AFTERTREATMENT SYSTEMS FOR MEDIUM AND HEAVY ENGINES

SCR SYSTEM
DIESEL PARTICULATE FILTER

PARTS & SERVICE

Genuine Parts

How the Genuine FPT ATS works

The After Treatment System (ATS) converts the pollutants present in exhaust gases produced by the engines into substances that do no harm the people or the environment.

The most critical pollutants produced by Diesel engines are:

NITROGEN OXIDES (NOx)

At high engine combustion temperatures, Nitrogen (N_2) & Oxygen (O_2) combine and react producing Nitrogen Oxides (NOx). NOx can cause acid rain and ozone layer exhaustion.



PARTICULATE MATTER (PM)

Is made of small carbon and other toxic substances particles created by incomplete fuel burning process. When repeatedly inhaled, they might create health problems (also severe).



Additional pollutants converted by ATS systems are Carbon monoxide (CO) and Hydrocarbons (HC), both by-products of incomplete fuel combustion.

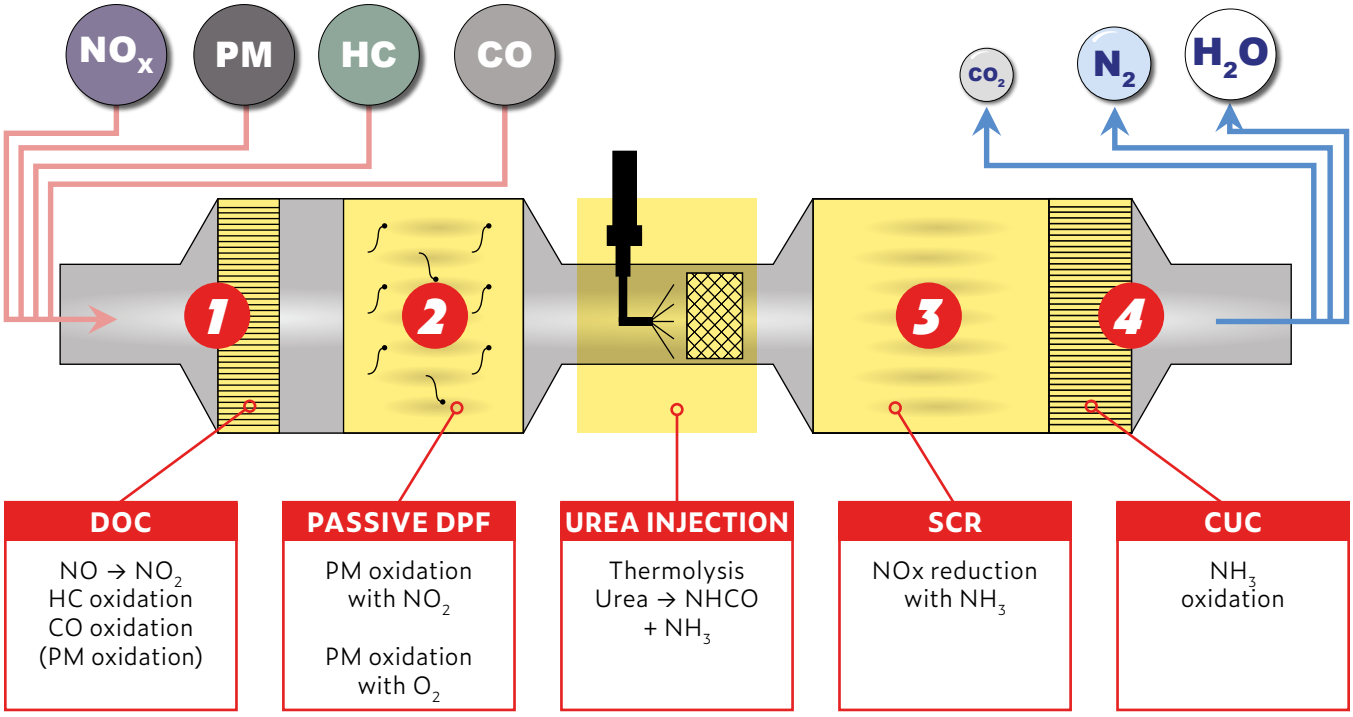
FPT has selected the combination of SCR (Selective Catalytic Reduction) and DPF (Diesel Particulate Filter) for the medium (NEF) and heavy engine (Cursor) families to meet Euro VI emission standards and following.

