Improving Traffic Flow and Reducing CO₂ Emissions

The road congestion, accidents, and environmental impact that result from heavy vehicle traffic and transport are issues of great concern for automobile manufacturers. It is estimated*, for example, that road congestion doubles fuel consumption and magnifies the environmental impact of exhaust emissions by a multiple of two to four. To help resolve this problem, Toyota is actively developing and popularizing its Intelligent Transport System (ITS)*.

One objective of ITS research is to integrate roads, vehicles and people through information and communications technology, in order to help achieve smooth traffic flow and thus hold down fuel consumption and reduce the impact on the environment. Aiming at early realization of this goal, Toyota is tackling this issue from the perspectives of both car design and the development of advanced traffic management systems. In FY1998, progress was made in the areas noted below.

From Research and Development to Implementation

Transport
Local Traffic System Experiments to Reduce CO₂ Emissions

* Intelligent Multimode Transit System (IMTS*)

IMTS is a medium-range, medium-capacity transport system that combines the efficiency of trains and the flexibility of buses. Use of CNG engines or hybrid power trains significantly reduces noise, vibration, and exhaust emissions compared with conventional diesel powered buses. A combination of driving on dedicated roads in automated “platoons” and manual driving on ordinary roads allows efficient and flexible operation responding to fluctuating demand — an arrangement that will also contribute to reducing traffic congestion.

In March 1999, Toyota completed construction of a 1.5km experimental line at the Higashifuji Technical Center and established an experimental framework designed to put the ITS idea into practice. Toyota will begin full-scale experiments using low-emission buses from FY1999.

* Estimated CO₂ reductions through ITS (unit: 1,000 tons of carbon/year)

<table>
<thead>
<tr>
<th>System implemented</th>
<th>CO₂ reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Advanced navigation system</td>
<td>214</td>
</tr>
<tr>
<td>(2) Dynamic Route Guidance System</td>
<td>276</td>
</tr>
<tr>
<td>(3) Dynamic Parking Lot Guidance System</td>
<td>8</td>
</tr>
<tr>
<td>(4) Advanced Traffic Management System</td>
<td>329</td>
</tr>
<tr>
<td>(5) ACCS (Adaptive Cruise Control System)</td>
<td>89</td>
</tr>
<tr>
<td>(6) ETC (Electronic Toll Collection)</td>
<td>19</td>
</tr>
<tr>
<td>(7) Advanced Logistics System</td>
<td>522</td>
</tr>
<tr>
<td>Total</td>
<td>1457</td>
</tr>
</tbody>
</table>

* From a research study conducted in June 1999 by VERTIS (the Vehicle, Road and Traffic Intelligence Society) at the request of the Japan Automobile Federation

Development of “Crayon” Shared-Use EV Commuter System

The EV commuter system is a short-range personal transit system using small electric vehicles to reduce the impact on the environment. The EV commuters are based near train stations and other points for use as in-town rental cars. Toyota developed the “Crayon” EV commuter system in FY1998 using “e-com” cars equipped with MONET* and VICS*.

Toyota began experimental operation of Crayon in May 1999. Charging stations have been set up at 10 locations within Toyota’s facilities in Toyota City, and 50 e-coms are being shared by about 300 employees.

Facilities
Experiments to Ease Traffic Congestion through Infrastructure Improvement

Electronic Toll Collection (ETC*) System

Currently, congestion at tollgates accounts for 35% of highway traffic congestion. With the ETC system, tolls are collected through electronic identification as vehicles pass through tollgates without stopping. Since ETC processing is about four times faster than the conven-
Intelligent Transport System (ITS)

This system uses GPS car navigation and communications technology to ensure the efficient movement of vehicles and to reduce fuel consumption and CO₂ emissions by commercial vehicles.

Toyota has developed a “Time-t” system for management of delivery trucks, automatic vending machines, and retail shops via a portable phone network, allowing efficient product replenishment and collection of sales receipts. This system was supplied to soft-drink manufacturers in June 1998.

“Time-t” (monitor)

“Time-t” (dispatch center)

“Time-d” System (merchandise delivery system for vending machines)

VICS provides real-time information on congestion and traffic restrictions to drivers, and has demonstrated its effectiveness in easing congestion and cutting the extra distance covered by vehicles that have strayed from their destination, thus helping reduce the environmental impact of traffic.

Toyota has played a major role in establishing VICS service centers, and has promoted development and drivers’ acceptance of this system. As of FY1998, over 1 million Toyota and other vehicles have been equipped with VICS-compatible navigation systems.

FY1998 also saw 4,300 subscribers enjoying the advantages of MONET, which provides real-time traffic and weather information, as well as information regarding facilities, from the Toyota Media Station to moving cars upon request from the drivers. Plans call for a new and improved service package to be introduced in June 1999 that will feature Internet access and real-time images fed from roadside cameras along major routes that enable drivers to ascertain traffic flow.

** Logistics

** Saving Fuel with an Advanced Fleet Management System

This system uses GPS car navigation and communications technology to ensure the efficient movement of vehicles and to reduce fuel consumption and CO₂ emissions by commercial vehicles.

Toyota has developed a version of this system for taxis, called “Time-t.” In May 1998, the first such system was put into operation at a taxi company in Toyota City. The dispatch center computer currently controls about 100 taxis and is able to direct the most conveniently located taxi to pick up a customer.

Government projects are also underway to introduce ETC in Japan — on the Higashi-Kanto, Shuto, and Tohoku expressways in 2000, and in 730 toll-gates on major expressways and toll roads nationwide by FY2002. Toyota is actively involved in these projects.

Field Evaluation in Hong Kong

** Car Multimedia

** Easing Congestion through Vehicle Guidance with Detailed and Timely Information

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