

## 실측형상오차를 이용한 HDD 스피들용 볼베어링의 NRRO 해석

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### NRRO Analysis of a HDD Spindle Ball Bearing using Measured Geometric Imperfection

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**Abstract** : This paper presents theoretical analysis of the NRRO(the non-repeatable run-out) for a ball bearing with geometric imperfection. The 3DOF dynamic analysis of a ball bearing using the Runge-Kutta method is performed to calculate the displacement of shaft center. Frequency and magnitude characteristics of radial and axial vibrations are investigated. The ball form errors of the ball, the inner race, and the outer race in a HDD spindle ball bearing are precisely measured. NRRO of a ball bearing is analyzed by using the measured waviness data. It is concluded that dominant components of radial vibrations are  $f_c$  and  $2f_b \pm f_c$ , and dominant component of radial vibrations is  $2f_b$ . These are generated by size error and second waviness of balls.

## HDD의 디스크의 진동 감쇄 설계를 위한 공기흐름해석

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### An airflow analysis for the reduction of disk flutter in HDD

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**Key Words** : disk flutter, HDD, LES, PES

**Abstract** : As the data storage device market demands higher data transfer rate with higher track density, TMR budget is to be tighter so that even minor improvement is sought in HDD development fields. Disk flutter associated with the turbulent air flow inside the chamber becomes of great interest for the reduction of PES especially at OD. A comparative transient turbulent flow study is presented in this paper for the reduction of disk flutter with different housing designs.