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Commentary

Developments in Engine Emission Control Methods

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DESCRIPTION

The combustion system consists of the combustion chamber and all of its features, including the fuel distribution, charge composition, charge motion, and chamber geometry. Here, incomplete fuel oxidation takes place and pollutants including NO_x, CO, and PM are produced. Other engine systems, such the intake charge management system and the fuel injection system, have a huge impact on what happens in the combustion system [1]. In fact, these secondary systems' main objective is to have an impact on the combustion process. There are numerous ways to reduce the amount of pollutants created by the combustion system. The composition of exhaust gas is basically fixed once it exits the combustion system until it enters the emission After Treatment System (ATS), where additional pollution reductions are possible as well as the potential source of secondary emissions such N_2O, NO_2, and NH_3 [2].

Catalytic reactors make up the after treatment system, which aims to further reduce pollutants. A Three-Way Catalyst (TWC) is adequate in some circumstances, such as stoichiometric Spark Ignition (SI) engines, to achieve very considerable reductions in pollutants. Other situations need for a variety of catalytic devices, such as lean burn diesel engines [3]. To make sure the ATS performs as planned, backup systems are needed. These include systems to ensure contaminants and pollutants that might accumulate are removed (regeneration of filters, sulphur management, urea deposition), control of exhaust gas composition through control of exhaust stoichiometry or supply of additional reactants not normally found in exhaust gas or present in sufficient quantity (e.g., urea, additional HCs, additional air, or O_2), and thermal management to ensure the catalysts operate within the required temperature window.

EMISSION CONTROL METHODS

In recent years, there has been a lot of worry about how the IC engines are. The environment and human health are negatively impacted by the excessive atmospheric pollution caused by internal combustion engines [4]. As a result, efforts are being made in unison to lower the harmful emissions that the exhaust system is responsible for emitting without losing performance or fuel efficiency. Any element that is added to our atmosphere and has a negative impact on the life on our planet is considered air pollution. Along with IC engines, additional sources of pollution include electric power plants, industrial fuel users, and domestic fuel consumers.

Diesel Oxidation Catalyst (DOC)

DOCs lower emissions of carbon monoxide, gas-phase hydrocarbons, and the organic component of Particulate Matter (PM). Diesel engines need only an oxidation catalyst because they burn lean. New strategies are needed to minimise NO_x in an oxidation-rich environment. These lean applications can make use of selective catalytic reduction, lean de-NO_x catalysts, and NO_x adsorbers, among other technologies.

NO_x adsorbers (NO_x traps)

The EGR and SCR issues as NO_x reduction technologies were avoided in the design of the NO_x adsorber. According to the notion, the zeolite will behave as a molecular sponge to trap the NO and NO_2 molecules. No additional NO_x can be absorbed after the trap is full (like a sponge full of water), thus it is expelled through the exhaust system. There are numerous plans to "purge" or "regenerate" the adsorber. Prior to the adsorber's ability to purge it, diesel fuel (or another reactant) is injected. Because NO_2, in particular, is unstable, it will combine with hydrocarbons to form H_2O and N_2. Hydrogen has also been used, with similar effects however it is challenging to store hydrogen. Although fuel reformers are still a developing technology, some experimental engines have mounted hydrogen reformers for on-board hydrogen generation [5].

CONCLUSION

The energy needed for pollution control frequently decreases fuel efficiency and raises the price. The goal of emission control is to create effective, long-lasting, affordable emission control

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systems that complement new combustion techniques while reducing efficiency losses.

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