

## Building Engines that Have a Low Environmental Load



### Containing Total CO<sub>2</sub> Emissions

In helping people and goods get where they need to go, Hino Motors' trucks and buses are today integral components of the social transportation infrastructure.

CO<sub>2</sub> emissions are a primary cause for the increasingly serious impact of global warming on the environment, so the need to reduce them is at the same time an issue of pressing concern for both the automobile industry and society.

In 1991, Hino Motors became the first manufacturer in the world to begin commercial production of hybrid buses. This was a result of working tirelessly to develop and improve environmental technologies as a part of efforts to enhance the environmental performance of commercial vehicles.

Hino Motors recognizes that one of its social responsibilities as a commercial vehicle manufacturer is to contain the amount of total CO<sub>2</sub> emissions and reduce air pollution. Therefore, the Company is working to help protect the global environment while contributing to the welfare of each and every individual by consistently taking the lead in efforts to enhance its clean diesel and hybrid technological capabilities.

### Pursuing Next-Generation Clean Diesel Engines

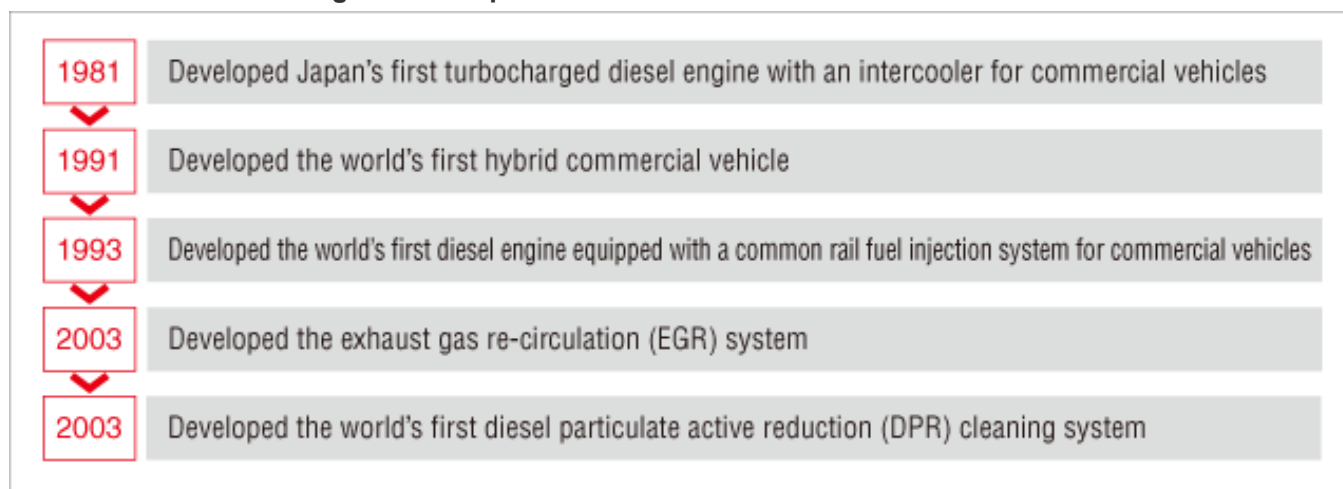
Diesel engines are distinguished by their higher thermal efficiency compared to all other internal combustion engines. Because they contribute lower amounts of CO<sub>2</sub> emissions owing to enhanced fuel efficiency, diesel engines are also considered as an important element in the fight against global warming.

On this basis, Hino Motors has long understood the significant potential and role that diesel engines can play in the difficult challenge of reducing such airborne contaminants as nitrogen oxide (NO<sub>x</sub>) and particulate matter (PM). The Company will continue striving to enhance its engine development capabilities with an eye to offering

improved fuel efficiency in combination with low emissions, as well as increasingly lightweight and cost effective vehicles.

Empowered by these patient endeavors and an unwavering dedication to develop and deliver environmentally friendly diesel engines, Hino Motors aims to stand at the forefront of its industry worldwide.

