增压中冷柴油机缸套热态变形研究

Study on cylinder liner hot deformation of turbocharged inter-coo

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中文摘要：

　　缸套承受不均匀的热负荷而产生的失圆变形，主要影响缸套与活塞组件间的密封、摩擦/磨损以及排放性能。控制缸套的变降低排放，具有重要的意义。该文应用流固耦合传热方法，建立了缸盖-冷却液-缸套-缸体耦合传热模型，在对冷却液流动特究了缸套的稳态传热温度场分布以及热态变形规律。研究表明：受各缸冷却水套流动与热负荷不均匀的影响，各缸缸套温度低，相邻两缸间的缸套顶部温度高于其他部位，最高温度出现在3、4缸间的缸套顶部；各缸缸套综合热变形是不均匀的，1、位于第4缸90°位置（飞轮方向），最大综合收缩变形位于第1缸90°位置（1、2缸间）；缸套不同截面径向变形呈现与综合主要呈现膨胀变形，上部与下部受缸体结构约束，膨胀变形较小；各缸呈现不均匀的"豌豆"形径向变形，其中2、3缸对称，量相对较小，各缸的变形差异也较小。

英文摘要：

　　Abstract: Deformation of the cylinder liners, which was caused by inhomogeneous mechanical and thermal loads, mainly affects t wearing between piston assembly, and the cylinder liners and emission performance. It is significantly important for reducing oil cons properties to control cylinder liner deformation and out-of-roundness. The characteristics of deformation caused by mechanical load Therefore, there is a need to find out the distortion of liner caused by thermal load. In the present study, a coupled heat transfer mode the cylinder liners, and the engine body of four cylinders, in-line, water cooling, turbocharged inter-cooled diesel engine was establi method. In this model, the external boundary conditions, which are difficult to determine on the fluid and solid contact faces, were tr heat transfer in the solid and fluid was coupled by coupling the surfaces of the solid and fluid. Thus, the expected results of tempera computed. The flow characteristics of coolant and the key point temperatures of the cylinder liners and cylinder heads were tested t transfer. On the basis of correctional boundary conditions of heat transfer, the flow characteristics in the water jacket and heat transf analyzed. Then, the steady-state heat transfer temperature distribution and the characteristics of thermal deformation of the cylinder coolant flow and cooling are uneven due to the difference of water jackets for each cylinder. The flow velocity is gradually reduced f temperature is gradually increased. The temperature of the exhaust side is higher than that of the intake side. The temperature distrib inhomogeneous coolant flow and thermal load. The temperature of the top of the cylinder liners, which is located between two adjac cylinder liner (the highest temperature is 195℃, which is located at the top of the third and fourth cylinder liners). Temperature gradu cylinder liners. The temperature at the top of the liners, which has contact with the bodies, is high, and the temperature gradient is la middle area of the liners surrounded by coolant. The temperature and gradient at the bottom area of the liners for each cylinder liner, the pistons, are similar. The synthetic thermal deformation of each cylinder liner is not uniform; deformations of the first and the fourt of hot deformation is 0.216mm and located at 90° of the fourth cylinder on the flywheel end. The largest shrinkage deformation is -0 second cylinder. The trend of deformation at the radial section of the liners is different from the trend of synthetic deformation. The r mainly presents expansion deformation. Expansion deformation of the top and bottom of each liner, constrained by the body, is smal deformation, which is just like the shape of a pea, and there is a symmetry between the second and the third cylinders, and between t Deformation of main and minor thrust face for each cylinder liner is relatively less, and the difference of deformation of each liner is a

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