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Engines, the most important components of vehicles, have such environmental protection imperatives as improved fuel efficiency, lower exhaust emissions, and reduced noise levels. In the Engine Division, every staff member is making efforts to develop and manufacture engines that are friendly, both to people and the natural environment, as well as to supply products that have enhanced basic and environmental performance.

The Engine Division is responsible for developing and manufacturing diesel and gasoline engines for use in automobiles and industrial vehicles. Using individual production technology that makes use of unmanned transporter vehicles, we are manufacturing many kinds of engines with displacements that range from 1.5l to 4.5l. Having capabilities for both industrial and automotive engines, the division plays an important role within the Toyota Group.



▲An engine assembly line that makes use of unmanned transporter vehicles

## Development and Design

### Developing Engines That Are More Environmentally Friendly

The 1DZ-II diesel engine was developed for use in GENEO forklifts to achieve cleaner exhaust emissions and lower noise levels. Compared with previous engines, the thickness of smoke emitted during initial start-up and acceleration has been reduced 30% to 40%. Noise levels have been reduced 3dB to 5dB.



▲The 1DZ-II, a 2.5-liter diesel engine for industrial equipment

The 3C-E diesel engine, developed for use in Corolla and Cardina automobiles, offers excellent fuel economy and relatively clean exhaust emissions. The use of an electronically controlled fuel injection system and the optimization of the combustion chamber shape and capacity are key factors underlying the fuel economy improvement. To clean the exhaust emissions, we adopted an electronically controlled exhaust gas recycling unit that lowers the levels of nitrogen oxides and a diesel fuel oxidizing catalyst unit that reduces the release of CO<sub>2</sub>, hydrocarbons, and particulates.



▲The 3C-E, a 2.2-liter diesel engine for automobiles

To improve fuel economy and reduce resource consumption further by reducing the engine's mass, we are currently using computer-aided engineering methods to design smaller and thinner components, increase component modularization, and make greater use of components made of lightweight materials, such as aluminum and plastic.

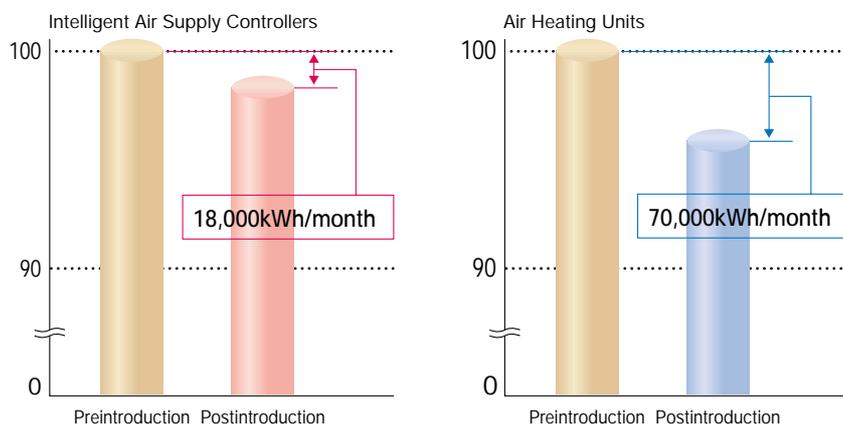
## Production

### Promoting Energy Conservation with Concepts Based on Fresh Perspectives

Some of our manufacturing equipment is powered by compressed air, and we have taken steps to reduce related energy consumption by installing units that control compressed air supplies more intelligently. These units supply each production line with only the amount of air the line requires and only when required. Additional heating units that use excess steam from factory co-generation

systems to heat the compressed air have been installed. They increase the volume of air and reduce the electric power required to compress the air. We estimate that these measures save 88,000KWH of electricity each month, which corresponds to a monthly reduction of 16 tons of CO<sub>2</sub> emissions.

### Energy Consumption Associated with Compressed Air Supplies (level before introduction of new equipment = 100)



▲A unit that more intelligently controls compressed air supplies

### Greenification of Factory Grounds Using Recycled Wastewater

Our division features an employee relaxation atrium with abundant greenery, water, and natural light. We have also worked to create attractively verdant strolling paths within the garden-like grounds of the plant and otherwise promoted greenification throughout those grounds. Wastewater from the plant is treated and used to water the many plants on the grounds. Because of its many features that promote harmonious coexistence with people and the natural environment, the Hekinan Plant won the Chubu Bureau of Communications, Trade, and Industry Director's Prize (a special prize awarded by the government bureau responsible for communications, trade, and industry in the Chubu region of Japan).



▲The atrium located at the center of the Hekinan Plant