

(1-21) Cylinder to Cylinder Deviations in Fuel Spray and Exhaust Emissions at Idling in High Pressure DI Diesel Engines

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ABSTRACT

High pressure fuel injection in a direct injection diesel engine is one of the most effective methods to reduce PM emissions. Pilot injection is also used to reduce NO_x emissions and engine noise. Little research has investigated the fuel spray behavior under high pressure injection and pilot injection, and cylinder to cylinder deviations in spray behavior and the correlations with deviations in HC emissions are not clear. This study attempted to determine the relationship between cylinder to cylinder deviations in spray configuration and deviations in THC emissions with high pressure and pilot injections. It was found that an increase in injection pressure causes decreases in hole to hole and nozzle to nozzle spray deviations (Fig.1). Very high injection pressures cause unstable spray development due to leakage from the magnetic valve. Deviations in THC emissions have a minimum at 40 to 80 MPa injection pressures (Fig.2). Pilot injection of a very small quantity of fuel causes larger deviations in the spray configuration and mass. The amount of fuel adhering to the walls is less with pilot injection but there is no significant improvement in the THC emission while the HC components in the exhaust gas differ.

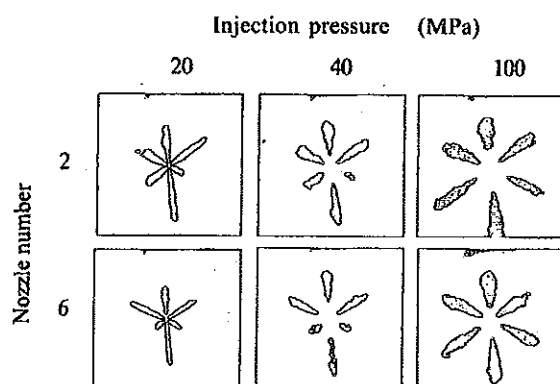


Fig.1 Influence of injection pressure on spray shape

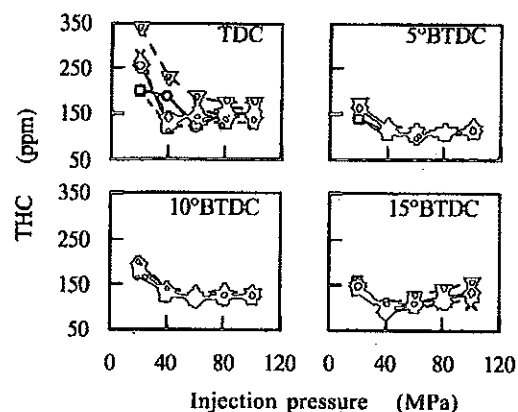


Fig.2 THC variations in each cylinder at different injection timings and pressures