



Development of Environment-friendly Vehicles

**2007
POINT**

1. The Impreza fully remodeled in June, 2007 offers enjoyable driving performance and high safety with the environmental performance significantly improved.
2. The Forester fully remodeled in December, 2007 has the packaging, driving performance and environment balanced at a high level with environment-friendly fuel economy and emission performance.

Improving Fuel Economy

Objective

Expand the scope of vehicles which meet the FY2010 Fuel Economy Standards

Automobiles emit carbon dioxide (CO₂) proportional to the amount of fuel consumed. By improving fuel economy, CO₂ will be reduced resulting in the better conservation of limited energy resources and the prevention of global warming. Subaru, while utilizing the advantages of AWD and high power engines, has been working to improve fuel economy by developing technologies that make engines more fuel efficient, reduce transfer loss in the drivetrain and reduce vehicle weight and running resistance, and we are in the process of introducing vehicles which meet the Japanese FY2010 Fuel Economy Standards, the target for gasoline vehicles.

Current Status in Meeting FY2010 Fuel Economy Standards

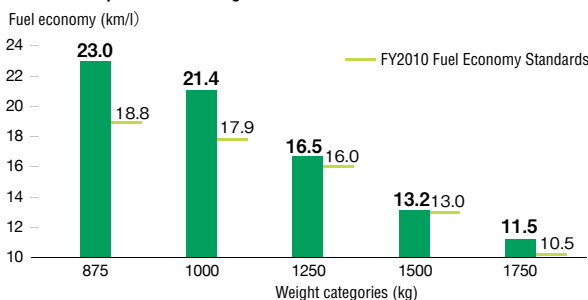
The Standards Achieved in All Weight Categories

Gasoline-powered passenger cars meeting the FY2010 Fuel Economy Standards accounted for 90% of the total production, clearing the FY2010 Fuel Economy Standards in all the weight categories.

Gasoline-powered mini trucks met the Standards in all weight categories in FY2001, and then all models met the Standards in FY2002 and thereafter.

Subaru will expand the scope of vehicles which meet the FY2010 Fuel Economy Standards.

◆ Status of Subaru's Compliance with the FY2010 Fuel Economy Standards for Gasoline-powered Passenger Cars



■ The NEW FORESTER with Modified Engine

Newly Developed 2.0-liter DOHC Engine (EJ20)

In place of the 2.0-liter SOHC engine on the preceding model, the newly developed 2.0-liter DOHC engine (EJ20) was mounted on the New Forester.

The combustion chambers, intake ports and manifold were designed anew. Combined with the adoption of variable valve timing mechanism, the combustion efficiency was enhanced over the whole range, while the torque at low-to medium-rpm and the output at high rpm were increased.



[Newly-developed 2.0-litre DOHC Engine]

In addition, with the low-friction valve mechanism, optimization of coolant thermostat and adoption of high-ignition spark plugs, top-ranking fuel economy in the class was achieved.

▶ See Feature Article on p. 14

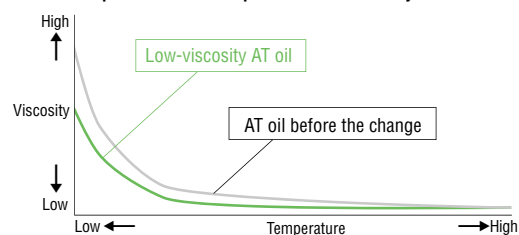
■ Improved Drive-train

Higher Fuel Economy Due to Low-viscosity AT Oil

Oil tends to get thick (highly viscous) when cold and thin (lowly viscous) when hot. In an automatic transmission (AT) which transmits power and shift speed by the oil pressure generated by an oil pump and multiple clutch disks, the use of low-viscosity oil reduces oil pump loss and shearing/churning resistance when cold, thus leading to improved fuel economy.

Subaru has expanded the use of low-viscosity AT oil from the New Impreza, which resulted in an increase of about 1% in fuel economy due to the reduced loss at cold temperature.

