectant dispersion systems on urban expressways

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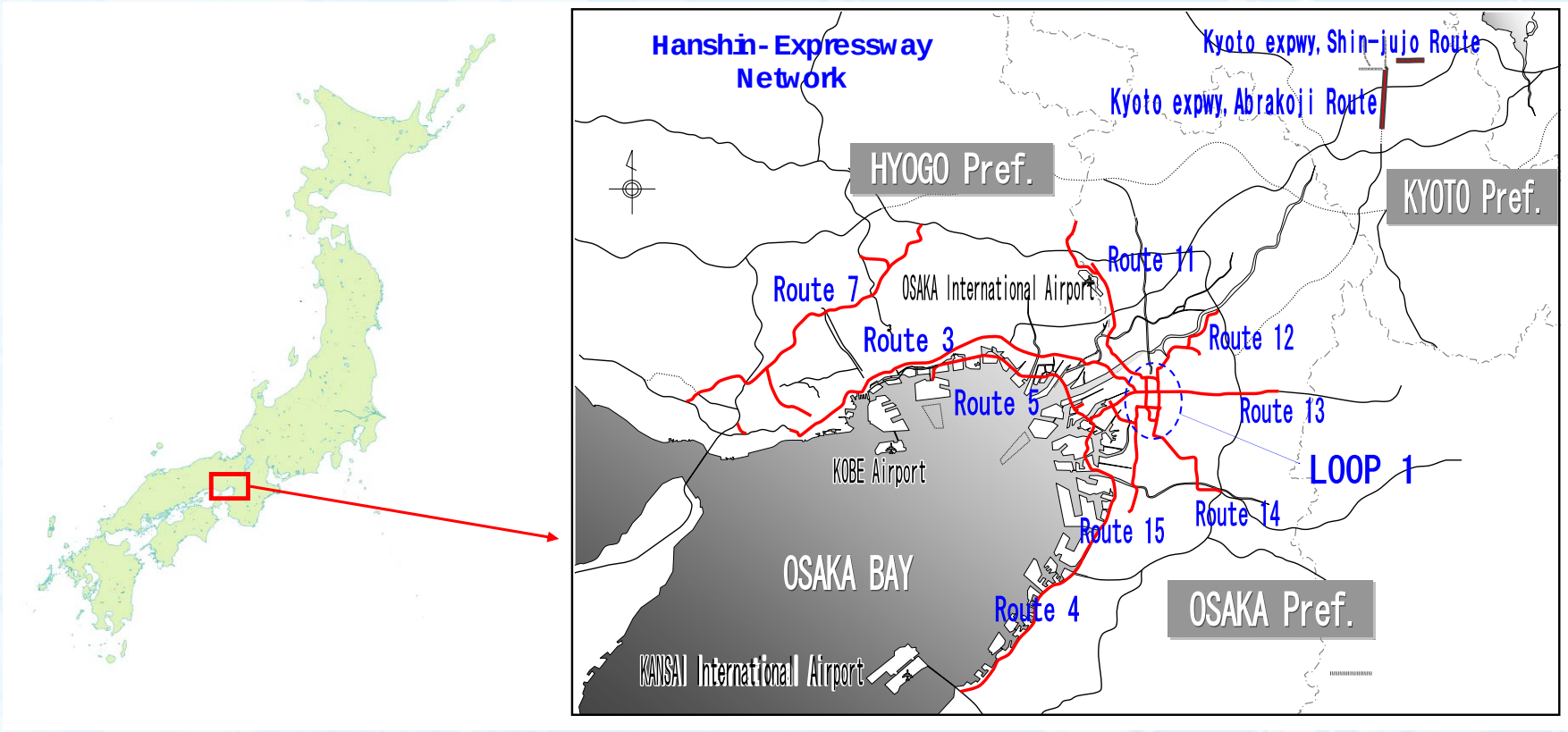
阪神高速技術

Introduction

- The oldest section of the Hanshin Expressway was opened to traffic in 1964, and the total length of 242.0km is in service at present.
- The Hanshin Expressway is toll road.

