

Connected Vehicle Accelerates Green Driving

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ABSTRACT

After the turn of the century, growing social attention has been paid to environmental concerns, especially the reduction of greenhouse gas emissions and it comes down to a personal daily life concern which will affect the purchasing decision of vehicles in the future.

Among all the sources of greenhouse gas emissions, the transportation industry is the primary target of reduction and almost every automotive company pours unprecedented amounts of money to reengineer the vehicle technologies for better fuel efficiency and reduced CO2 emission.

Besides those efforts paid for sheer improvements of genuine vehicle technologies, NISSAN testified that “connectivity” with outside servers contributed a lot to reduce fuel consumption, thus the less emission of GHG, with two major factors; 1. detouring the traffic congestions with the support of probe-based real-time traffic information and 2. providing Eco-driving advices for the better driving behavior to prompt the better usage of energy.

This article explains how the connected vehicle via network realized the reduction of fuel consumption and, thus, CO2 emission in real-life deployments in Japan and China.

INTRODUCTION

Nissan is pursuing technical developments and commercial deployments of various kinds of Telematics solutions for the improvement of environmental concerns toward ecological use of energy and less emission of CO2.

This article refers to the effectiveness of Dynamic Route Guidance (DRG) and Eco Drive Advice (EDA) deployed for CARWINGS, a Japanese commercial implementation of

Telematics, and DRG for the world's highest density real time traffic information based on taxis in Beijing, China.

CASE STUDY #1: CARWINGS IMPLEMENTATION IN JAPAN

In Japan, governmental agencies gather traffic data mostly from infrastructure-based sensors and provide traffic information through VICS¹ for the use of general vehicles. In addition to this governmental traffic information, with consents from vehicle owners, major Japanese vehicle companies gather, mostly via either customers' carry-in cellular phones or embedded cellular phone modules, and analyze anonymized probe data, which contains location-related data with time stamps, to obtain broader, detailed, and nearly real-time traffic information.

With using probe data in conjunction with VICS data, NISSAN started commercial implementation of DRG, with statistical analysis to forecast the near-future traffic congestions in 2006. Based on our experiments in Kanagawa Prefecture in Japan, we obtained the data which showed that a vehicle with a DRG-enabled Navigation System increased the average speed by 25% and **reduced the emission of CO2 by 17%**, when compared with a plain vanilla Navigation System without any traffic information as shown in [Figure 1](#). (Red bar v.s. Green bar)

In addition to these DRG effects, NISSAN provides Eco-Driving Advice (EDA), as shown on [Figure 2](#) and [Figure 3](#), for drivers and proved that further improvement of fuel consumption would be attained. This is an implementation based on our findings that the differences of customer's driving habit yield diversified levels of fuel efficiency.

For the reference of drivers, we report the up-to-date status of EDA result on drivers' Web site as well as on Navigation