◆ Relationship between Oil Temperature and Viscosity



■ Lighter Body

The NEW IMPREZA Lighter by about 20 Kg

Subaru also aggressively pursues to make bodies lighter. The fully remodeled the New Impreza has both top-ranking safety performance and fuel economy by reducing weight by about 20 kg over the preceding model through such means as elimination of sub frames, rationalization of the side structure and extended use of high-tensile materials.

Green Products

Approaches to Assisting Eco-drive

Communication among Driver, Car and Environment

Subaru is also positively engaged in developing eco-drive assist devices as an interface to promote communication between a driver and his or her car. Starting with the Eco Lamp mounted on the Forester launched in 2002, the Eco Gauge and Shift-up Indicator (for MT-equipped vehicles) were added on the Legacy marketed in 2006.

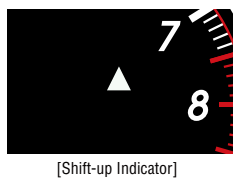
Eco Gauge

The needle of the Eco Gauge swaying to the "+" direction indicates an economic driving condition to the driver. About 5% saving in fuel economy (in-house testing) can be expected by consciously controlling the accelerator to keep that condition.



Shift-up Indicator

When an economic engine rpm is reached, the indicator starts blinking, prompting the driver to shift up.



We will keep forging ahead to develop such eco drive assist devices.

Improvement of Fuel Economy

The First Mini Cars Which Met the FY2015 Fuel Economy Standards

Mini-class Vehicles

Following the FY2006, the Subaru R1, R2 and Stella were ranked among the top in the "2007 Top 10 Fuel Efficient Gasoline-powered Mini Models (Exc. MT models)" standing which was announced by the Ministry of Land, Infrastructure, Transport and Tourism.

In addition, the specially equipped Stella Limited and R Limited which were released in May, 2008 to celebrate the Subaru's 50th anniversary, are the first mini models which have met the FY2015 Fuel Economy Standards.

Small Class Vehicles

Two models of the fully remodeled Impreza with 1.5-litre DOHC engine, one with front-wheel drive and manual transmission and the other with all-wheel drive and automatic transmission, achieved the FY2010 Fuel Economy +10% Standards (10% or higher against the Standards). Also, another two models of the Impreza, one with front-wheel drive and automatic transmission (vehicle weight category of 1,270 kg or over) and the other with all-wheel drive and manual transmission reached the FY2010 Fuel Economy +20% Standard.

Furthermore, two models of the fully remodeled 2.0-litre DOHC Forester met the FY2010 Standards, one with turbocharger passing the +15% Standards, and the other naturally aspirated with automatic transmission passing the +20% Standards, both in the 1,520 kg or over category.

Cleaning Exhaust Gas

Objective

Low Emission Models Which Outperforms the FY2005 Emission Standards by 75% Reduction to Be Expanded

Substances such as carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NOx), which are emitted from automobiles, are one of the causes of air pollution in metropolitan areas where there is intensive motor traffic. In order to improve the state of the air, Subaru is gradually launching low emission vehicles (certified by the Ministry of Land, Infrastructure, Transport and Tourism) that meet standards stricter than the regulations.

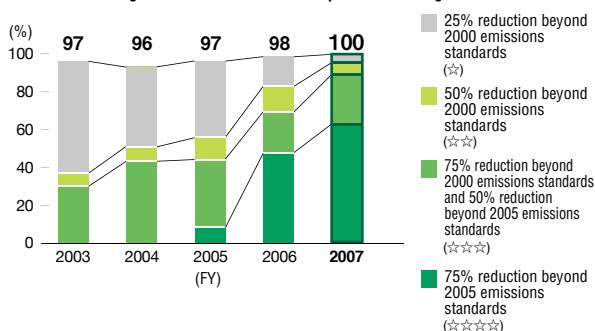
Status of Achieving Low Emissions

Expansion of Certified Low Emission Vehicles

The fully remodeled Impreza and Forester are all certified as low-emission vehicles which meet the 2005 Standards by the Ministry of Land, Infrastructure, Transport and Tourism with at least 50% below the Standards (☆☆☆☆), while 64% of these production models achieved the Standards with at least 75% reduction (☆☆☆☆☆). Thus, the vehicles certified as low emitting totaled 90% of the whole non-mini production.