## ■ Milestones in Technological Development



## The Driving Force behind Efforts to Consistently Develop Innovative Technologies

Hino Motors has successfully developed clean and environmentally friendly engines that fully comply with exhaust emission regulations. A driving force behind the Company's innovative technologies is its open and flexible corporate culture that extends well beyond any single organization or field of expertise. Formerly, the processes involved in the development of engines were the exclusive domain of mechanical engineers. In recent years, however, there are demands for electronically controlled devices such as fuel-injection systems, raw materials that facilitate the manufacture of high-intensity lightweight vehicles, and next-generation fuels. This has necessitated the combined input of a wide spectrum of engineering fields including electronics, metallurgy and chemicals. In this context, Hino Motors has created a corporate culture that facilitates and encourages specialist expertise across a broad range of disciplines to be channeled into a single, common and unified goal. Through the composite knowledge of various personnel, Hino Motors is in the position to swiftly solve difficult issues that are beyond the realms of individual engineers. This inherent corporate DNA has been the hallmark of the Company's vehicles since its founding to the present day. It reflects efforts to deliver the highest quality founded on superior technologies, and remains the source and motivation for the timely development of new and advanced technological breakthroughs.



In pursuit of the ideal engine that has no impact on the environment  
Mr. Ihara (right), General Manager of the Engine Engineering Division, in deep discussion with Mr. Sano (left) of the Medium- and Large-Size Engine Planning Office of the Engine Engineering Division

## Responding to Successive Environmental Regulations

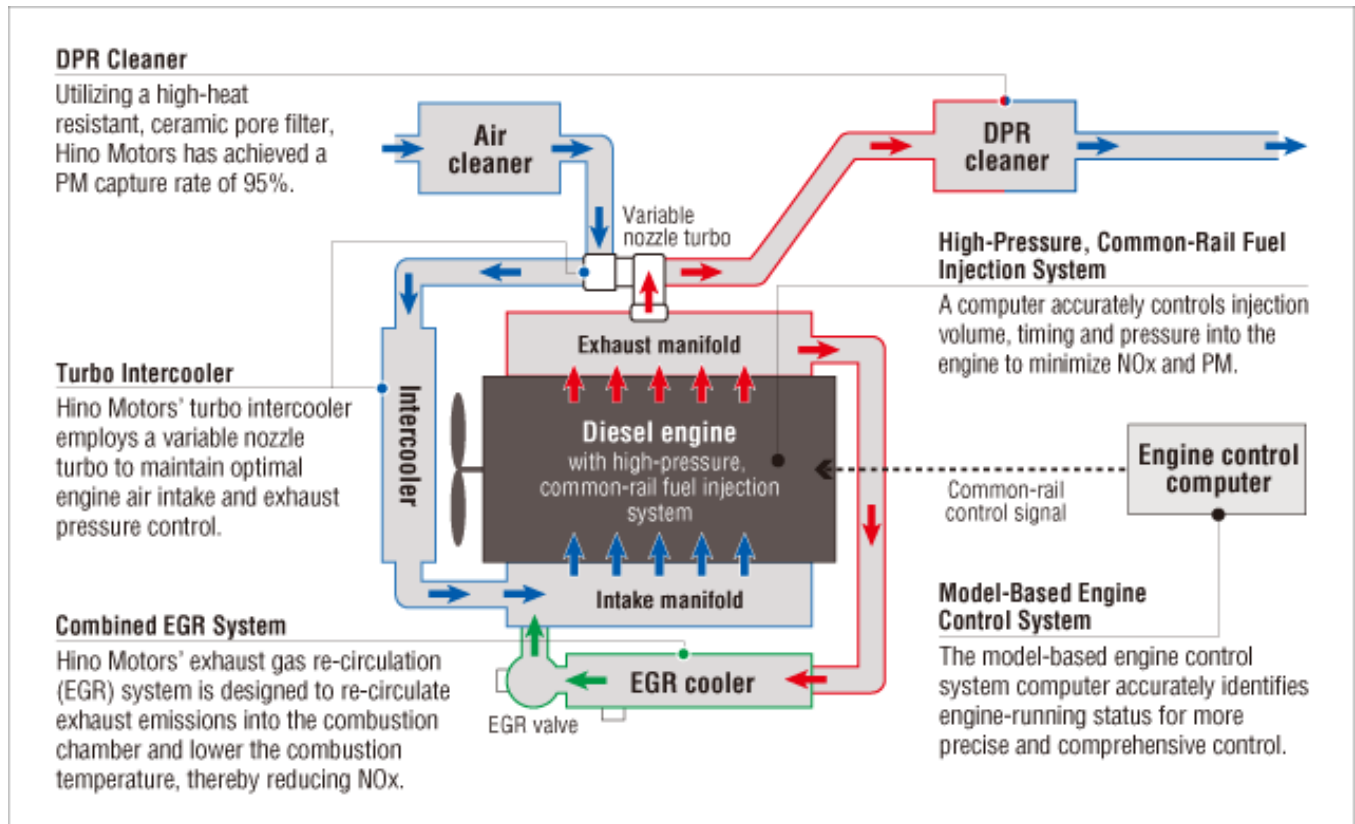
The protection of the environment became an increasingly important concern throughout the 1990s, and a variety of restrictions, requirements and regulations aimed at reducing and preventing the emission of such air contaminants as NOx and PM were successively introduced. In response, Hino Motors positioned the development of environmentally friendly diesel engines at the heart of its overarching corporate mission.

