

# ENVIRONMENTAL ACTIVITIES

The Isuzu Group is committed to environmental stewardship on a global scale, regarding preservation of the natural environment as an issue of paramount importance for management. Our basic stance is to ensure that our vehicles are environmentally sound throughout their lifecycle, from development to production through to usage and disposal. At the same time, Isuzu is committed to conducting environmentally sound business activities as well as participating in environmental programs on a local community and social level.

Underscoring Isuzu's commitment are concerted efforts to develop a diesel engine that is even cleaner and more environmentally friendly by upgrading Isuzu's current lineup of diesel engines to further reduce already low emissions of carbon dioxide (CO<sub>2</sub>), a primary cause of global warming. Acquisition of ISO 14001 certification at all domestic and principal overseas manufacturing plants also testifies to Isuzu's proactive stance toward environmental management. With its engineering division having also obtained ISO 14001 certification, Isuzu has a complete environmental management system in place—one which promotes the manufacture of environmentally sound products with a regularly updated internal auditing system.

Moreover, Isuzu believes that automakers shoulder a social responsibility to offer vehicles that clear exhaust emission regulations not only by legally mandated deadlines, but as far in advance of those deadlines as possible. Isuzu took the lead by launching the *ELF-KR* series ahead of the competition in June 2002. The *ELF-KR* series satisfies tighter Japanese exhaust emission regulations more than two years ahead of the enforcement date.

## ISUZU FIRST TO SATISFY 2003 JAPANESE EMISSION EXHAUST REGULATIONS WITH LAUNCH OF *ELF-KR* SERIES

### 1. OBJECTIVE OF DEVELOPMENT

Isuzu developed the *ELF-KR* series with the aim of achieving industry-leading environmental performance.

In recent years, environmental activities have become a key social responsibility for all corporations. For freight companies, for example, reducing the environmental impact of logistics operations has become a priority issue.

Under these circumstances, it has become imperative for automakers to develop vehicles outfitted with environmentally sound diesel engines. Demand has been especially strong for the early development of light-duty trucks with such engines, given that they are frequently used for delivery services in urban areas.

It was with the objective of responding to the demands of society and the times that Isuzu brought to market the

*ELF-KR* series of low-emission light-duty trucks. Launched well over two years in advance of the enforcement date for stricter emission standards, the *ELF-KR* series highlights the top priority Isuzu gives to enhancing environmental performance.

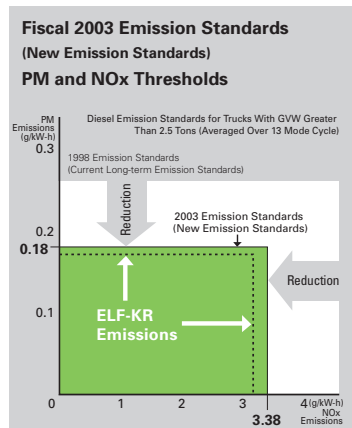


### 2. THE 2003 EXHAUST EMISSION REGULATIONS

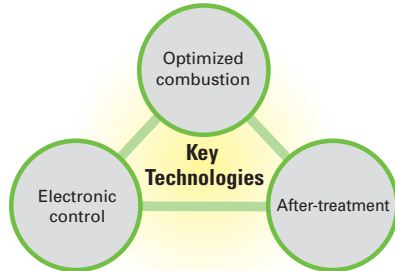
Japanese exhaust emission regulations for diesel vehicles will be tightened in two stages, with the implementation of the new targets for diesel vehicles. The goal of these regulations is to sharply reduce thresholds for per-vehicle emissions of nitrogen oxides (NO<sub>x</sub>) and particulate matter (PM). The new targets will become effective with the enforcement of tighter exhaust emission regulations in 2003. These strict regulations call for sharp reductions of approximately 25% in NO<sub>x</sub>, 30% in PM, and 70% in hydrocarbons (HC) and carbon monoxide (CO) relative to 1998 levels prescribed by existing long-term standards.

The new exhaust emission regulations will come into force in October 2003. Automakers are required to change vehicle models

to comply with the new standards by August 31, 2004. The *ELF-KR* series cleared these emission standards more than two years in advance of this deadline.



**3. THREE KEY TECHNOLOGIES IN THE ELF-KR SERIES** ➔



**Electronic Control Technology**

This technology precisely controls internal engine systems, fuel-injection, intake/exhaust and exhaust gas recirculation (EGR) systems in response to driving conditions to reduce exhaust emissions and improve fuel efficiency.

**Optimal Combustion Technology**

Isuzu employs 16 valves to maximize air intake into engines, which makes engines burn more cleanly, reduces fuel consumption and enables high output.

**After-Treatment Technology**

This technology removes exhaust emissions using catalytic converters and other means.

The ELF-KR series is equipped with a state-of-the-art clean diesel engine that integrates these three key technologies.

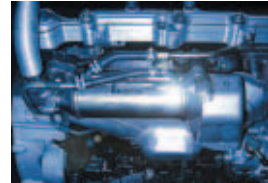


Reducing both NOx and PM at the same time requires highly advanced technologies that facilitate complete combustion in short periods of time. This is made possible by using the Common Rail High-Pressure Injection System in conjunction with the Electronic Control System. Previously, these technologies were used only in certain heavy-duty trucks. The ELF-KR series employs a version of these technologies that has been upgraded for use in light-duty trucks, benefiting simultaneously from a reduction in noise.

**Cooled EGR Systems Enable Further NOx Reductions**

Conventional EGR systems effectively reduce NOx emissions by recirculating a portion of the exhaust gas and mixing it with the intake air to lower the burning temperature.

Cooled EGR systems are designed to cool high-temperature exhaust gas using a cooling device attached to the EGR pipe before feeding it back into the engine intake. This results in a lower combustion temperature than when using conventional EGR systems, thereby lowering NOx emissions.



**Oxidization Catalytic Converters Sharply Lower PM and HC Emissions**

Oxidization Catalytic Converters are an after-treatment technology that chemically converts PM and HC emissions into benign substances. These devices oxidize unburned hydrocarbons called SOFs (soluble organic fractions) in PM and lubricant hydrocarbons through contact with a metallic catalyst, converting them into water (H<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>). By passing all exhaust gases through oxidization catalytic converters attached midway along the exhaust system, PM and HC emissions are significantly reduced.



**4. ELF-KR INCORPORATES LEADING-EDGE TECHNOLOGIES** ➔

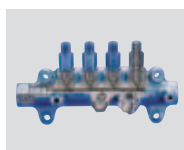
The ELF-KR series employs leading-edge clean engine technologies such as a Common Rail High-Pressure Fuel Injection System, cooled EGR, oxidization catalytic converters for removing PM, and 16 air intake valves. These innovations make possible a clean diesel engine with minimal exhaust emissions.

**Common Rail High-Pressure Fuel Injection System Cuts NOx, PM, Black Smoke Emissions**

Nitrogen oxides form easily at the high temperatures needed for complete combustion, while PM and black smoke are easily produced at low temperatures, where combustion is incomplete.



High-Pressure Pump



Common Rail



Injector

**16 Valves Improve Fuel Consumption, Lower Emissions of PM and Black Smoke**

Isuzu has adopted a design that uses two air intake valves and two exhaust valves for every cylinder. Four cylinders per engine gives 16 valves in total. This design increases intake and exhaust volumes from each cylinder, which will enhance air flow efficiency and create a better fuel-air mixture for combustion, while lowering PM and black smoke and improving fuel consumption.

