DEVELOPMENT OF AUTONOMOUS SNOW BLOWERS USING THE QUASI-ZENITH SATELLITE SYSTEM ON EXPRESSWAYS IN JAPAN

November 25, 2021

Kazue USUI
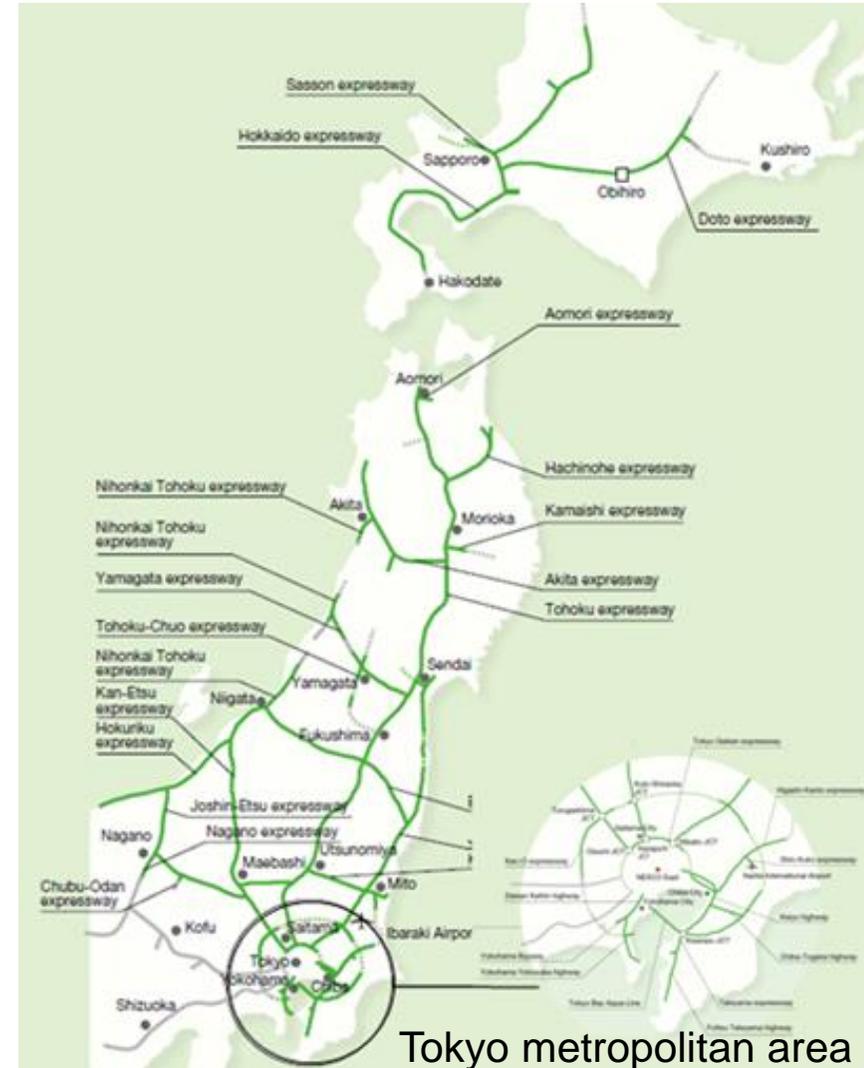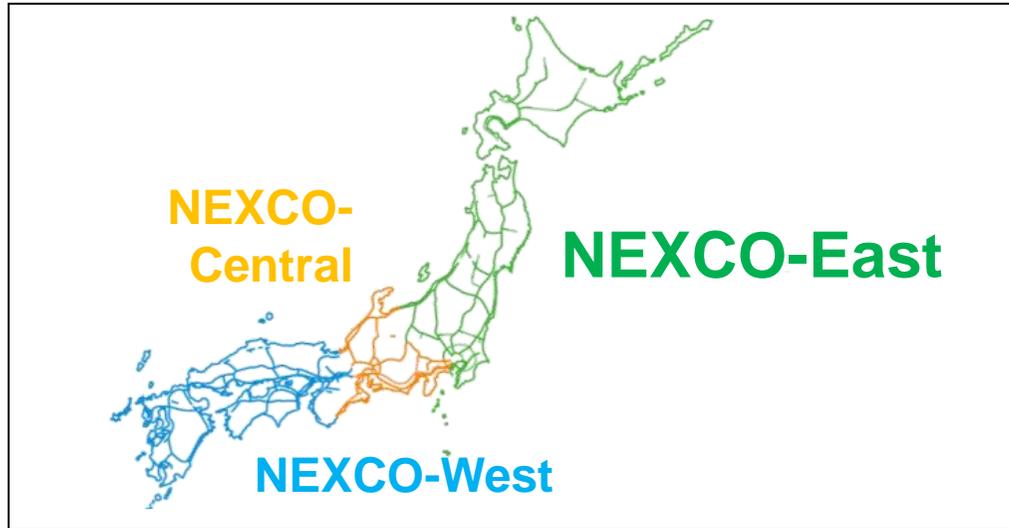**East Nippon Expressway Co., Ltd. (NEXCO-East)**

