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# 车用柴油机低排放缩口燃烧系统的优化

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摘要 为了定量评价低排放缩口燃烧室内的气流特性，引入了涡流强度保持性的概念。采用FIRE软件对车用直喷式柴油机低排放缩口型燃烧室内气流的空间分布及其变化规律进行了数值计算，利用计算结果并结合MATLAB软件计算了不同缩口直径燃烧室内的瞬态涡流强度保持性大小，由此评价这种燃烧室的气流特性，并分析不同缩口直径对燃烧室内气流特性及其涡流强度保持性的影响。在此基础上，通过台架试验对比分析燃烧室内的这种涡流强度保持性与喷射系统参数和进气涡流匹配时对柴油机性能的影响。结果表明，采用适当的低排放缩口型直喷式燃烧室结构可有效地组织和控制燃烧室内气流分布规律及其强度，而且对于这种燃烧室结构存在着最佳的喷射位置和进气涡流比，从而在动力性和经济性基本保持不变的条件下可有效地改善柴油机的排放特性。

关键词 动力机械工程；缩口型燃烧室；涡流强度保持性；进气涡流；优化匹配；排放

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# Optimization of low-emission combustion system with reentrant combustion chamber for automotive diesel engine

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**Abstract** The concept of swirl intensity retention(SIR) was introduced to evaluate quantitatively the transient flow characteristics of the air in the low emission reentrant combustion chamber. The air flow field and its evolution in the reentrant combustion chamber of an automotive heavy duty direct injection diesel engine was simulated by the software FIRE. The SIRs for the combustion chamber with different reentrant diameters were calculated by the software MATLAB from the simulation data and the effects of the reentrant diameter on the flow characteristics in the combustion chamber and their SIRs were analyzed. On this basis, the concerted effects of the SIR with the fuel injection system parameters and the intake air swirl ratio on the diesel engine performance were studied on a dynamometer test bench. The results show that the designed properly reentrant combustion chamber can effectively organize and control the air flow field history in the chamber, and there are the optimized fuel injection spray orientation and location relative to the chamber and the optimized intake swirl ratio for this kind of combustion chamber, so can improve the engine emissions without penalty on its performance.

**Key words** power machinery and engineering reentrant combustion chamber swirl intensity retention intake swirl optimization matching emissions

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