Spring 2020

Simulation of Lubricant Evaporation / Flow from a Nanoscale Film under Laser Heating for Cloud-Storage Applications

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Honors Research Project / Senior Design Project Report

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Faculty Project Sponsor: Dr. Shao Wang
Project Number: 104

Spring Semester 2020

ABSTRACT

The process known as heat-assisted magnetic recording is an advanced data storage technology which can be applied to develop higher data-density storage in next generation hard disk drives. These such drives are instrumental in the utility of server storage (colloquially known as “cloud storage”) devices and the storage of large-data projects such as that of the Event Horizon Telescope array, which last year captured and processed the first-ever images of a black hole. During this process, data is written to a magnetic surface by means of laser heating; the coercivity of the magnetic medium is reduced by the heating of this surface and within this heating period, the data is able to be written to the disk in a smaller area than would be possible without laser heating. However, during this heating process, the lubricant present on the disk can evaporate because of the high temperatures generated by the laser. This can lead to an accumulation on the slider which may then return back to the disk after the heating process has completed. This variation in the volume of lubricant present on the disk may reduce the overall efficiency of the process. In order to study these effects, the lubricant distribution and the temperature distribution on the disk and slider surfaces are evaluated with the help of lubricant film simulation made possible by finite element analysis software.

Due to confidentiality concerns, the contents of this report may not be submitted to an online repository such as IdeaExchange. To request a copy of this report, please contact the Honors Project Sponsor for this project, Dr. Shao Wang, or the Honors Department Advisor for this report, Dr. Ajay Mahajan.