Experimental Evaluation of GD&T for HDD Arm

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ABSTRACT

This research aims to evaluate the existing relationship between various geometrical dimensions of Arm-coiled actuator, pivot bearing, the quality of the tolerance ring, the assembly process parameter(s) and a major quality characteristic of arm height deviation after assembly called Actuator Pivot Flex Assembly (APFA). The research results in a statistical model of the parameters that affect the APFA arm height deviation and its variation.

Keywords: ACA, Tolerance Design, Pivot Bearing

INTRODUCTION

In HDD industry, designed experiments can be used to systematically investigate the process or product variables that influence product quality. Once the process conditions and product components that influence the APFA height have been identified, direct improvement can be made to enhance the quality and performance of product. Several authors have presented methodology in details for design of experiments. Mamun and Ge (2005) addressed the need for accuracy precision of the actuator which can leads to dramatic improvements in performance. Prannattee and Tangchaichit (2008) gave tolerance study of a pivot ball bearing of actuator-arm based on the worst case and statistical analysis combined with parametric simulation to generate the mathematical modeling equation by linear regression analysis. The needs to enhance the performance of hard disk drive are very clear. See Abramovitch and Franklin (2002) for more background on disk drive. Geometric Dimensioning and Tolerancing (GD&T) can greatly influence the function of the product especially actuator whose dimension specification is very tight. The research in applying design of experiment technique to analyze the dimension is very common. See for example Huele (2006). This research presents the relationship between dimensional accuracy of actuator arm-coiled and factors those involve in the process.

METHODOLOGY

This research experimentally evaluated the relationship between various geometrical dimensions of Arm-coiled actuator (ACA), pivot bearing, the quality of the tolerance ring, the assembly process parameter(s) and a major quality