SCR (Selective Catalytic Reduction) system

has the task to reduce di NOx emissions by using gaseous ammonia (NH_3). Ammonia is created by the conversion of DEF (Diesel Exhaust Fluid) injected in the exhaust line.

DPF (Diesel Particulate Filter)

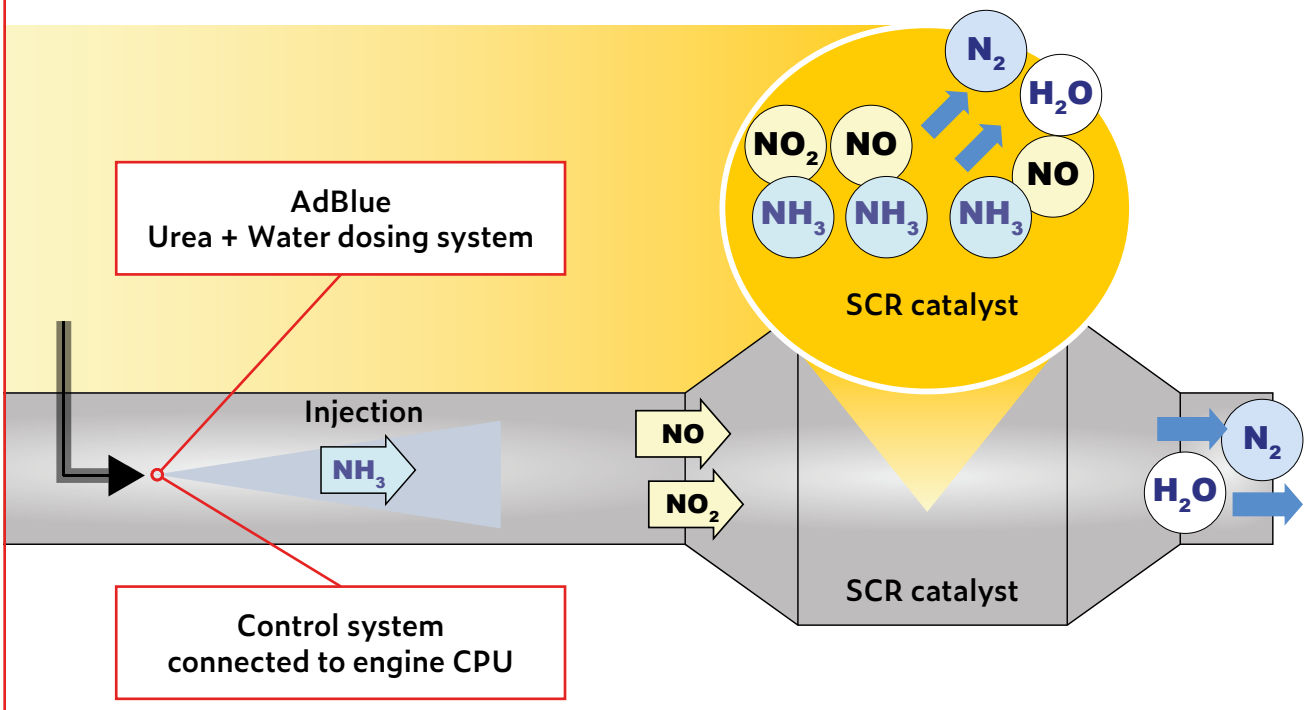
has the task to physically trap the solid soot particles produced by the diesel engine combustion.



The exhaust gases leaving the turbine enter first the DOC - Diesel Oxidation Catalyst 1 in which the hydrocarbons (HC) and the carbon monoxide (CO) are converted into carbon dioxide (CO_2) and water (H_2O). Subsequently, the exhaust gases pass through the particulate filter DPF 2, which traps the carbon particles in the inlet channels of the ceramic honeycomb. Afterwards, the gas enters into the SCR 3 module: through the injection of DEF (standardized liquid solution of urea and water), the chemical conversion of NOx reduction takes place, resulting in free nitrogen (N_2) and water vapor (H_2O). At least the Clean Up Catalyst (CUC) 4 is located after the SCR and has the task of selectively oxidize the NH_3 in excess.

