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The Regeneration Process in An Active Type Diesel Particulate Filter

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Abstract.

The 3d numerical simulation was used to investigate the internal flow field of a diesel particulate filter as the active regeneration process was actuated. It was noted that if the inner carbon particles were unevenly distributed, the local temperature might be too high to burn out the filter. The fuel of the regeneration flame was gasoline. The target regeneration temperature was set to 1000K which is the ignition point of the carbon particles. The theoretical fuel rate at different engine loads and speeds were estimated at first according to the O_2 mole fraction and temperature of diesel engine exhaust. The fuel rates and exhaust flow rates were then used as input for the commercial CFD code Fluent. The plane just in front of the filter was chosen as a reference to find out the uniformity of the regeneration flow. The variances of temperature and mass flow rate on that plane were obtained to evaluate the uniformity of regeneration process. It was found that without a flow distributor, the flow would not be uniform such that most particles would be accumulated along the central part of the filter. The temperature at that part would be too high during the regeneration process to cause damage to the filter.

Keywords: Computational Fluid Dynamics, Diesel Particulate Filter, Regeneration