TC07

Optimal Design of SFF HDD Suspension for Improving the Unloading Performance

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The HDD (hard disk drive) using Load/Unload (L/UL) technology includes the benefits which are increased areal density, reduced power consumption and improved shock resistance than those of contact-start-stop (CSS). Dynamic L/UL has been widely used in portable hard disk drive and will become the key technology for developing the small form factor hard disk drive. The main design objectives of the L/UL mechanisms are no slider-disk contact or no media damage even with contact during L/UL, and a smooth and short unloading process. For realizing those, we should consider many design parameters, such as L/UL speed, disk rpm, pitch static attitude (PSA), roll static attitude (RSA), suspension stiffness and so on in L/UL system. In this paper, we focus on lift-off force.

The "lift-off" force, defined as the minimum air bearing force, is another very important indicator of unloading performance. The large amplitude of lift-off force increases the ramp force, the unloading time, the slider oscillation and contact-possibility. To minimize "lift-off" force, we optimize the suspension shape using the integrated optimization frame, which automatically integrates the analysis with the optimization and effectively implements the repetitive works between them. In particular, this study is carried out the optimal design considering the process of modes tracking through the entire optimization processes. Through the mode tracking, we perform the optimalprocess in safety. Also, we consider latin hypercube designs that try to achieve optimality. As a result, we yield the regression equation which can easily find a lift-off force and structural optimization for suspension. Also, the verification of optimal model is approved by various methods.

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TC08

Optimal Design of Rubber-like Mounts Supporting Notebook HDD for Shock and Vibration Isolation

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Mobile devices became an important part of our daily life. *Especially*, notebook PCs give the flexibility to work and play anywhere. However,Notebook PCs cannot be nomadic if the respective components are not robust enough to endure rugged notebook operating environment. For example, cooling fan, hard disk and speakers which are equipped in notebook PC lead to some problems against vibration performance. Moreover, notebook PC suffers critical failure from careless drop and impact. To minimize the likelihood of failure, the hard disk driver is supported by rubber mounts in given system.

Due to varying stiffness and damping of rubber, we must consider the non-linearity of rubbers when we identify dynamic characteristics and obtain shock response. Based on estimated modal parameters, we can simulate acceleration transmissibility and compare with experimental results and PES(Fig.1). Estimated PES is an important index to predict the TMR level, and provides useful information about the character-istics of the vibration performance. For shock analysis, notebook HDD isolation system is assumed to be a two degree of freedom system which consist HDD and notebook body. Compared with vibration test, large deflection between *HDD and notebook body makes the stiffness increase.Through experimental results,* stiffness can be approximated using exponential curve-fitting. The equation of motion can be solved numerically, i.e., via non-linear solution technique(4^{th} order Runge-Kutta method). Also, the validity of asserted model is identified through linear-drop test(Fig.2). Finally, we assert optimal material properties and the stepped rubber model to improve shock and vibration performance.

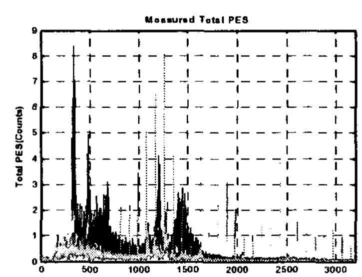

Fig. 1. Estimated PES of Various Rubbers

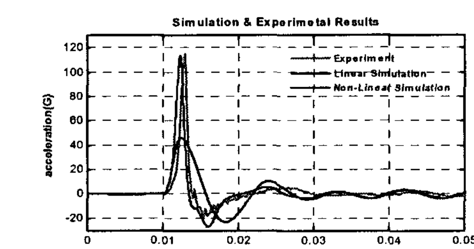

Fig. 2. Analytical and Experimental Shock Response

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