NEXCO
EAST

Contents

Largest Expressway Management Company in Japan

NEXCO-Central

NEXCO-East

NEXCO-West

	NEXCO East	Whole Japan
in Operation[*1]	3,943 km (40.4%)	9,766 km (100.0%)
under Construction[*2]	85 km (30.6%)	278 km (100.0%)
Rest Areas[*2]	328 Nos	-
Traffic Volume[*1]	259 Mil Veh./day	-
Toll Revenue[*1]	2.0 Bil YEN/day (1.3 Bil INR/day)	-

Tokyo metropolitan area

NEXCO EAST

*1 : As of March, 2021
*2 : As of July, 2020

Various areas : Mountainous, Coastal, Urban, Rural etc.

▼ **Mountainous**

▲ **Coastal**

Urban ▲

Various activities : Development, O/M, Disaster management, Service area etc.

▲ **Traffic control**

▲ **Operation and Maintenance**

▲ **Construction Management**

▲ **Disaster Restoration**

NEXCO EAST

2. *Snow removal work on expressway*

Swift and proper snow & ice control measures for safe, secure and comfortable transportation for users of expressways

Application of anti-freezing agents

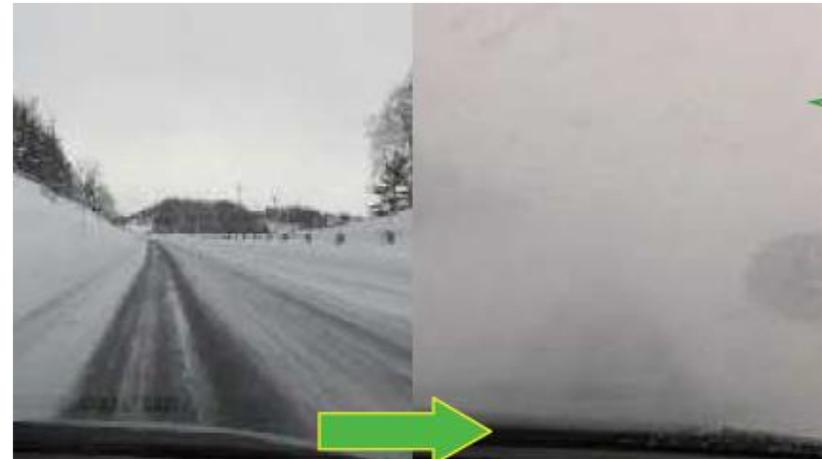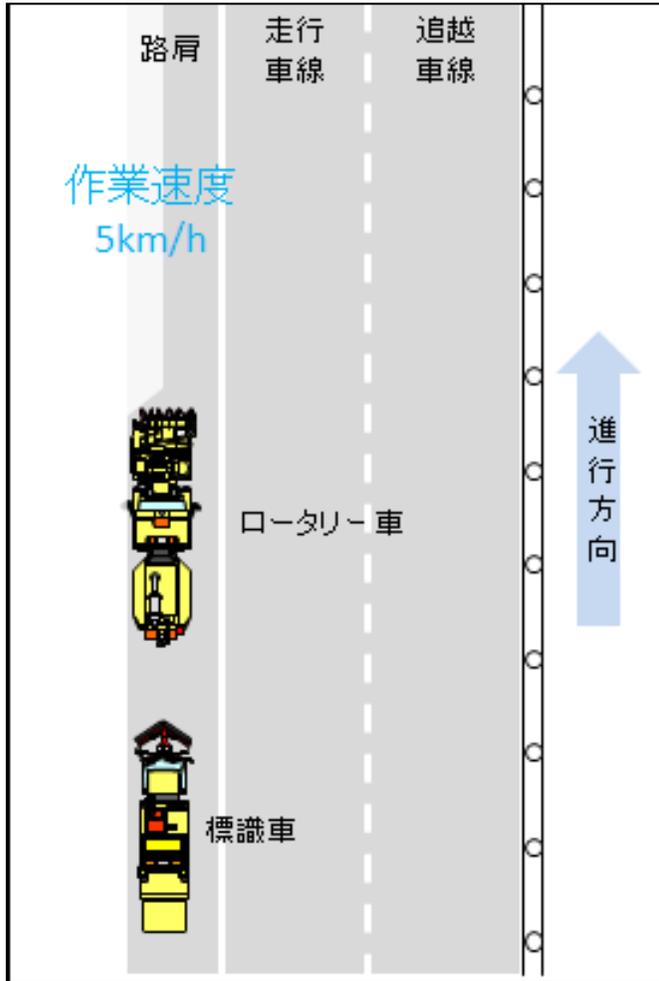**Road shoulder snow removal**

