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柴油/甲醇组合燃烧(DMCC)减少重载柴油机烟度排放的试验研究

Reduction of smoke emissions from heavy duty diesel engine with diesel/methanol compound combustion

关键词: [柴油/甲醇组合燃烧](#) [增压中冷柴油机](#) [干炭烟烟度](#) [不透光烟度](#)

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摘要: 在一台满足国三排放法规要求的重载车用增压中冷电控单体泵柴油机上,将其改造成柴油/甲醇组合燃烧(DMCC)发动机并进行台架试验.利用电控单元控制向进气歧管喷射的甲醇量及其喷射时刻,原柴油机供油系统保持不变.试验主要研究在稳定工况时,不同的负荷以及不同的甲醇对柴油的比例情况下,经催化转化后发动机干炭烟烟度(415烟度)和不透光烟度(439烟度)排放的情况.试验结果表明,在燃用现有市售的燃油条件下,与原机相比,相同工况下采用DMCC的干炭烟烟度和不透光烟度都有大幅度的减少.干炭烟的最大降幅达95%,平均降幅达到50%以上.在柴油喷射量不变的情况下,增加甲醇喷射量,干炭烟烟度会持续减小,而不透光烟度呈先减少后增加的趋势.同负荷时的甲醇对柴油替代率为44.88%到56.73%时,不透光烟度存在最低点,并且发动机的烟度排放存在最优值.在同一工况下,随着柴油对甲醇的比例增加,发动机的干炭烟烟度和不透光烟度排放都逐渐增加.

Abstract. The study was performed on a heavy duty (HD) diesel engine with a turbocharged inter-cooled electronic unit pump. The HD diesel engine was modified with diesel/methanol compound combustion system (DMCC). DMCC engine has two fuel supply systems, the diesel fuel system and the additionally installed methanol supply system. Methanol pressurization was induced into the intake manifold by six injectors controlled by an electrically controlled unit (ECU), and mixed with fresh air to form the homogeneous mixtures into cylinder and then ignited by pilot diesel. The amount of methanol injected was responsible for meeting requirement of engine power output under different operating conditions while diesel fuel remained constant. Effects of methanol-to-diesel ratio on dry soot and light-proof smoke were studied under different operation conditions after diesel oxidation catalyst (DOC). The testing results show that, compared with the baseline engine, both the dry soot and light-proof smoke decreased with increase of methanol-to-diesel ratio while in the same operation condition. The average reduction of dry soot is over 50% with the maximum of 95% when the engine with DMCC is operated. The testing results also shows that when amount of diesel fuel injected is constant, the dry soot decreases but the light-proof smoke varies with the increase of the proportion of methanol, and the light-proof smoke has optimum value. Meanwhile, both the dry soot and the light-proof smoke increased as the ratio of methanol to diesel fuel decreases.

Key words: [diesel/methanol compound combustion](#) [turbocharged inter-cooled diesel engine](#) [dry soot](#) [light-proof smoke](#)

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