Overview of the Hanshin Expressway
(around Minato-machi area)

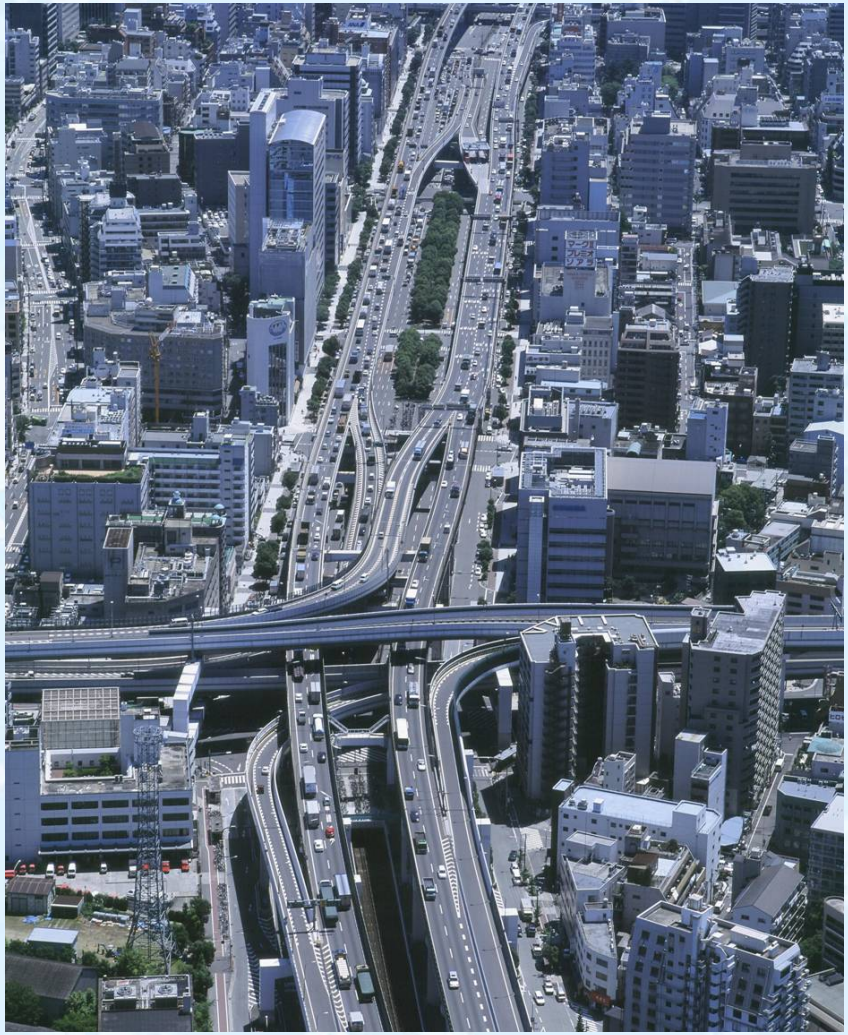
Location of 242.0km Network



Location of Hanshin Expressway

In-service Length □ 242.0km

Viaducts in highly urbanized area go along the river, over the city street, and…



Long-spanned Bridges on Osaka Bay Area

The winter season road surface management of the Hanshin Expressway. (prevent surface icing)

The winter season road surface management of the Hanshin Expressway. (The snow removing after the snowfall)

The consumption of sodium chloride for prevent surface icing.

F Y	Osaka area	Kobe area	Total (tons)
2007	1,557	1,430	**2,987**
2008	866	1,045	**1,911**

Not only rainfalls but also sodium chloride…..

For the purpose of the study

De-icing agents

- CHLORIDE-BASED AGENTS

  been in use for many years, but encouraging corrosion of road way structures.

