

HEAT TRANSFER IN EXHAUST SYSTEM OF A COLD START ENGINE AT LOW ENVIRONMENTAL TEMPERATURE

by

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During the engine cold start, there is a significantly increased emission of harmful engine exhaust gases, particularly at very low environmental temperatures. Therefore, reducing of emission during that period is of great importance for the reduction of entire engine emission. This study was conducted to test the activating speed of the catalyst at low environmental temperatures. The research was conducted by use of mathematical model and developed computer programme for calculation of non-stationary heat transfer in engine exhaust system. During the research, some of constructional parameters of exhaust system were adopted and optimized at environmental temperature of 22 °C. The combination of design parameters giving best results at low environmental temperatures was observed. The results showed that the temperature in the environment did not have any significant influence on pre-catalyst light-off time.

Key words: *exhaust emission, low environmental temperatures, catalyst start, mathematical model*

Introduction

For more than three decades, the catalysts have been used for significant emission reduction. Together with the electronic control of device and system operation in vehicles, the catalysts nowadays reduce the vehicle emission up to 95%. However, the problem is that the catalyst does not function satisfactorily until it reaches the activating temperature, which is 250 °C to 350 °C. Engine operation period until the catalyst and engine reach the starting temperature is called cold start phase. According to references, 60% to 80% of the total CO and HC emission is emitted during this period. At lower environmental temperatures, below 0 °C, this value is 95% to 98% [1-3].

Mainly due to poor fuel evaporation in the first few cycles, richer composition (mixture) is required for having safe starting and good driving achievement. This leads to increase of fuel consumption and emission of incomplete CO and HC combustion products.

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