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EGR对轻型柴油机缸内燃烧及排放性能影响的可视化

Visualization of influence of ERG on combustion process and emission performance for light-duty diesel engine

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作者	单位
贾和坤	江苏大学汽车与交通工程学院, 镇江 212013
刘胜吉	江苏大学汽车与交通工程学院, 镇江 212013
尹必峰	江苏大学汽车与交通工程学院, 镇江 212013
黄晨春	江苏大学汽车与交通工程学院, 镇江 212013

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中文摘要:

为探索EGR对轻型柴油机小负荷工况下缸内燃烧及排放性能的影响规律,该文以某高压共轨轻型柴油机为样机,搭建柴油机缸内工作过程可视化研究平台,通过缸内燃烧过程高速摄影、缸内示功图采集及放热率计算分析了EGR对轻型车用柴油机燃烧过程及排放性能的影响规律。研究表明:通过所搭建的柴油机缸内工作工程可视化平台可以直观的分析柴油机缸内喷雾燃烧过程。小负荷工况条件下,随着EGR率的增加,滞燃期缩短,柴油机缸内燃烧持续期延长,燃烧后期平均温度上升,缸内压力峰值、瞬时放热率峰值均降低,与EGR率为10%时相比,EGR率40%时NOX、HC和CO排放分别下降了65.6%,46.4%和8.7%,而炭烟的排放先减小后增大,EGR率超过30%后炭烟排放及燃油经济性出现恶化。该研究可为有效降低柴油机排放提供参考。

英文摘要:

In order to exploring the influence of EGR on combustion and emission characteristics in a low load working condition on a light-duty diesel engine. Taking one high pressure common rail light-duty diesel engine as the research object, a visualization platform for cylinder working process of a diesel engine was built. Influence of EGR on combustion process and emission characteristics was studied through cylinder combustion process high-speed photography, cylinder pressure and heat release rate. The study illustrated that spray and combustion process was analyzed directly through visualization platform. In a condition of low load, with the EGR rate increased ($\leq 30\%$), the ignition delay shortened, and the combustion process extended, meanwhile the maximum combustion pressure, the peak of heat release rate and the average temperature of combustion last stage rose. Compared with the EGR rate of 10%, the NOX, HC and CO emissions reduced by 65.6%, 46.4% and 28.7%, soot emissions first decreases and then increases. The soot emission and fuel economy worsened when the EGR rate was over 30%. This study provided an effective way of reducing diesel emission

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