



PROTECTING THE ENVIRONMENT

CREATING THE FUTURE WITH TECHNOLOGY

Respecting the global environment is the most important aspect of our journey toward sustainable development. At the same time, in order to allow all people across the world to enjoy a prosperous lifestyle, further industrial development is a necessity.

Continued innovation is crucial to achieve a balance between economic development and the protection of the natural environment. At Nissan, we view this as a major challenge.

Innovation is taking place in many areas. The birth of the super ultra-low emission vehicle, with exhaust gas that is almost as clean as the air, is one example of innovation.

Environmentally friendly products can become effective when they are more widely popular. But for that to happen, it is essential that customers are satisfied with the price of these products. To meet this requirement, we have focused our efforts on realistic technological developments while taking on a multitude of technological innovations.

Keeping nature and industry in balance while opening the way to the future through the development of credible technologies: at Nissan, we view this as our mission.

Curbing Global Warming

Reducing CO₂ emissions

The Intergovernmental Panel on Climate Change predicts that by the end of this century, the earth's average temperature will rise between 1.4 and 5.8°C, and sea levels will rise from 9 to 88cm. Global warming is one major issue of our time and requires an urgent response. The burning of fossil fuels, such as oil and natural gas, creates CO₂ emissions. Because of this, the concentration of CO₂ in the atmosphere is increasing, giving rise to the so-called greenhouse effect. This is thought to be the major cause of global warming. We know we must first control our consumption of energy, and also reduce CO₂ emissions from our cars. Viewing this as one of the most important issues we face, Nissan is working to protect the environment.

Reducing CO₂ Emissions from Driving Steady progress and challenges

During a car's lifecycle from production to disposal, by far the largest volume of CO₂ is emitted while the car is being driven, accounting for approximately 90% of all CO₂ emissions. In order to reduce emissions from use, Nissan is using highly effective technology in many of our vehicles. And, in order to accelerate our efforts, Nissan has set the following commitment: "strive to meet the Japanese government-mandated 2010 fuel economy standards by 2005, five years ahead of the original schedule."

Working toward this clear goal, Nissan has made a sustained effort to improve fuel economy technology. Many improvements in engine efficiency have been made due to direct injection and in-drive system efficiency through the use of a continuous automatic transmission

device (Continuously Variable Transmission [CVT]) and vehicle weight-saving techniques. In fiscal year 2003, as a result of these technological advancements, Nissan achieved its fuel economy goals set for 2010 in four out of seven weight classes in Japan.

Hybrid Electric Vehicles

Hybrid electric vehicles, which run on the combination of a gasoline engine and electric motor, are characterized by superior environmental performance because of their low CO₂ emissions and clean exhaust. In Autumn 2002, Nissan signed a basic agreement with Toyota Motor Corporation (Toyota), under which Toyota will provide its hybrid systems while Nissan will independently focus on developing product appeal and adapting hybrid technology to the engine and vehicle, aiming to produce more than 100,000 vehicles in five years. Nissan introduced the first test model, the Altima Hybrid, in the United States in

CVT – Continuously Variable Transmission

With conventional automatic transmission (AT), gradual transmission changes are made in response to engine revolutions. But, with our CVT technology, we achieve optimum automatic changes in transmission

due to a pulley and steel belt that replaces the gears. In 1992, following its first installation in the March, CVT was installed in cars like the Teana, providing smooth acceleration and improved fuel economy.



Contributing to Environmental Protection through Car Navigation and Electric Toll Collection (ETC)

Nissan is focusing our efforts on the development of Intelligent Transport System (ITS), a technology that aims to solve the various problems that are part of road traffic, such as accidents or traffic jams, and environmental issues through cutting-edge information and communication technologies and control technology (see

pp. 54-56 for details). The car navigation system and the ETC system in use in Japan are components of ITS technology. Car navigation systems help to find the fastest route to one's destination while avoiding congestion and helping improve traffic conditions. ETC allows cars to pass through and safely pay tolls, which are a contributor

to traffic congestion on high-speed roads. From an environmental perspective, these technologies benefit the environment by helping avoid wasteful travel, reduce traffic jams, and improve gas mileage. With our new ITS technology, our aim is not only to provide a pleasurable driving experience, but also to reduce environmental impact.

June 2004, less than two years from the signing of this basic agreement. We will make further improvements, using the test car as a base, in order to start production and sales in North America in 2006.