- ACETIC BASED AGENTS

  environmentally-friendly, but, tend to be costly.

Feasibility study on the suitability of automated acetic acid cryoprotectant dispersion system on urban expressways.

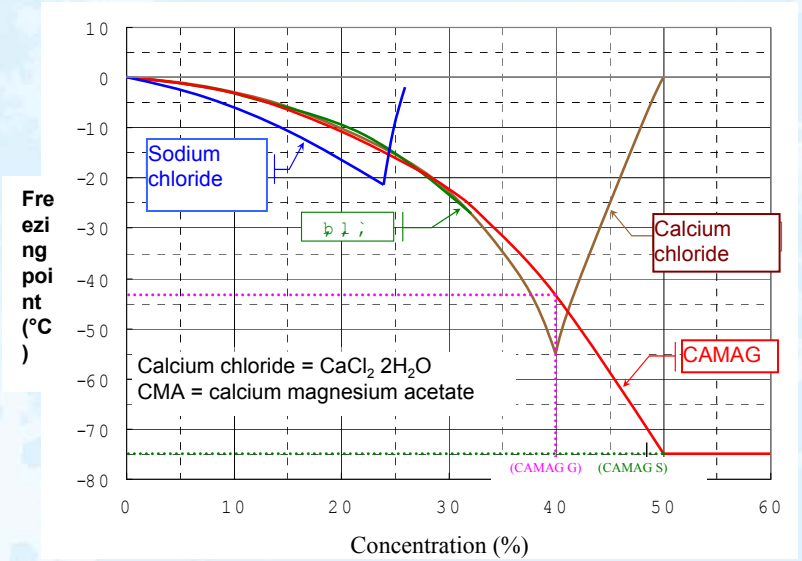
CAMAG : a liquid agent based on potassium acetate with glycerin additive.

Main components and performance of CAMAG.

CAMAG

Potassium acetate: cryoprotectant agent

Glycerin: extend performance, boost water retention improve dispersion



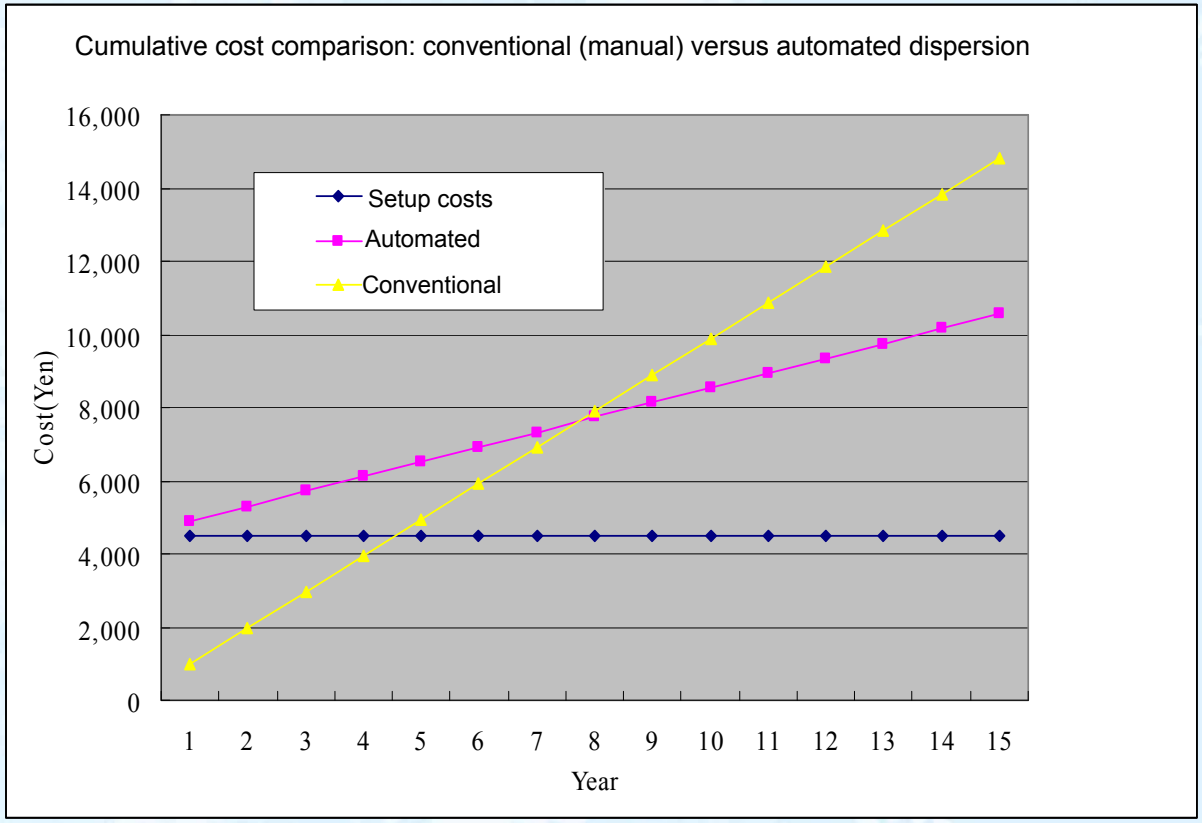
- Freezing point -75□.
- Viscosity increases tire drag.
- No adverse environmental impact on plants and other ecosystems.
- Negligible corrosive effect on metal components of vehicles, also roadway structures.

