Stress Analysis and Design Optimization of Pulleys

姚家福、劉勝安

E-mail: 9708050@mail.dyu.edu.tw

ABSTRACT

This study uses Solidworks Cosmosworks finite element analysis software, carry on modal static analysis to the flat pulley and flat belt transmission, bestow the effective tension on the pulley with the belt, make the pulley produce the stress, finite element analysis software of the computer to show the stress of the pulley is distributed the situation, and then carry on the optimization. The optimization is designed and divided into ellipse and rectangle and H arm with the form of arm of the pulley mainly, and then divide into six and five with the number of yarn of arm of the pulley, carry on six groups of optimization analysis altogether. The pulley of every group turns a design object of the optimization minimumly with quality, under the prerequisite of the size with sectional arm is a design parameter of the optimization, with permitting the stress as the stress limiting conditions of the optimization the most greatly of gray cast iron of pulley material. The result of study shows, find the pulley no matter the number of yarn of arm is six or five, the lightest in weight with the pulley of the H arm, secondly it is the rectangle, the end is an ellipse. Make the pulleys designed reach the optimization, in order to be regarded as the structural design of belt pulley and reference of development.

Keywords : Finite Element Analysis , Static Analysis , ; Effective Tension , Pulley , Optimization

Table of Contents

REFERENCES

參考文獻 [1]Chukanov, V. I, “ Accurate Calculation of a Flexible Belt Drive ”, Russian Engineering Journal, Vol. 46, No. 11, pp.26-30, 1966.

[2]Firbank, T. C, “ On the Forces Between the Belt and Driving Pulley of a Flat Belt Drive ”, ASME Design Engineering Technical Conference, III,77-DET-161, 1977.

[3]H. Kim, K. M. Marshek, “ Belt Forces and Surface Model for a Cloth-Backed and a Rubber-Backed Flat Belt ”, Journal of Mechanisms, Transmissions, and Automation in Design, Vol. 110,pp93-99,1988.

[4]M. Parvini, J. Harandi N., A. Kavousian, and M. Soufian, “ Structural Analysis of Conveyor Belts. II Finite Element Approach. ”, Journal of Applied Polymer Science, Vol. 46, pp775-781, 1992.

[5]謝全釗，三維有限單元摩擦接觸分析於皮帶傳動系統性能之研究，博士論文，國立清華大學動力機械工程研究所，2001。

[6]褚靜如，皮帶及滑輪的有限元素模擬，碩士論文，國立成功大學機械工程研究所，2005。

[7]莊明家，”機械設計及分析”，台灣復文興業股份有限公司，1990。

[8]岩浪繁藏編，蕭旭烈譯，”機械設計演習”，正言出版社，1984。

[9]Joseph E. Shigley, Charles R. Mischke, and Richard G. Budynas, “ Mechanical Engineering Design ”, 7th Edition, Mc Graw Hill, 2003.

[10]三五橡膠型錄，動力傳動用橡膠帶，三五橡膠廠股份有限公司。

[11]小栗富士雄，小栗達男共著，張兆豐主編，臺隆書店編譯委員會編譯，”標準機械設計圖表便覽”，2版，臺隆書店。

[12]Culverhouse, P.F., “ Four Design Routes in Electronics Engineering Product Development ”, Journal of Design and Manufacturing, Vol. 3, pp. 147-158 (1993).

[13]張澤厚，＂機械設計(原理．實例．習題)＂，財團法人徐氏基金會，1988。
[14]林龍震老師工作室，＂SolidWorks 2007進階設計＂，博碩文化股份有限公司，2007。
[15]M.F.Spotts原著，馮騰榔，王亞平，戴義國共譯，＂機械元件設計＂，4版，文京圖書有限公司，1992。