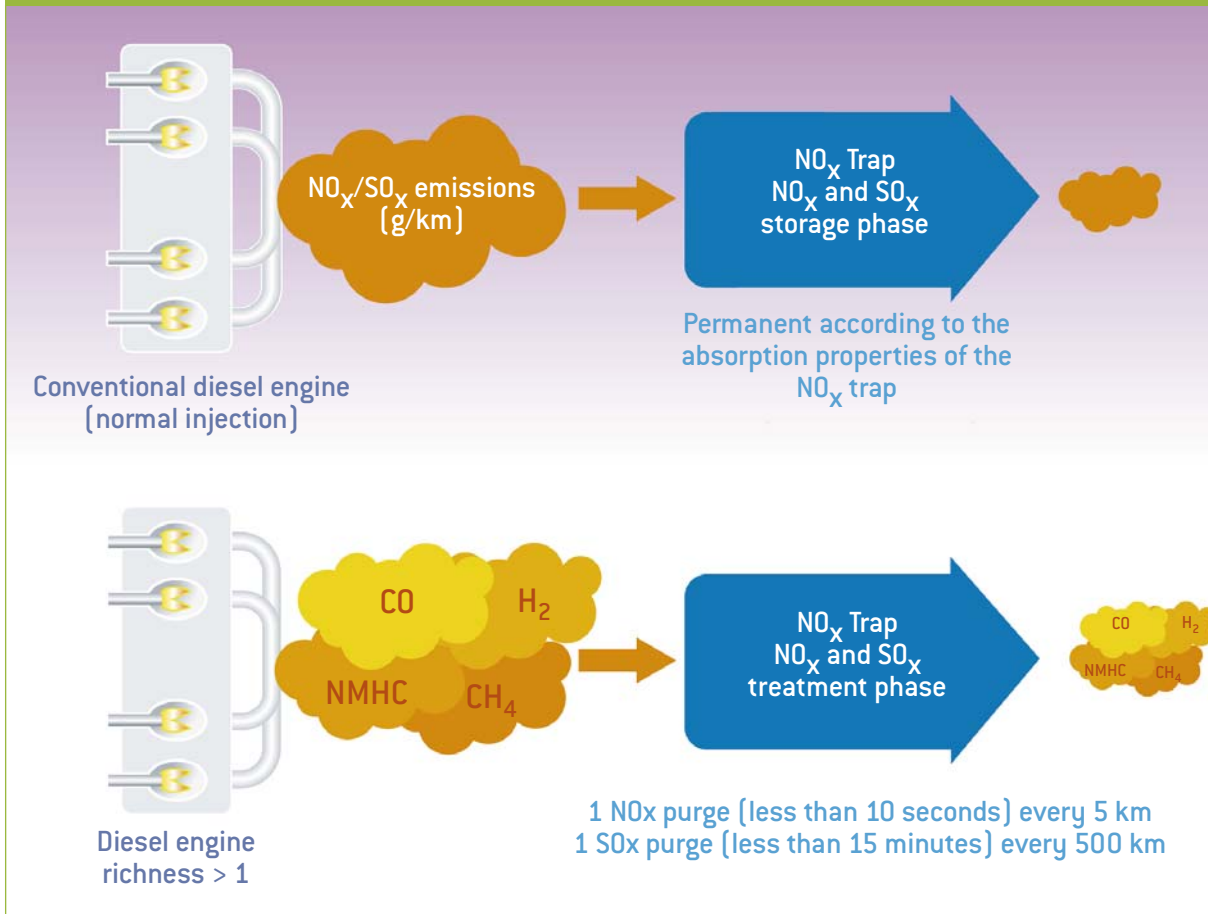




The NO_x trap

To meet future emissions standards, diesel engines may need to use a system for post-treating nitrogen oxides (NO_x) in addition to the catalytic converter. This is the role played by the NO_x trap.



RENAULT COMMUNICATION

BASIC FACTS

NO_x emission levels required by future standards will be lower than those guaranteed by conventional catalytic converters. One of the solutions envisaged to meet these requirements is to supplement its action with a new filter, called the NO_x trap. This captures nitrogen oxides and stores them in a microporous structure. The operating principle is similar to that of the particulate filter (see sheet), and requires NO_x traps to have regular phases of regeneration.

IN SHORT

The NO_x trap is used in addition to the catalytic converter to lower the level of nitrogen oxide emissions below those required in future standards.



➤ HOW DOES IT WORK?

The NO_x trap fulfils the role of both the conventional oxidation catalytic converter (HC/CO oxidation) and NO_x trap. Contrary to its oxidation function, which is continuous, the NO_x trap function is discontinuous. In nominal operation, for lean-burn, the catalytic converter traps the NO_x but does not treat it. To regenerate the catalytic converter, the lean-burn engine must operate in rich-burn so that the unburned hydrocarbons and the carbon monoxide emitted in large quantities reduce the stored NO_x. In order to optimise treatment of all pollutants, the storage and regeneration phases of the trap must be accurately managed. Hence, the heart of the control system is based on modelling of the NO_x trap and a management computer:

- evaluating heat at all points of the catalytic converter: storage capacity highly dependent on temperature;
- modelling of NO_x storage in lean-burn and release in rich-burn;
- in order to ensure non-divergence of such a system, end-of-release detection (empty NO_x trap) based on the analysis of richness probe signals upstream and downstream has been developed;
- NO_x trap computer: elaboration of the release request.

The NO_x trap release phases are characterised by an engine operating mode in richness 1, obtained using an inlet valve (air flap) and the addition of post-injection.

During sulphur oxide (SO_x) release phases, this operating mode must be associated with a high level of heat inside the trap.

The NO_x trap application is therefore supported by the development and enhancement of this method of combustion:

- new air management system enabling both the air flow and the EGR rate to be controlled independently;
- elaboration of injection settings ensuring transparency for the user (neutral torque during combustion mode transition, dynamic response);
- development of richness regulation (presence of a proportional richness probe upstream the NO_x trap).

As for all anti-pollution systems, legislation requires a diagnosis of this function:

- development of OBD (On Board Diagnostics) of the NO_x trap, based on monitoring of its absorption capacity.