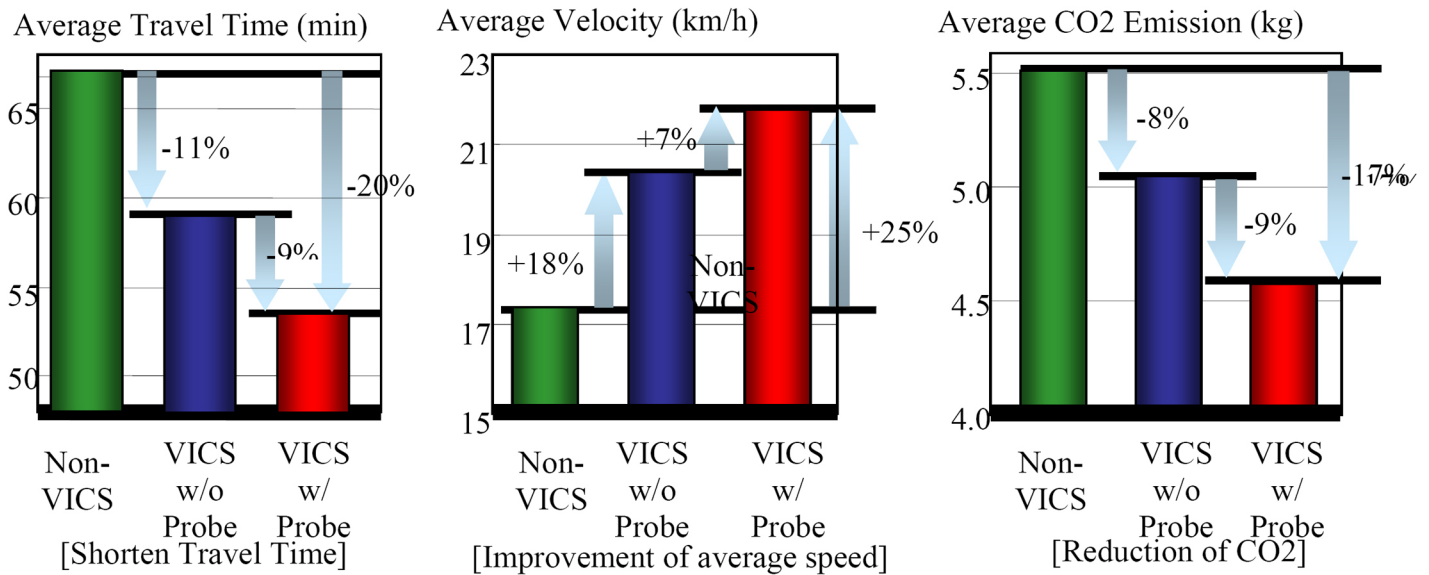


Figure 1.

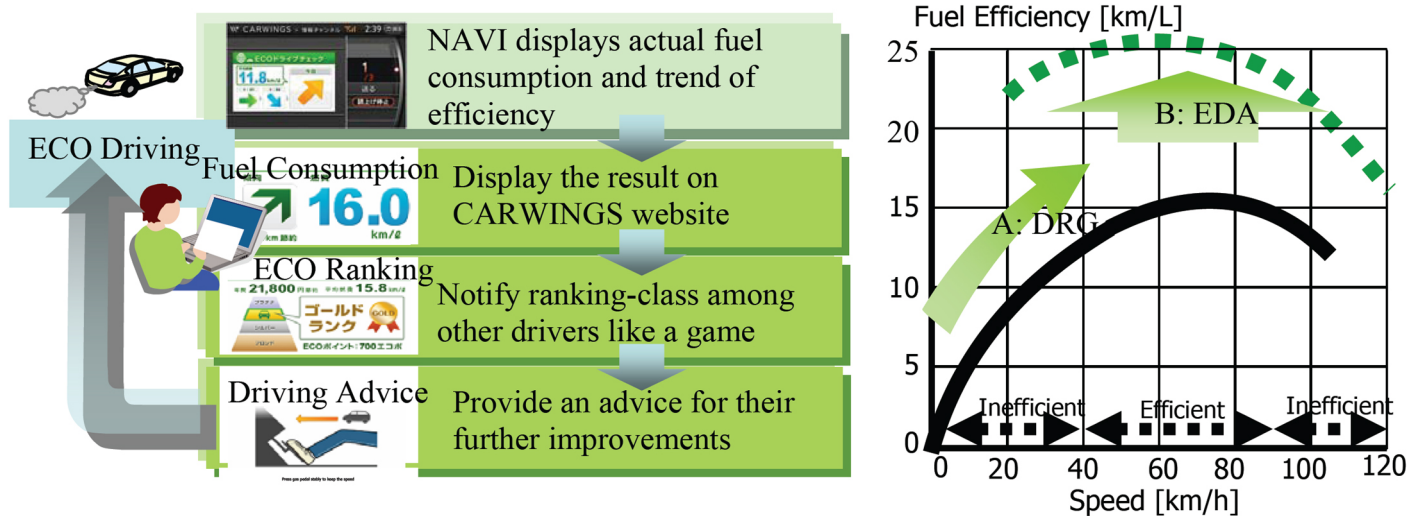


Figure 2.

since July '07 in Japan as a packaged service of the Eco Management System (EMS).

International Trade and Industry consecutively in 2008, 2009, and 2010.

Such a daily awareness through Eco-related activities will contribute a lot for the improvements of real life Eco Management. As a result of those EMS activities, we testified through our examinations that **EDA would bring in additional 18% of improvements, even after DRG**, on Fuel Efficiency among controlled group.

As shown on the right side of Figure 2, NISSAN proved the effective solutions toward Green Driving with those combination of A: DRG and B: EDA and was awarded with two major ECO prizes from Ministry of Land, Infrastructure, Transport, and Tourism in 2007 and from Ministry of

