整合流力與應力特性之正齒輪泵浦排量最佳化分析

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摘要

By incorporating the consideration of dynamic pressure, leakage, and gear stresses, this work conducts the displacement optimal analyses to the spur gear pumps designed with relief grooves. First, using a derived analytic expression for pump flow rate, the pump theoretical displacements, dimensionless displacements, and flow rate fluctuation can be calculated. Then, both the models of the pressurized and shear flow theories for the parallel plates are used to obtain the leakage and pressure of the carry over region. Also, the pressure distribution of the meshing region is also included through the hydrodynamic analysis. In the finite element stress analysis, the resulting pressures are imported into package ANSYS via APDL programming. Accordingly, the fillet bending stress and contact stress of gear pairs are obtained. Finally, including the constraint considerations, the design, machining, and stresses, the analysis to optimize the geometric displacement of the spur gear pumps is performed by the optimal code, MOST. Furthermore, parametric study is executed. The influences of gear design factors of the module, tooth number, and pressure angle on the displacement and flow rate fluctuation of the optimization spur gear pumps are investigated.

關鍵字：ear; Pump; Displacement; Finite element method; Optimization