

ABSTRACT

The present work is an application of Computer Aided Design and optimization techniques to solve the problem of designing disc brakes. The design methodology, preliminary and detailed design, are considered. Using CAD techniques, geometrical parameters, friction area required, disc material, friction material, lining life, and other parameters are calculated and adjusted, so that the friction brake can dissipate the heat generated during braking with acceptable values of temperature and stresses at the friction interface. The geometrical parameters such as the outer and inner disc diameters, thickness of disc and pad, and the pad angle are adjusted.

A CAD program is constructed using Object Oriented Language “Visual Basic” with full graphics interface. It can provide an easy way of evaluating the performance of disc brake parameters while changing the design inputs. The final design dimensions are inserted in data files which can be automatically transferred to graphics software using the “AutoLISP” programming of “AutoCAD” program for automatic viewing and further detailing of the design construction. The CAD procedure is illustrated by solving few design problems and verified by previous researchers results. Another program is developed for the optimization of disc brakes. Three objectives are investigated; maximum attained torque; minimum actuating force and thermal stresses; and minimum temperature and disc volume at maximum torque. The design vector is taken to be the outer disc diameter, the diameters ratio, the disc thickness, and the pad angle. Charts of the optimum results are plotted.

A comparison is made with the present optimization results and the previous results indicating a saving over previous case results which did not consider all design objectives and parameters.