- Biological decomposition

Potassium acetate CH3COOK → H2O, CO2, K

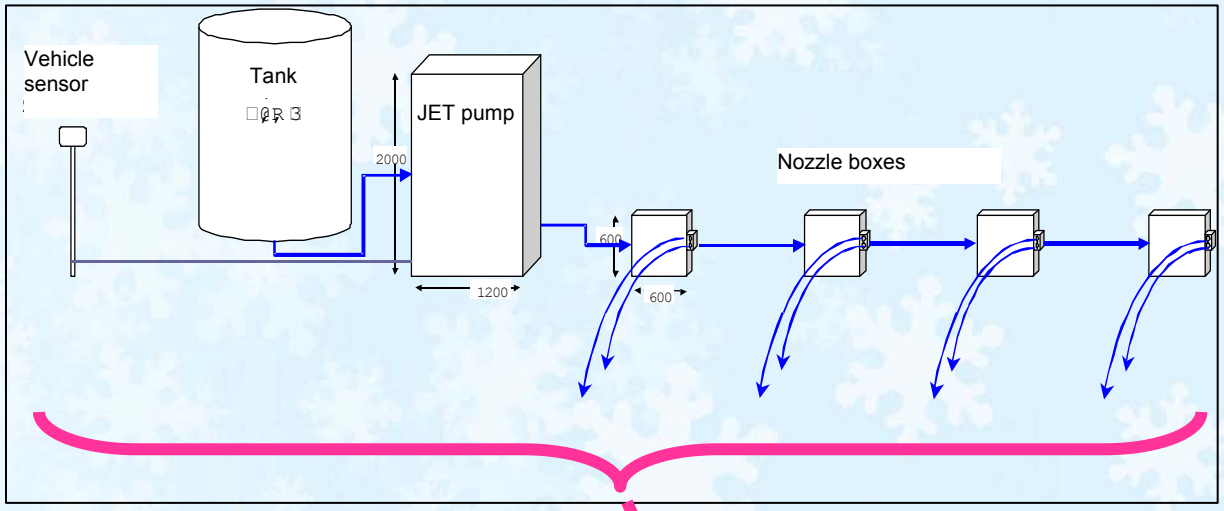
Glycerin C3H5(OH)3 → H2O, CO2

Usage in conjunction with automated dispersion systems



Assuming setup = \45.0 million,
equipment maintenance = \4.04 million,
Conventional de-icing expenses = \9.87 million

