Automotive Technology
business sector
Automotive Technology: an overview

Powertrain systems  Safety systems  Comfort systems
Automotive Technology business sector

All Makes

ACURA | ALFA ROMEO | ASTON MARTIN | Audi | Bentley | BMW | BUGATTI | BYD | Cadillac

CHANGAN | CHERY | CHEVROLET | CITROËN | CORVETTE | DACIA | DAIHATSU | DODGE | DFM | FAW | FERRARI

FIAT | Ford | Foton | Great Wall | HAIMA | HOLDEN | Honda | Hyundai | JAC | Daewoo | Infiniti

ISUZU | JAGUAR | Jeep | KIA | LADA | LAND ROVER | LANCIA | LEXUS | Lotus | Mahindra | MAN

mitsubishi motors | MINI | mitsubishi | NISSAN | Peugeot | prostas | PROTON | RENAULT | ROYCE

SAIC | SEAT | SKODA | smart | Ssangyong | SUBARU | Suzuki | Tata | tesla motors | Toyota | volvo
Sustainable mobility through innovation

The internal-combustion engine will dominate until electrical powertrains establish themselves in larger numbers. Bosch has the technology to reduce the fuel consumed and the CO$_2$ emitted by internal-combustion engines by another 30 percent by 2020:

- through direct injection coupled with turbocharging and engine downsizing
- through start-stop systems, optimized thermal management, brake energy recuperation, and on-demand management of electrical auxiliary systems
- through variable valve control, scavenging for gasoline engines, and Denoxtronic for diesel engines
Diesel cars are economical
- More than 30% lower fuel consumption than port fuel injection gasoline engines on average
- Longer engine lifetime
- Higher resale value than gasoline cars

Diesel cars are clean
- About 80% reduction in harmful emissions over the last 10 years
- About 25% lower CO$_2$ emissions compared to port-fuel injection gasoline engines
- Quiet operation due to innovative pre-injection

Diesel cars are fun to drive
- High specific power output
- High torque → up to 50% higher torque than gasoline cars
- Better acceleration at lower engine speeds
- Less fuel stops due to higher mileage

Source: Diesel Academy
World Wide Particulate Emission Regulations*

<table>
<thead>
<tr>
<th>Year</th>
<th>Europe</th>
<th>Japan</th>
<th>USA (EPA)</th>
<th>USA (CARB)</th>
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** State of the Art**

<table>
<thead>
<tr>
<th>Region</th>
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<th>EU6 PM</th>
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</table>

** All emissions standards (values) in g/km**

** 100 % means the value of 0.37 g/km regimened in the USA in 1971**

PM = Particulate Matter Emissions

1) EU5 PM: from 09.2009: 5.0 mg/km (current PM measurement method)
   EU5 PM: from 09.2011: 4.5 mg/km (proposed limit with new PM method)
2) EU6 PM: from 09.2014: 4.5 mg/km (proposed limit with new PM method)
Particulates Reduction by Clean Diesel

- The Clean Diesel has 98%* less particulates than the diesel engines of 1990. The particulates generated in the engine are filtered out by the particulate filter.

The Clean Diesel has almost no further particulate emissions

* Comparison between ECE83 and Euro 5 emission legislation.
**World Wide Nitrogen Oxide Emission Regulations**

<table>
<thead>
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</tbody>
</table>

**NOx emission of a Clean Diesel is reduced by 98-99% in comparison to an older diesel engine version**

* All emissions standards (values) in g/km
** 100 % means the value of 5.6 g/km regimented in the USA in 1971
PC: Strategies to Reach Euro5 & 6 and Tier2 Bin5

1. Diesel Particulate Filter
2. Optimization of combustion process
3. NOx-EGT

Source: DS/NE-NA
Optimizing the Diesel System

Air Management
- Swirl-/Throttle Valve
- Turbo Charger/VGT*

Fuel Injection System
- New Generations
- Multiple Injections
- Reduced Tolerance
- Optimized Nozzle

Combustion Process
- Reduction of compression ratio
- Combustion strategies

Powertrain
- Hybrid Technology

Exhaust gas management
- Fast Catalyst Light-Off (reduce thermal losses)
- Diesel Particulate Filter
- NOx storage catalyst
- Catalyst temp control

Source: Diesel Academy