Fuel Cell Vehicle (FCV)

Looking further into the future, fuel cell vehicles (FCV) present great opportunities. FCVs run on a motor that generates electricity through the reaction between hydrogen and the oxygen in air. The only emission from the process is water, meaning FCVs are attracting much attention as the ultimate eco-car.

Nissan started developing fuel cell vehicle technology in 1996. In Japan, our X-TRAIL FCV 2003 model, a high-pressure hydrogen-powered fuel cell vehicle, was approved by the Japanese Minister of Land, Infrastructure and Transport in November 2003, after which we commenced

limited lease sales. In March 2004, Cosmo Oil Co., Ltd. leased the first Nissan X-TRAIL FCV and started a joint study with Nissan on a hydrogen supply system. This movement was followed by the Yokohama City and Kanagawa Prefectural governments, in the first-ever government leasing in the Tokyo Metropolitan area of FCVs to promote the use of low emission vehicles.

There are still issues when it comes to achieving the full-scale spread of FCVs, including cost reduction, fuel supply, and infrastructure, and we believe it will still be some time before we find solutions to these issues. However, for the world automobile industry, the challenge that accompanies a reform of the energy system is one we have not experienced before. At Nissan, we are participating in open-road testing in Japan and the US, and are accelerating our efforts to find solutions that aim at putting FCVs into widespread use in the future.



Altima Hybrid

X-TRAIL FCV



Kanagawa Prefectural Government leases the NISSAN X-TRAIL FCV (Japan)



Making and Delivering Cars **Balancing economic and environmental merits**

We are pursuing the streamlining of our plants, and have achieved some of the highest levels of production efficiency in the world. Low production volumes and high cost in effect imply an inefficient use of resources. Thus, improving production efficiency brings not only economic but also environmental benefits.

Since 2002, we have introduced highly efficient cogeneration systems that effectively use waste heat from power generation at a number of our plants. In

addition, we have set up an energy conservation team that is addressing the reduction of CO₂ emissions from production on an ongoing basis.

In fiscal year 2003, we achieved a 12% reduction in CO₂ emissions from production in Japan as compared to figures from fiscal year 1990. By no means, however, are we satisfied with this level. The issue remains of how to effectively reduce CO₂ emissions while steadily increasing the number of cars we produce. We will continue to act progressively on the issue of CO₂ reduction in order to find better solutions.

Working Toward Sustainable Mobility **– Making proposals as a member of WBCSD**

Nissan is a member of the World Business Council for Sustainable Development (WBCSD), a coalition of 170 international corporations. As part of this activity, Nissan has been participating in "Mobility 2030," a project that explores the attainment of sustainable mobility by the year 2030, and together with other participating corporations, we have defined the following seven objectives.



World Business Council for
Sustainable Development

1. Reduce exhaust emissions
2. Reduce greenhouse gas emissions
3. Reduce the number of transport-related deaths and injuries
4. Reduce transport-related noise
5. Mitigate traffic congestion
6. Narrow mobility divides between countries
7. Improve mobility opportunities for the general population

Reference: WBCSD "Mobility 2030"



The Possibility of CO₂ Absorption

At Nissan, we are also exploring ways to absorb CO₂ from the atmosphere. Many different approaches are possible, such as the absorption of CO₂ by planting trees or growing seaweed. We want to continue to explore these possibilities, networking with researchers from around the world.

Reducing CO₂ Emissions by Streamlining Logistics

Shipment retrieval and modal shifting*

It is impossible to think of manufacturing without taking into account the role of logistics. From the procurement of parts to the completion of the assembly of one car, goods are constantly being transported to and from the plant. However, truck operations, which are the core of our logistics activities, create high CO₂ emissions.

At Nissan, we are striving to streamline logistics in order to reduce CO₂ emissions. In Japan, we switched over to a system in 2000 in which we retrieve our shipments directly from the supplier when procuring parts. Many truck runs were required when our suppliers delivered our parts, but with our retrieval system, since it is possible to load several shipments together, we can reduce the number of trucks in operation thereby reducing CO₂

emissions. Although this method has been used widely in Europe and America, Nissan became the first to adopt this method in Japan. At Nissan in the US and Europe, in addition to this retrieval method, Cross Dock System has been introduced to consolidate routes in order to more efficiently organize truck runs within a wide transport area.

