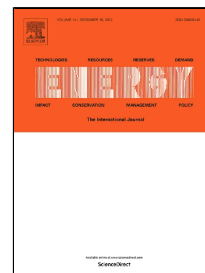


# Accepted Manuscript

Effects of Altitude on Combustion and Ignition Characteristics of Speed-up Period during Cold Start in a Diesel Engine

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1 **Effects of Altitude on Combustion and Ignition Characteristics of Speed-**  
2 **up Period during Cold Start in a Diesel Engine**

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7 **Abstract**

8 Altitude has a significant effect on the combustion of diesel engines during cold start, especially  
9 during speed-up. In this study, combustion characteristics of speed-up period were investigated  
10 using an experimental test on a heavy-duty diesel engine with an intake and exhaust pressure  
11 controlled by the plateau simulation test system to simulate altitude conditions including 0 m,  
12 3,000 m and 4,500 m. Further effects of altitude on ignition characteristics of diesel engine were  
13 accomplished through a zero-dimensional thermodynamic model coupled with a detailed kinetic  
14 model. Results indicated that as the altitude rose from 0 m to 3,000 m, the pressure in the cylinder  
15 was reduced, the number of diesel engine speed-up cycles increased, and the rising speed ratio  
16 decreased during speed-up. There was a misfire after the fifth cycle at an altitude of 4500 m, and  
17 the rising speed ratio was significantly reduced. Through analysis of fuel injection, air intake and  
18 ignition phase, we confirmed that the misfire at the high 4,500 m altitude was caused by the  
19 ignition delay, which was mainly controlled by chemical reaction during cold start. In the detailed  
20 kinetic study, the hot-flame and blue-flame reactions slowed down in the chemical reaction of the  
21 mixture as the altitude rose. The higher altitude enhanced the H-atom abstraction, but weakened  
22 the second O<sub>2</sub> addition and the peroxyalkylhydroperoxide isomerization. The decomposition

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