

轿车液力变矩器扁平率研究 Flatness Ratio of Flat Hydrodynamic Torque Converter for Passenger Car

刘春宝 朱喜林 马文星

吉林大学

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摘要: 为研究扁平率对液力变矩器性能的影响,提出了基于椭圆的循环圆设计方法,定义椭圆短轴与长轴比值为扁平率,设计出4种不同扁平率液力变矩器。利用CFD软件对不同扁平率液力变矩器内部瞬态流场和特性进行计算。深入分析了不同扁平率液力变矩器的内流场及性能。液力变矩器内部流动结构随扁平率变化而改变,如低速比工况涡轮叶片工作面高压区随扁平率下降而扩大,数值上却降低。流动结构的改变引起性能的变化,计算表明液力变矩器最高效率随扁平率减小而降低。适当减小扁平率可以提高起动变矩比,继续减小后将下降。适当减小扁平率也可以使低速比工况泵轮容量系数降低,泵轮将吸收更大功率。总体上,液力变矩器性能随扁平率减小而降低。 Hydrodynamic torque converters for passenger cars were designed with an increasingly narrower profile for the purpose of achieving smaller axial size that would cause the change of inner flow field and performances. Understanding the change rules under different flatness ratio could guide the design of flat torque converter. To investigate the change rules, four different flatness ratio torque converters were designed by means of bran-new flat torus design method and blade design method based on quadratic function distribution of momentum. Flatness ratio was also redefined, and then the change of flatness ratio can completely reflect the change of whole torus. The internal flow field of the flat torque converters was calculated by CFD software. The character of the flow field in pump, turbine and stator was analyzed in detail. Through the analysis, several valuable conclusions were educed. Based on the numerical solution, the performances of the flat torque converter were predicted. By comparing with the performances of different flatness ratio torque converters designed by same method, the influence of the flatness ratio of torque converter on hydrodynamic performance was found out.

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