In Japan, not only do we use trucks to transport our goods, but a modal shift has also been made toward the combined use of rail and ferry transport. With the implementation of this method on our routes between the Kanto area and Kyushu, we were able to reduce the more than 2,000 tons of CO₂ emitted by truck operations by 70%.

In addition, we are also promoting a modal shift in the transport of finished vehicles. Fifty percent of our transport aimed at the Japanese market is currently achieved through the use of watercraft.

* Modal shift is a switch from truck main line cargo transport to more environmentally friendly marine transport or rail when possible. There are efficiencies associated with consolidated, long-distance mass transport, which is one of the merits of a modal shift. But to promote a modal shift, a proactive approach from all involved parties is essential to secure such a large amount of cargo as well as to transfer cargo from trucks, etc., among other changes.



Parts transport through a combination of rail and ferry use in addition to transport by truck to reduce CO₂ emissions (Japan)

Toward Cleaner Emissions

Protecting the air, water, and soil

Nissan is pushing forward with technological development to achieve even cleaner exhaust emissions.

One of the results of Nissan's technology is the realization of the world's cleanest gasoline car.

We want to dramatically increase the benefits for society

by adopting highly efficient technology in as many of our cars as possible.

The issue of speediness is an important angle for us in working on environmental protection.

Protecting the Water and Soil Measures taken at our plants

Nissan complies with the legal restrictions of each country where global operations are based, and also carries out stringent checks to prevent accidents in our effort to protect the air, water, and soil. In terms of water, we believe it is an unquestionable responsibility to manage the water used at our plants appropriately. In addition to this, at our plants in Japan, we are taking further measures such as installing sensors on our rain gutters to prevent the accidental flow of harmful substances caused by rainwater. For soil, we voluntarily run investigations and when improvements are considered necessary, we promptly carry out cleanup measures.

Expansion of Ultra-Low Emission Vehicles (U-LEV) Adopting effective technology in as many cars as possible

In response to stronger worldwide demand for action to protect the environment, Nissan set the goal to achieve the ultra-low emissions (U-LEV) status established by the Japanese Ministry of Land, Infrastructure and Technology in at least 80% of new cars sold by the year 2003 as part of our medium-term environmental plan, Nissan Green Program 2005, which was announced in January 2002. A U-LEV is a car with exhaust emission levels more than 75% below the level prescribed in the ministry's exhaust emissions standards from 2000. We calculated that if 80% of passenger cars sold in Japan were U-LEVs, this, in terms of the reduction of nitrogen oxide (NOx) and hydrocarbon (HC) emissions, would have approximately the same effect as selling 400,000 – or 60% annual sales in Japan – electric or other zero emission vehicles. We achieved this target ahead of time in January 2003, and by the end of fiscal year 2003, 90% of gasoline passenger vehicles sold in Japan were U-LEV certified.

U-LEVs: From March to Fairlady Z

At Nissan, we have expanded U-LEV technology to as wide a range of models as possible. The latest environmental technology is being adopted in compact cars like March and Cube, sports cars like Fairlady Z, and minivans like Elgrand. We are introducing this technology widely to make it possible for different age groups, who are buying cars for many different purposes, to drive U-LEV cars.

Environmental technology can only be truly effective when it is adopted widely. Focusing our efforts on effective technologies with immediate applicability is an important approach when it comes to environmental protection. While we work to improve the fuel economy of our cars, we also make efforts to apply the "75% below year 2000 emission standards U-LEV" technology to as many different models as possible.



The Birth of the Super Ultra Low Emissions Vehicle (SU-LEV) The world's cleanest gasoline car

Nissan goes beyond U-LEVs, working to develop the world's cleanest gasoline car. The Bluebird Sylphy, launched in Japan in 2003, was the first car in the country receiving certification as a super ultra-low emission vehicle (SU-LEV) – that is, with exhaust emissions at only half the level of the U-LEV – as defined in the Ministry of Land, Infrastructure and Technology standards from the year 2005 onward. This is the most stringent emissions standard in the world. The Bluebird Sylphy was first launched in 2000. The 1.8-liter engine (2WD) model of this car has the same exhaust emissions reduction capability as the Sentra CA, which received certification in California (USA) as the cleanest gasoline-fueled car in the world, and has had emissions at half of U-LEV levels.

