Mazda Motor Corporation

・General Technological Development of Innovative Next-generation Low-emission Vehicles (FY2004-2008)

Clean Diesel Engine with the World’s Highest Level Fuel Efficiency and Environmental Performance

Diesel engines are capable of efficiently converting burning energy into driving force and are superior to gasoline engines in the fuel efficiency performance. In Japan, hybrid vehicles are currently attracting attention for their high environmental performance including the performance relating to the exhaust gas, energy saving and CO2 emissions reductions. In Europe, however, diesel engine vehicles are very popular because of their high fuel efficiency performance. It is said that one out of every two vehicles in Europe is a diesel engine vehicle.

On the other hand, traditional diesel engines emit larger amounts of air pollutants such as NOx (nitrogen oxides) and PM (particulate matters such as soot) than gasoline engines, and achieving environmental performance on par with that of gasoline engines by purifying the exhaust gas has required the use of a catalyst that requires a large amount of noble metal and large exhaust gas treatment equipment such as urea SCR equipment.

Against this background, NEDO conducted the "General Technological Development for Innovative Next-generation Low-emission Vehicles" Project for five years from FY2004 with the aim of improving the environmental performance of diesel engines to alleviate global warming and reduce the emissions of environmental pollutants. Mazda Motor Corporation, which is the automobile manufacturer that has been especially conscious of the possibilities of diesel engines among the Japanese automobile manufacturers, participated in the project and endeavored to develop a new burning technology that does not compromise the high heat efficiency of diesel engines and to develop innovative catalyst technologies.

As a result, Mazda Motor Corporation commercialized in 2012 the "SKYACTIV-D" diesel engine whose fuel efficiency is at the world’s highest level and whose exhaust gas is so clean that no NOx post-treatment equipment is required.

This engine is being used in Mazda vehicles such as "ATENZA" and "CX-5," and the number of SKYACTIV-D-equipped MAZDA vehicles sold (in Japan) by June 2013 exceeded 50,000, thereby greatly contributing to the popularization of diesel engine vehicles, which helps reduce greenhouse gas emissions.
**Q. Why did this project start?**

In the year 2004 (the year in which the project started), the public interest in environmental issues such as global warming and air pollution had been heightening. As a result, addressing automobile-related environmental problems had become an urgent task and the need to develop and popularize low-emission vehicles had increased. In addition, it had been demanded to comply with the Post New Long Term Regulation, which had been the strictest regulation in the world, by around 2010. This had been a challenge that could not be met through efforts of the automobile manufacturers alone and required research and development in diverse fields and coordinated collaborative efforts between the industry, academia and government organizations. Against this background, NEDO started the “General Technological Development for Innovative Next-generation Low-emission Vehicles” project in FY2004 and pursued the five-year national project on a scheme for coordinated collaborative efforts between the industry (including domestic automobile manufacturers), academia and government organizations.

**Q. What was the aim of the project?**

Diesel engines are superior to gasoline engines in thermal efficiency, but their exhaust gas contains larger amounts of NOx (nitrogen oxides) and PM (particulate matters such as soot) than gasoline engines. For this reason, there had been a need to improve the environmental characteristics and energy efficiency of diesel engines. Therefore, this project pursued the development of technologies to dramatically reduce environmental pollutants in the exhaust gas of diesel engines while retaining the high thermal efficiency of diesel engines, with a focus on the development of exhaust gas post-treatment technologies and fuel utilization technologies dedicated for diesel engines. Specifically, this project pursued the development of engines employing new diesel fuel burning methods, the development of technologies for introducing clean fuels and the development of new exhaust gas purification systems that dramatically reduce environmental pollutants in the exhaust gas of diesel engines.

**Q. What is the role of NEDO?**

Because it was necessary to comply with the strictest exhaust gas regulation in the world and establish a new method for evaluating the technologies developed and predict the effect on the environment (the air), NEDO supported the development of the scheme for coordinated collaborative efforts between the industry, academia and government organizations (ranging from coordinated collaborative efforts in basic research to coordinated collaborative efforts to put the developed technologies, systems, etc. into practical use). In addition, NEDO checked the progress statuses of the research and development activities and reviewed the directions of the research and development activities for improving the research and development activities as necessary, by receiving interim evaluations by external learned people and holding regular technological committee meetings. In particular, NEDO helped the organizations involved put the technologies developed in the project into practical use smoothly after completion of the project, by flexibly changing the target values in line with the decisions made by councils of ministries and agencies of the national government and newly adopted standards, erasing the concern about the environmental impact of diesel vehicles, carrying out public relations activities for the future popularization and promotion and holding result report meetings.