LOW POLLUTANT EMISSIONS

SCR



The injector introduces the DEF (stored into a specific tank) in front of the mixer element. DEF standard composition is made of 32,5% urea and 67,5 demineralized water and this solution is sold in Europe under the trade name of AdBlue®.

The mixer element will combine the AdBlue with the exhaust gases into a homogeneous gaseous mixture. The mixture enters the SCR catalyst where the chemical reactions take place. The SCR transforms NOx into water vapor and Nitrogen, common gases of our atmosphere.

The Engine Control Unit (ECU) takes care of the whole system and conversion reactions.
To maximize the conversion of NOx, it calculates the precise quantity of reducing agent needed to be injected at any operating condition, based on key engine parameters such as temperature, amount of Nitrogen Oxide present in the exhaust gases, engine speed, etc.

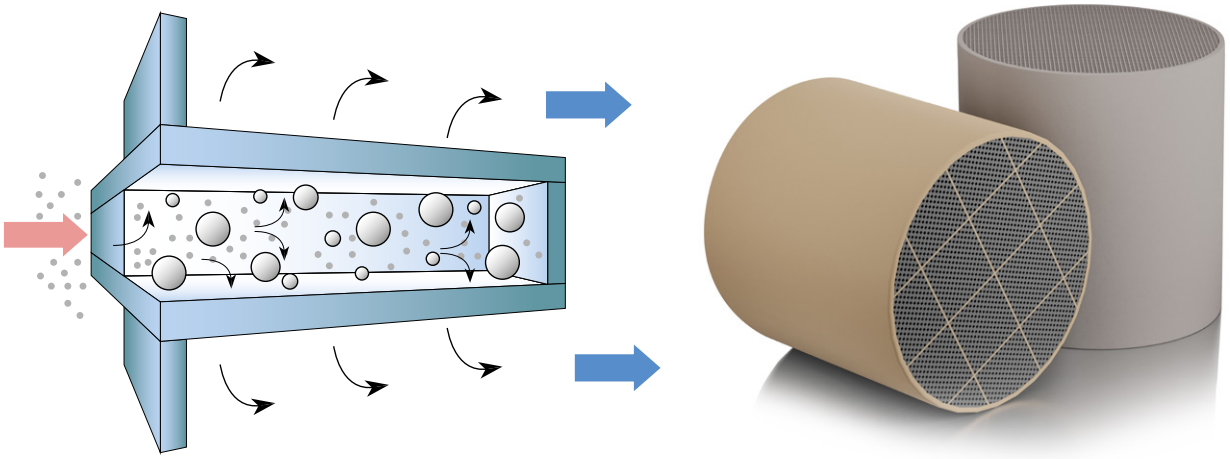
LOW FUEL CONSUMPTION

DOC & DPF

Diesel Oxidation Catalyst (DOC) is a device capable to promote a series of oxidation reactions using O2 in lean operative conditions.

Diesel particulate filter (DPF) has the function to retain and accumulate particles coming from exhaust gases and prevent them of being released into the atmosphere.

Its structure is made by alternatively open/closed porous ceramic channels, so that, because of their size, particles are trapped inside the filter while gases pass through the porous walls.



When there are enough soot particles accumulated into the channels, the filter needs to be cleaned. The Engine Control Unit then activates a periodical process called "**Active Regeneration**".

Active Regeneration process consists of increasing the temperature of exhaust gases up to 580 °C and above. At such temperature the soot particles into the filter, mostly composed by Carbon, combine with the Oxygen of the exhaust gases. The process converts the soot particles into gaseous CO_2 which then escapes through the pores of the walls of the filter.

The ECU controls the regeneration process by acting on fuel injection system (number of injections per cycle per cylinder), air management (EGR if present, throttle / exhaust valve, turbocharging pressure): the throttle / exhaust valve reduces the air flow to maintain the temperature of the exhaust gas high and at the same time ensure a minimum combustion rate.