At the same time, the Company has continued to recognize its obligation to minimize the burden placed on consumers, who are obligated to replace and upgrade their existing vehicles because of the statutory and regulatory requirements. In entering a period of intense competition, Hino Motors will work to jump ahead of its

competitors in the development of high-performance, low-cost engines that have fewer burdens on the global environment.

Through its corporate culture that encourages robust exchange and the harmonious integration of each employee's knowledge and expertise, Hino Motors has successfully drawn from the ideas and conceptual plans of individual engineers to both standardize and reduce the number and types of component parts. In this manner, the Company has successfully made cutbacks in input and operating costs as well as gains in production efficiency. Hino Motors has channeled this Company-wide pool of originality and ingenuity into the development of its creative clean diesel particulate active reduction (DPR) system, which meets the environmental requirements of existing exhaust emission regulations.

### ■ Hino Motor's Creative Clean Diesel Particulate Active Reduction (DPR) System



### Realizing a Low-Emission Motorized Society through Increased Use of Hybrid Vehicles

In recent years, the hybrid vehicle (HV) has attracted considerable interest as a mode of transportation that has relatively low impact on the environment.

Despite a long history of research that dates back to the beginning of the 20th century, there was little or no practical application of the HV due to its large dimensions and weight, as well as to the poor energy efficiency of earlier prototypes.

Hino Motors brought new life into the research on this technology, and became the world's first commercial vehicle manufacturer to develop and market HVs in 1991.

Hino Motors' first attempt into the HV field began shortly after the Second World War. Seeking to address the acute energy shortage, Hino Motors succeeded in developing electric trolley buses. This technology later provided the basis for such Company milestones as the electric bus in 1973 and the HV bus in 1991. Expanding its lineup of "Dutro" light-duty commercial vehicles, Hino Motors' efforts contributed in 2003 to the volume production of HV trucks.

Currently, the Company uses a parallel hybrid system that combines the drive power of both the engine and the motor. In this system, the vehicle battery is recharged by accumulating vehicle kinetic energy with motor and inverter when decelerating and braking. Conversely, the engine is assisted by the motor when starting and



Unlocking the future of hybrid vehicles through control technologies  
Mr. Suzuki, HV Development Office, HV Development Division

accelerating. By reducing the load of diesel engines, fuel consumption and exhaust emissions are reduced. This is an optimal system for buses and delivery vehicles that repeatedly stop and start.

Hino Motors has further broadened the potential of diesel engines, offering customers more options through HVs that deliver fuel efficiency combined with low emissions. With these efforts for creating environmentally friendly vehicles, Hino Motors strives to be a global frontrunner.