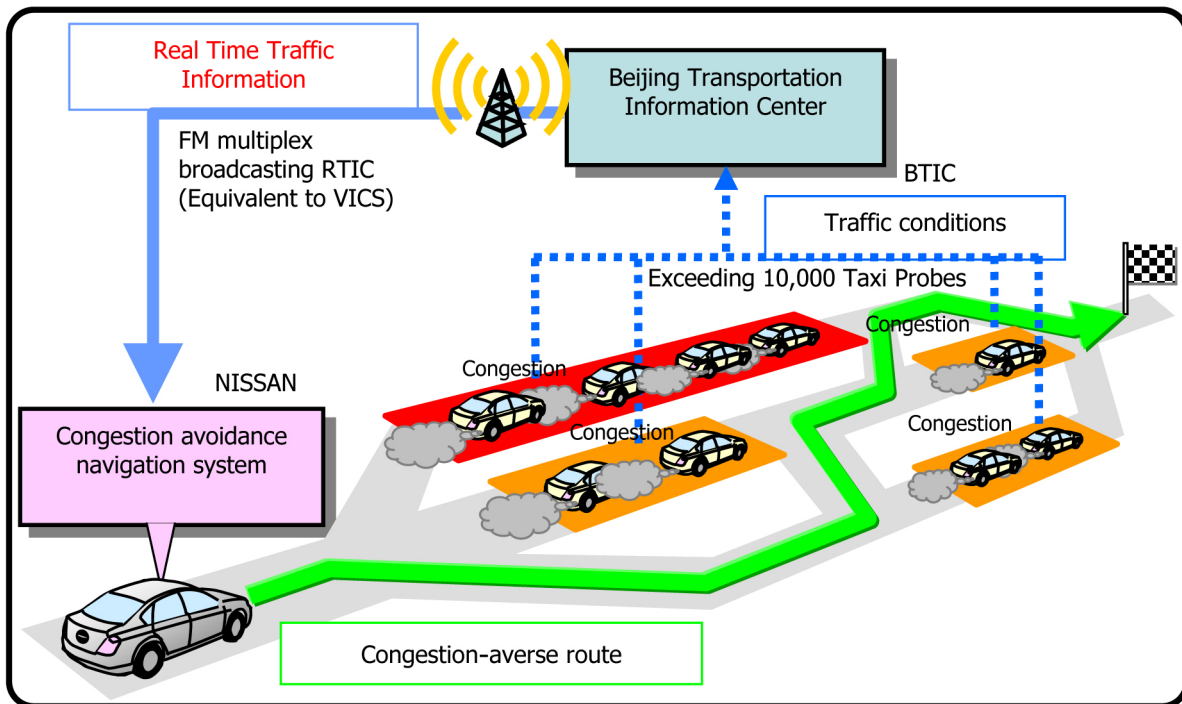


Figure 3.

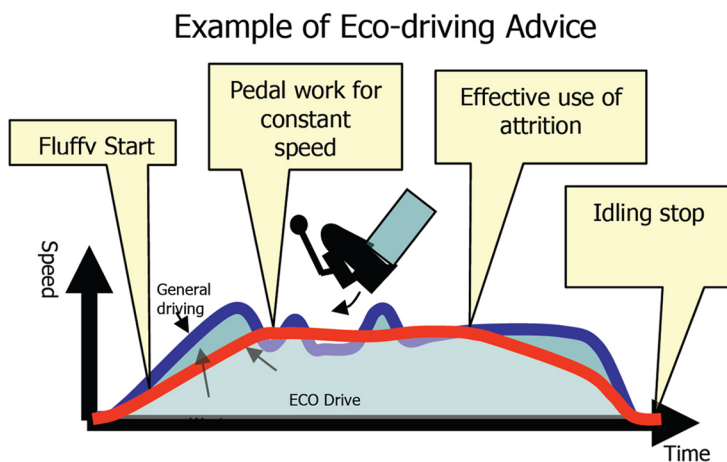


Figure 3.

CASE STUDY #2: STAR WINGS IMPLEMENTATION IN BEIJING, CHINA

In the year of 2006, NISSAN started to discuss with Beijing Traffic Information Center (BTIC) regarding the use of taxi-based real-time traffic information to improve the traffic and environmental conditions in Beijing. Within this collaboration, BTIC provided their traffic information processing technology with the world's highest density traffic information² gathered from taxis, while NISSAN provided

Traffic Forecast Technology based on our cutting-edge Navigation & Telematics Technology.

Through this collaboration, NISSAN testified that **18 percent of travel time was reduced** on average in the real traffic conditions in Beijing in July 2007 and demonstrated this total solution, named as STAR WINGS, at Beijing ITS-World Congress in Oct. 2007.

At the Beijing Motor Show in Apr. 2008, NISSAN announced the Navigation System with STAR WINGS, which utilized the BTIC's Traffic Information received via FM multiplex broadcasting, with a capability of DRG to avoid congestions, and then commercially launched NISSAN's new passenger vehicle called TEANA with the DRG-enabled the Navigation System in China. (Figure 3)

In addition, in Sep. 2009, NISSAN explored the possibility to apply **EDA in the Chinese market** and implemented an educational driving course for trial in Shanghai to find **15%, on average, of improvements** of fuel efficiency among those who took the course.

TRAFFIC FLOW SIMULATION FOR 2020 IN BEIJING

In the real market, penetration of Navigation Systems with DRG capability takes a long time³, because the take rate of those devices at the point of new car sales would be just a small percentage, especially in a non-Japanese market, and