Snow removal & Surface leveling

2. *Snow removal work on expressway*

Road Shoulder snow removal work need to be carried out when visibility is poor and can be conducted by skilled and experienced special workers.

Overview of the automation of snow removal vehicles

Michibiki, the quasi-zenith satellite

(1) Obtain position information.
(3) Correct that information.

(2) Create high-accuracy maps

0.09m   OK   0.41m
2.69m

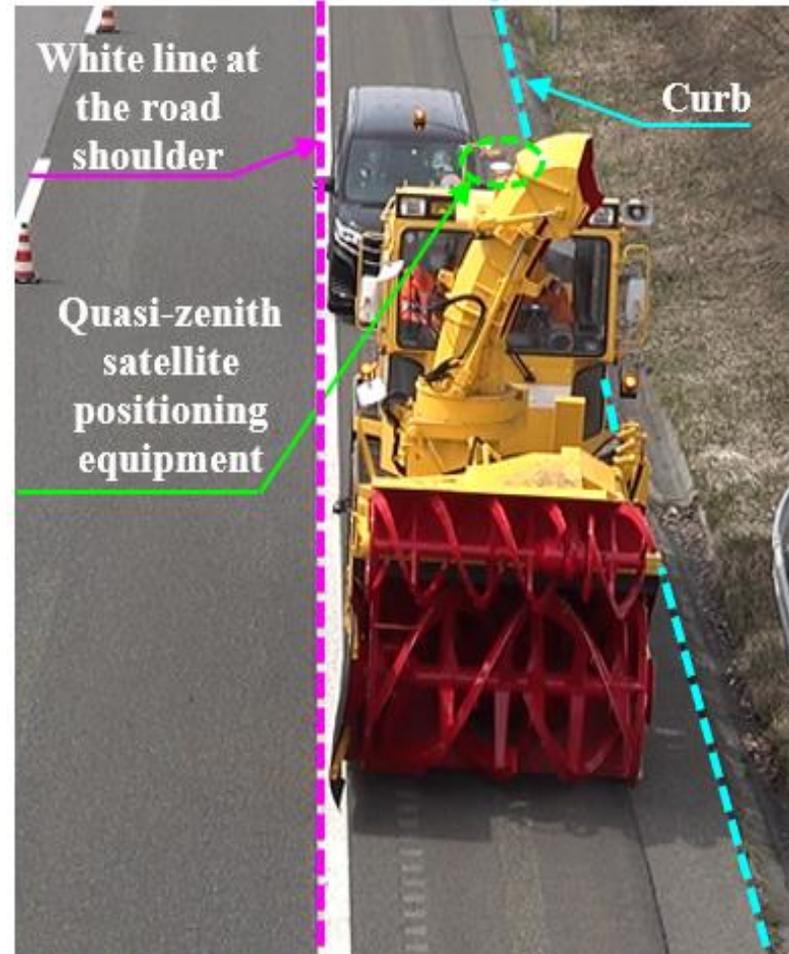(4) Monitor for display and warning

(5) Driver Assistance System

(6) Vehicle control

Driver Assistance System

Vehicle control

White line at the road shoulder

Quasi-zenith satellite positioning equipment

Curb

3. *Overview of autonomous snow blower*

The following are labels visible on the interface display:

- 8cm
- ←OUT
- 56cm
- 12:00:16
- Road shoulder width: 2.69m
- Target value for left margin (selectable): 25cm
- ① Run-off warning
- ① Margin width
- Caution
- Snow pole
- ② Caution information for the left side
- Target line
- Caution
- Outside line
- Lowering (the device)
- Lifting (the device)
- ② Caution information for the underside
- Bridge joint
- Angle of traveling
- +0.9°
- 4
- Reception status (4: FIX)