Protecting the Air During Production Controlling volatile organic compounds (VOCs)

Painting is the part of the manufacturing process to which the most careful attention must be paid. The reason is that painting causes the emission of VOCs called toluene/xylene, which are contained in many solvents. In an effort to control VOCs, Nissan has initiated a number of actions, such as promoting the use of recycled thinner with a lower environmental impact and reducing the volume of solvents used. In addition, in our plants in Kyushu, we are switching over to water-based paints. As a result, at the same plant, the average amount of VOCs emitted from passenger cars was reduced to 20g/m², which is only one-third of the average emission value of passenger vehicles.



The Bluebird Sylphy, launched in Japan in 2003, the first car in the country receiving certification as a super ultra-low emission vehicle (SU-LEV)

Effective Utilization of Resources for a Sustainable Society

Aiming to make cars without producing waste, that do not end up becoming waste

Cars are produced with many valuable resources.

Aiming to continue the circulation of these precious materials,

Nissan strives to make cars without producing waste, and that do not end up becoming waste.

While progressing with the development of proprietary recycling technology, we have also formed partnerships with recyclers and have taken part in the establishment of a recycling network.

Technology and the collaboration of many people are what enable the continued circulation of resources in society.

Building a Recycling System Advancement through partnerships

To raise the recycling rate of automobiles, Japan instituted an Automobile Recycling Law, effective from January 2005. Nissan has always believed that recycling is an important issue, and we have put a lot of effort into addressing it. Currently, all new Nissan cars sold in Japan have achieved recoverability rates of 90%* or more. The goal that we are presently working to meet is achieving 95% by 2005. March, Cube, and Cube Cubic models have already reached this goal.

* The recycling rate considered the highest attainable at the time the new models were produced, after taking into consideration changes in handling and disposal methods at the automobile's end of life.

In order to achieve a circulatory recycling flow, it is important to take a comprehensive approach to the vehicle. At Nissan, many departments such as planning, production, technological development, sales, distribution,

and others, work across department boundaries, considering the vehicle from the design to the end-of-life stages, thus enhancing the recyclability of our cars.

Also, a partnership between those who make the vehicle and those who recycle it is essential. If improvements made to the vehicle do not fit with the steps taken during disassembly, one cannot expect to see improvements in the recycling rate. For this reason, Nissan employees visit vehicle recycling locations in each country and listen to the people working there to allow for a design that is easier to recycle and to develop technologies with less environmental impact.

In 1997, we started an experimental disassembly plant in Japan in close collaboration both with recyclers and related industries to promote further research. We have developed technologies and production methods that allow us to increase the recycling rate and reduce

Shredder Residue Recovering at our Automobile Manufacturing Plants (Japan)

At present, approximately 5 million cars are scrapped each year in Japan. After being scrapped, 80% of each car is either reused as parts or recycled as material, while the remaining 20%, unfortunately, so far has ended up being landfilled as Automobile Shredder Residue (ASR). ASR consists of crushed substances that

cannot be separated, such as plastic, glass, rubber, and metal. At Nissan, we have continuously conducted experiments to work on the issue of ASR and we succeeded in achieving materials recycling. From Autumn 2003, we began to renovate part of the waste disposal incinerator at the Oppama plant and initiated thermal

recycling, using combustible materials as a fuel to melt metals for recycling. In addition, the steam generated during incineration is utilized throughout the factory as energy. We are working to widely implement and share this knowledge.



Equipment for the recovery of automobile shredder residue
(Oppama plant, Japan)

Enforcement of the Automobile Recycling Law (Japan) – Eleven automobile manufacturers jointly involved in recycling

In March 2004, Nissan and ten other companies including automobile manufacturers established an ASR recycling promotion team. With enforcement of the Japanese Automobile Recycling Law due in January 2005, Nissan plays a leading role in this team that crosses over company boundaries, with the aim to establish effective recycling of ASR.

This alliance enables each company to share the knowledge of recycling they have accumulated and generate economies of scale. The project will create positive cost and speed effects exceeding those that would accrue if each vehicle manufacturer recovered and recycled ASR independently.

environmental impact. Also, to make it possible for recyclers to adopt these initiatives, we provide open information on the procedures, equipment, technology, and cost involved. We believe that networks created in

this way, combined with the sharing of information and know-how across a range of stakeholders, is what allows us to move toward more efficient use of resources.

Major Recyclable Parts on the March

