FUJITSU THE POSSIBILITIES ARE INFINITE

Drive Technologies for Magnetic Recording

May, 2008

Abstract

The applications of hard disk drives are being extended to data centers, personal computers, automobiles and consumer electronics such as video recorders.
Technologies that enable higher recording density and reliability provide the best solution for meeting storage demands, as follows:

1) Data centers
The amount of data stored in data centers is increasing at the rate of 57% every year. Larger capacity hard disk drives meet this increased demand for capacity and save space and energy consumption at the data centers.

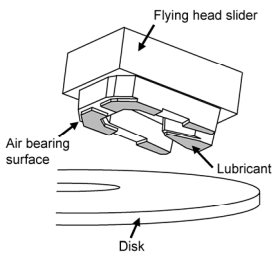
2) Consumer electronics
As high-definition movies become popular, video recorders and personal computers require increasing amounts of storage capacity. There will be no shortage of new applications that require large storage capacity.

Our research areas in drive technologies include the head disk interface (HDI), servo control, and mechanical/fluid dynamics technologies to achieve higher recording density and reliability.
We present here one of the drive technologies that focuses on the head disk interface (HDI).

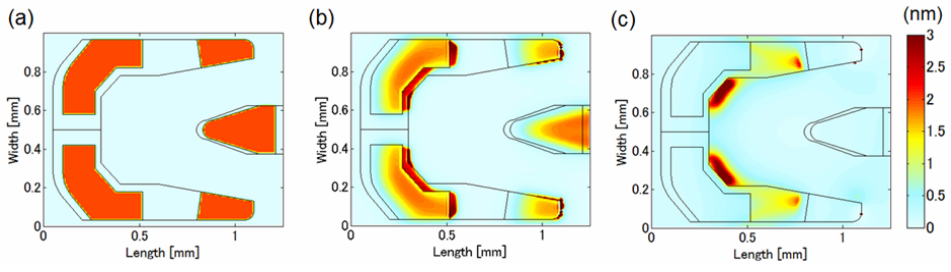
Technology

- **HDI**

The magnetic head, which reads and writes data from and to the magnetic disk, is attached to the slider. In today's drives, the slider flies above the disk at a height of ten nanometers. Since the recording density depends on the flying height of the slider, the flying height is expected to be reduced to 5 nm in the next generation of drives. Air bearings on the head sliders have been designed to minimize changes in the flying height, which are caused by the radial position on a disk surface (inner/outer), altitude change (0 m - 3000 m), and manufacturing variations. Many other factors can also influence the stability of the slider under such an ultra-low flying height regime, such as vibrations, contamination and lubricants.
The authors have developed a new solver, which can simulate the behavior of lubricant films on the slider surface. The figures below show the behavior of the lubricant film on the slider surface. This simulator makes it possible to design air bearings for sliders that control the lubricant behavior.



Flying head slider



0 seconds | after 10 seconds | after 100 seconds

Simulated motion of lubricant on slider