

STRATEGIES OF RECENT TECHNOLOGIES FOR REDUCING PARTICULATE EMISSION FROM DIESEL ENGINES

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Exhaust gases of diesel engines may be cleaned from particulates fairly effectively by filtering the gases. Filter regeneration is however, necessary to maintain the filter clean. Uninterrupted regeneration may be achieved by burning-up the trapped particulates in a continuous manner. Under high engine load conditions, this is attainable by reducing the ignition temperature of the particulates by means of suitable fuel additives, or an appropriate catalytic coating of the filter bed. However, under low engine loads, the exhaust gas temperature is too low and another sensible method has to be employed. The minimum required exhaust temperature could be achieved at fairly wide range of engine operation conditions by using several simple-to-employ means. These include inlet throttling (IAT), inlet pre-heating (IAP), exhaust gas recirculation (EGR), and exhaust throttling (EGT). In the present work, a comprehensive model has been developed to evaluate different strategies to achieve this temperature. The proposed model has been validated against experimental results obtained with a single-cylinder commercial Diesel engine. Then the model has been used to predict the engine fuel consumption, NO_x emission level and exhaust gas temperature under different operation conditions when employing the above means. The results showed that the required temperature could be achieved in a wide range of engine loads and speeds by controlling solely the intake pressure. However, under low engine loads, the regeneration-ignition temperature can only be achieved by combining two or three means. The present work provides a recommended strategy to cover the entire range of operation conditions.