Subaru will keep going forward for the dissemination of low emission vehicles.

Trends in Percentages of Low Emission Gasoline-powered Passenger Cars



Trends in NOx Averages

Launching Low Emission Vehicles Reduces NOx Year after Year

By launching low emission vehicles which meet the standards represented by the low emission vehicle certification standard into the market, Subaru has been able to reduce the average amount of NOx emitted by Subaru vehicles every year as shown in the chart below.

Trends in NOx Averages of Subaru Vehicles



[Notes]

-The figures calculated from the regulation values (10/15 mode and 11 mode) at the time of shipment.
 -About vehicles which are not for the current test mode, calculations were made with regulation or conversion values for the current mode.
 -The current test mode is a combined mode of the 10/15 mode and 11 mode.



Clean Energy Vehicles

Clean energy vehicles have such features as emitting fewer global warming substances (carbon dioxide) and air pollutants (carbon monoxides, hydrocarbons, nitrogen oxides, etc.) and have less environmental impact than gasoline engine vehicles. However, there are technical problems related to cost and driving distance. Subaru has been developing clean energy vehicles such as electric vehicles that have the gasoline engine vehicle-level performance and utility. Also, we are positively working on developing next generation batteries for hybrid vehicles and fuel cell electric vehicles.

Development of Next Generation Batteries

In Pursuit of Electric Vehicles with Travel Range at Least 200 km

Subaru is involved in the R&D of the next-generation battery "nano V Battery" (TM registration pending for approval) for future application to electric vehicles, while working for volume production of electric vehicles.

This battery has a Subaru-developed vanadium anode which allows storage of more lithium ions because of the nano-size crystals. By applying the lithium ion doping technology nurtured in developing lithium ion capacitors, this battery offers good prospects to have more than twice energy density than that without such technologies.

We announced a concept car with the nano V Battery, "G4e Concept" at the 2007 Tokyo Motor Show.

We will pursue relentlessly to further raise the energy density for electric vehicles which can run at least 200 km.



Our concept car, "G4e Concept"

Development of Lithium Ion Capacitor

Development of Storage Device Which Meets Low-to-High Electric Power

Subaru has been developing a lithium ion capacitor which can accommodate a wide fluctuation of electric power.

Currently, this capacitor is under study for practical application as eco-friendly device to alternative storage to lead batteries for automobiles and to the electric generations with highly fluctuating natural energies such as wind power and sunlight and with small energies from such sources as tiny hydropower and vibrations.

Industry-government-academia Joint Development of Energy Saving Gasoline Engines

Technological Development of Advanced Power Source

The development of technologies to realize cleaner and more energy-efficient advanced power sources requires cross-sectional industry-government-academia approach on a national scale.

Subaru has jointly taken part in the Strategic Development of Energy Conservation Technology Project by the New Energy and Industrial Technology Development Organization (NEDO) with Chiba and Nihon Universities to develop high-efficiency engines.

In the leading research phase, an epoch-making technology was developed to avoid knocking at a compression ratio of 14 with thermal efficiency improved by 6% to 11%. In the phase of practical application research for vibration reduction and rpm increase, we achieved an operation at 2,500 rpm, confirming the improvement in thermal efficiency at a practical operation range.

We are also jointly involved in the Program for Promoting Fundamental Transport Technology Research by the Japan Railway Construction, Transport and Technology Agency (JRRT) with the National Traffic Safety and Environment Laboratory and Toyama University. In a project to chemically control knocking, we succeeded in hiking a mode fuel economy by 6.5% with a compression ratio of 12 and are now raising the ratio up to 14.

Further effort will be expended to embody a new low-polluting gasoline engine with high efficiency comparable to that of diesel engines.

Noise Reduction

Development of Technology to Reduce Traffic Noises

Another area Subaru is actively involved is the development to effectively reduce vehicle noises from such prime sources as tires, engine and intake and exhaust systems. The New Forester launched in November, 2007 has such technologies applied to meet the acceleration noise level set in the Safety Standards with good margin.

◆The Main Countermeasures Employed to Reduce the Noise the NEW FORESTER Generates

