

Tips & Technology

For Bosch business partners

Current topics for successful workshops No. 10/2015

Diesel Injection



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Invented for life

How does diesel influence the air quality?

Bosch states why the CO₂ targets cannot be met without diesel in the way that nitrogen oxide emissions are reduced and how smokers and tires influence particle emissions.

CO₂ – it does not work without diesel

There are discussions about air quality across Europe. Diesel is often the focal point in these discussions. Diesel is a key technology to achieve fleet CO₂ emission targets – it does not work without the compression-ignition engine, particularly in Europe.

Share: Diesel cars generate some 4 percent of all CO₂ emissions in Germany.

CO₂ targets: Starting in 2021, the average new car in the EU will have an emissions cap of 95 g of CO₂ per kilometer. In other regions too, such as the US and China, vehicles have to become much more economical over the next few years.

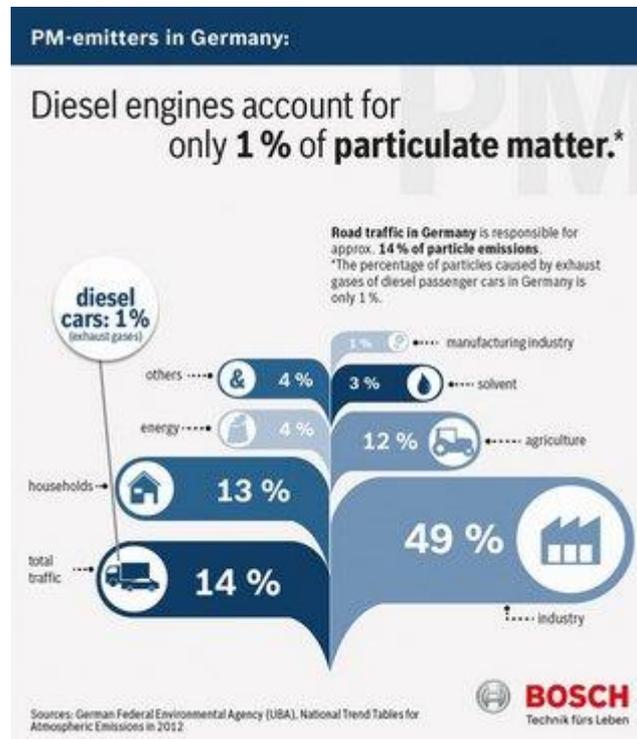
Potential: The CO₂ emissions of diesel internal-combustion engines can be reduced by as much as 10 percent. Enhanced aerodynamics and less rolling friction could once again lead to further improvements.

Electrification: Electrification will give diesel engines another boost – particularly for large and heavy vehicles such as SUVs. Bosch offers numerous solutions here, such as a 48-volt entry-level hybrid that can cut CO₂ emissions in real-life driving situations by up to 15 percent.

Particulates – the diesel-engine “vacuum cleaner”

Share: According to official estimates, about 1 percent of all the particulate matter emitted in Germany is caused by exhaust emissions from diesel cars.

Source: German Federal Environment Agency (Umweltbundesamt, UBA), national trend tables for atmospheric emissions, 2012



Efficient: Since Euro 1 was introduced in 1992, vehicle particulate emissions have been reduced by around 97 percent. The latest filters work at over 95 percent efficiency, and can efficiently filter out even the smallest of nanoparticles.

Vacuuming: Measurements in major cities have indicated that today's diesel engines even filter out particulates from the ambient air. For example, in the Parisian suburb of La Garenne, emissions from a diesel engine contain fewer particulates than the air that the engine takes in.

Source: Internal measurements

Dust: The wear and tear that driving causes on tires and brakes also produces particulates. On Germany's roads, this already accounts for three times the particulate emissions of exhaust gases.

Source: "Emissionen und Maßnahmenanalyse Feinstaub 2000-2020," Umweltbundesamt (UBA), Germany (2007); ISSN 1862-4804

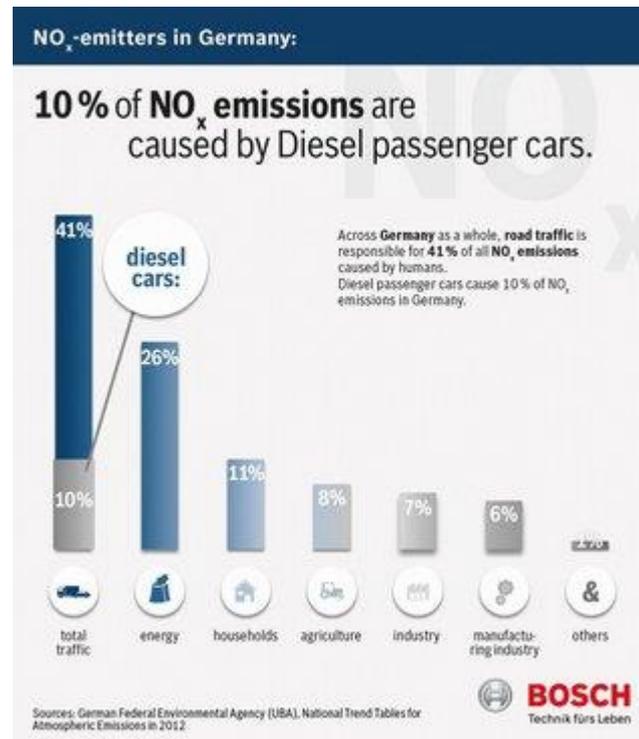
Cigarette smoke: Estimates suggest that in 2015, as many particulates will be produced by smoking as by automotive emissions.