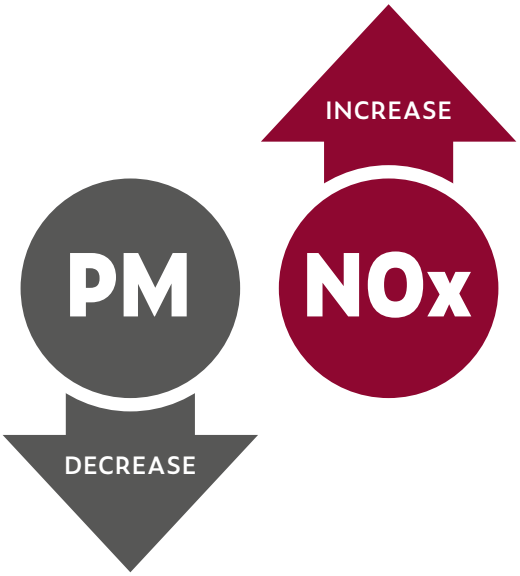
FPT engines are specifically calibrated to ensure that there is no discontinuity in the power delivered during the regeneration process compared to normal operations.

DPF regeneration, once started, is maintained in all normal operating conditions, however, if parameter cannot be maintained or the engine is stopped before the process is completed, the ECU will actuate it again during the next operating cycle.

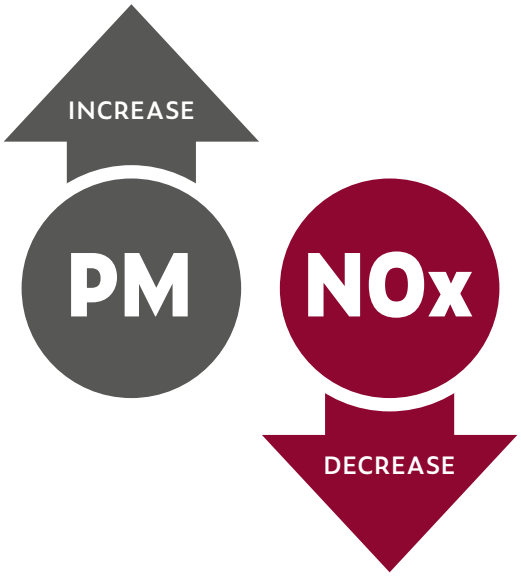
Genuine FPT ATS performance

Inside the combustion chamber, Particulate Matter (PM) and Nitrogen Oxides (NOx) have conflicting chemical factors.

A high combustion temperature leads to economic fuel consumption and low particulate (PM) levels, BUT it generates a high rate of NOx production.



When the engine is operating most efficiently for power, minimal PM is produced. However, the NOx levels are very high.



When exhaust gas is recirculated back into the intake, the NOx production is reduced. However, higher levels of PM are created.

NO DIESEL ENGINE currently can be designed to meet both PM and NOx emission standards without the use of an exhaust treatment system

IN EITHER SITUATION, an exhaust aftertreatment system is needed to reduce the levels of pollutants down to the required limits.

Thanks to the ATS system, engineers can develop engines with extremely low fuel consumption while still meeting the emission targets.

TOP PERFORMACE

Why you should choose a Genuine FPT ATS

As the emission legislation becomes more and more severe, it is fundamental that the engine is developed together with its ATS system: each phase in the combustion chamber, in any working condition, must be finely calibrated to ensure the best possible ambience for catalyzation and filtration processes to always meet the emission requirements and performance targets.

FPT develops specific solutions, according to the characteristics and the mission profile each FPT engine has been designed for. Every component of the ATS system has been developed, tested and validated to outstand the most severe conditions and ensure optimal performance and longevity in any working condition of your FPT engine.

Get the most from your Genuine FPT ATS

The FPT SCR system has been designed not to require any intervention by the driver for its cleaning. If the motor is switched off with the cleaning treatment in progress, it will automatically resume and run until completion.

One of the main criticalities for DPF is when an engine works for short periods at cold temperatures: these conditions might prevent the system to perform a complete and effective regeneration process. Soot particulate cake builds up into the filter, making it harder to discharge the filter. After a certain amount of suit is built up into the filter, it can be difficult for the gases to exit, and the engine performance can be affected. → **Make sure to perform a full regenerating cycle when requested (e.g. Lamp-on).**

Make sure that your urea tank is filled with certified DEF / AdBlue® additive only. → **Other fluids, not compliant with DEF specifications, may damage the system and could cause serious damage to your machine. Furthermore, exhaust emissions would no longer meet legal standards.**

Contact us

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