Automated dispersion system



Higher temperature (Bay side)

Lower temperature (Mountain side)

System operation controller and tank

Controller

Storage tank

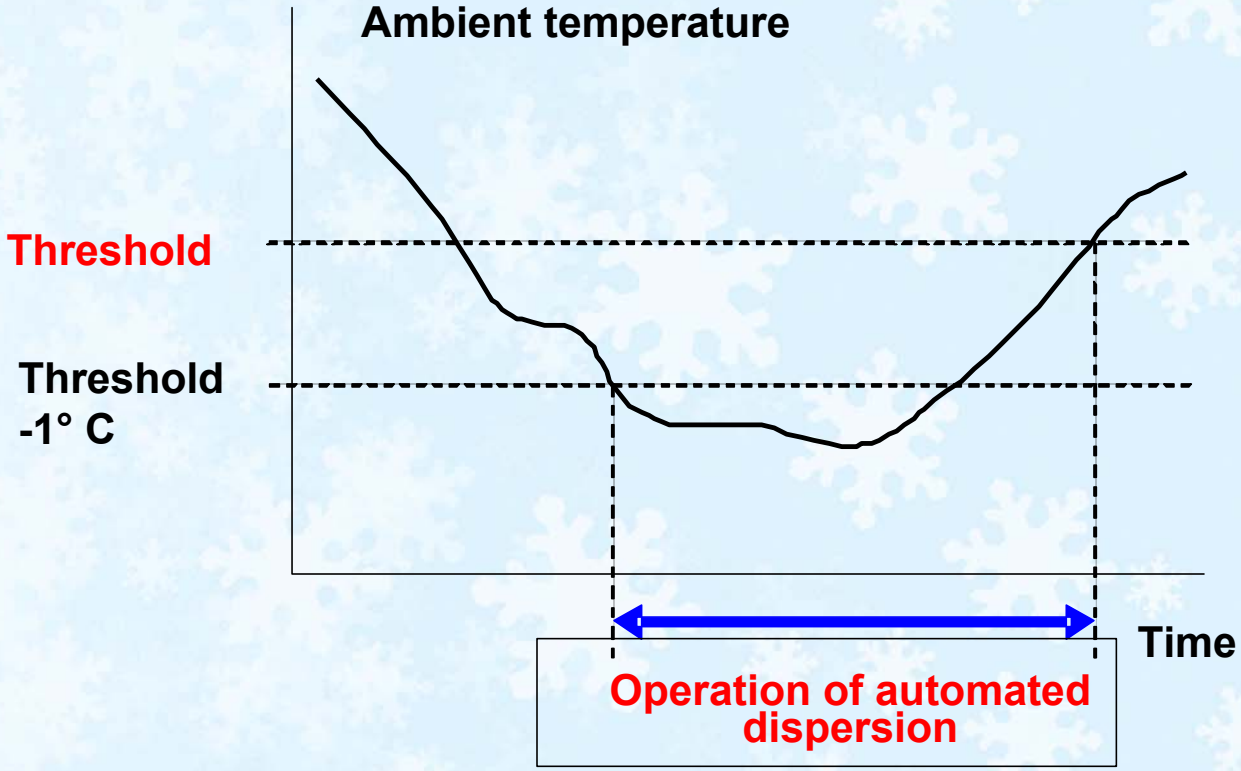
System operation independent nozzles

System operation
Vehicle sensor

Inbound lane

Outbound lane

System operation temperature sensor



Conclusion and future considerations

Benefits of the automated dispersion system

1) The automated system operated faultlessly and produced the required outcome.
2) Automated timing linked to temperature sensor.
3) Cost savings
4) Support for remote control functionality.
5) Installation points on the Hanshin Expressway
6) Snow melting performance

Thank you very much.

Merci beaucoup.

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