Source: "Emissionen und Maßnahmenanalyse Feinstaub 2000-2020," Umweltbundesamt (UBA), Germany (2007); ISSN 1862-4804

Nitrogen oxide - attention turns to real driving emissions

Share: Measurements have indicated that diesel cars are responsible for some 10 percent of NO_x emissions in Germany. Aside from road traffic, other sources include energy generation (27 percent) and private households (11 percent).

Source: German Federal Environment Agency (Umweltbundesamt, UBA), national trend tables for atmospheric emissions, 2012



Major advances: The EU introduced the Euro 3 norm in 2000. Since then, nitrogen oxide emissions from diesel cars have already been cut by 84 percent in the relevant test cycle.

Euro 6: A directive of the European Union, this new emission standard primarily sets lower maximum values for vehicle emissions of particulates and nitrogen oxide. For diesel engines, the old standard stipulated a maximum of 180 mg per kilometer. As of September 1, 2015, diesel engines will be restricted to emissions of just 80 mg of nitrogen oxide per kilometer (gasoline engines: 60 mg per kilometer).

A systematic approach to engineering: In order to improve the modern diesel still further, Bosch is drawing on a systems approach that combines internal combustion with exhaust-gas treatment. One of the vital technologies in this regard is Denoxtronic, which can reduce nitrogen oxides by up to 95 percent in real driving situations.

In this way, the limit of 80 mg of nitrogen oxides per kilometer can also be achieved in a number of real driving situations. In some driving situations, emissions may be even lower than this limit.

AdBlue: Systems such as Bosch's Denoxtronic inject odorless liquid urea, known as AdBlue, into the exhaust gas flow. This reacts with the exhaust gas and turns nitrogen oxide into harmless steam and nitrogen.

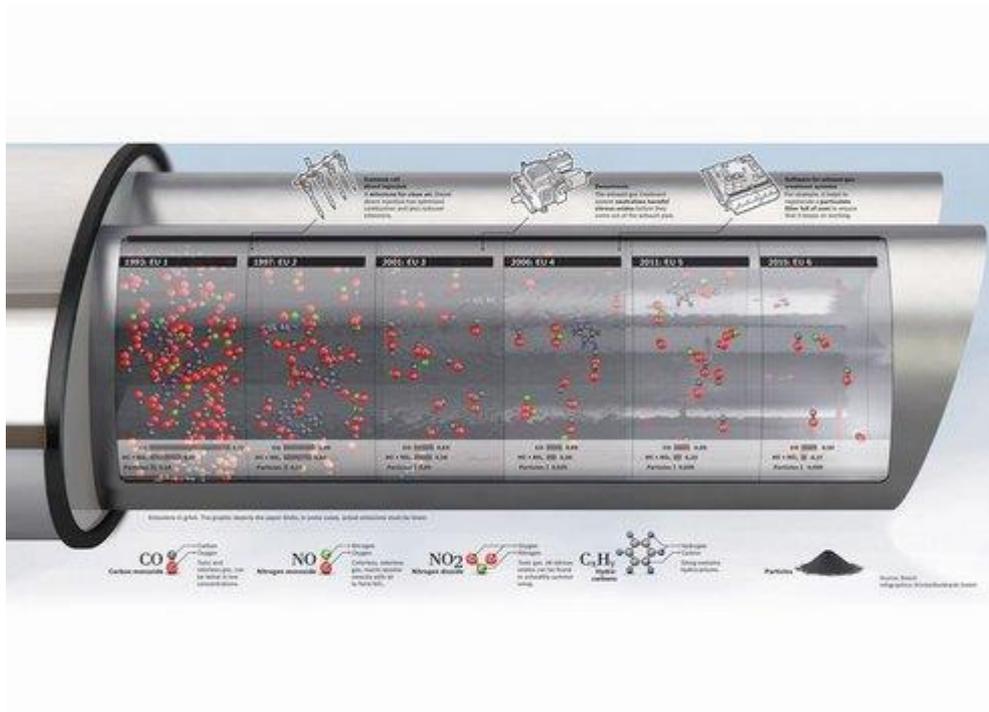
Real driving emission: A number of vehicles currently in production already produce only a minimum amount of emissions, and do so even outside the applicable certification cycle – for

example, during rapid acceleration or at high speeds. The task now is to drive the spread of this capability and develop cost-effective technologies that will ensure compliance, whatever the driving conditions.

Innovation: Bosch's 48-volt boost recuperation system can reduce untreated nitrogen oxide emissions by up to 20 percent, especially at high loads or when the car is accelerating. Bosch believes the system could allow the storage catalytic converter to reduce nitrogen oxide emissions by up to 80 percent. Electrification will also increase the level of efficiency of urea-based systems (SCR catalytic converters).

Bosch products for emission reduction

Engineers at Bosch have been intensely involved in the chemical process of combustion for decades and in developing solutions to reduce the NOx emission. This shows the development of the diesel engine: Modern diesel engine has a raw nitrogen oxide emission of around 96 percent less today than a compression-ignition engine in the early 1990s.



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