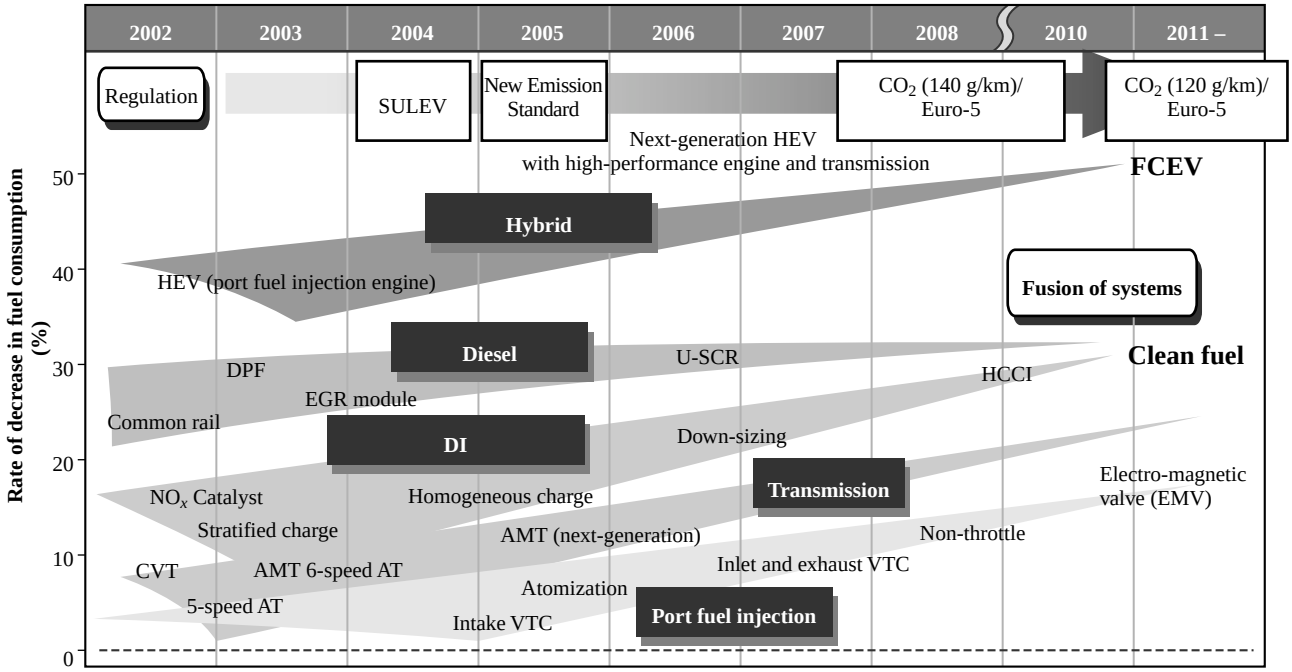
Trends in Engine Management Systems and Hitachi Group's Initiatives



SULEV: super ultra low emission vehicle
HEV: hybrid electric vehicle
AMT: automated manual transmission
FCEV: fuel-cell electric vehicle
DPF: diesel particle filter
EGR: exhaust gas recirculation
U-SCR: urea-selective catalytic reduction
HCCI: homogeneous charge-compression ignition
DI: direct injection
CVT: continuous variable transmission
AT: automatic transmission
EMV: electro-magnetic valve

TO preserve the natural environment that we have enjoyed so far, and for the future enjoyment as well, restrictions on automobiles are being made more strict each year.

Measures for preventing atmospheric pollution to be implemented before 2010 include the New Emission Standard (2005) in Japan, SULEV (super ultra-low emission vehicle) in North America, and the Euro-5 strengthened exhaust gas regulations in Europe. Severe regulation of CO_2 emissions are also planned as a measure against global warming, particularly in Europe. Providing society with functions that will satisfy those requirements is becoming an issue that must be addressed by automobile manufacturers.

Turning attention to energy resources, although oil is expected to last another 40 to 50 years, the countries that are capable of producing oil will steadily decline in number over the next 20 years. On the other hand, alternative energy sources such as natural gas are distributed over all regions, so there will be a shift from the crude oil dependency that has existed toward a distribution of energy according to the circumstances of each country.

Under such circumstances, we expect that use of the HEV, which combines the internal combustion engine and electric motor drive, will expand and that the FCEV, which produces energy from hydrogen, will become truly practical by 2010. In that era, too, however, gasoline, light oil and heavy oil are expected to continue to be the main fuels for internal combustion engines.

The Hitachi Group is continually making proposals for combining the engine and powertrain and environmental measures by means of technology centering on combustion, control, and simulation.

Direct injection, in which the fuel is injected directly into the cylinder, is an internal combustion method that provides a powerful means of severely reducing CO_2. Applying combustion analysis technology obtained from experience in the nuclear power and

thermal power industries, the Hitachi Group has supplied combustion technology such as spray characteristics, ignition spark advance and air flow for a stratified charge and a homogeneous charge, as well as components. In the future, we will continue to promote cleaner exhaust gases by combination with the HCCI used in diesel engines and to propose even cleaner engines.

Port injection, in which the fuel is supplied from the upstream of inlet valves, aims for optimization of exhaust, fuel consumption, and engine output in addition to superiority in system cost by applying fuel atomization technology and technology for continuous variation of the opening and closing timing, phase and lift of the inlet and exhaust valves, etc.

Concerning transmissions, we continue to propose a comprehensive improvement of mileage and enjoyable driving through improved transfer of torque to the road surface achieved by AT control and the "Next-generation AMT," which incorporates proprietary technology.

The mission of the Hitachi Group is to create new value and realize the dream of "Human, Vehicle and Society."