

Slim-type

†, *, **

An Experimental Study of Disc Warping in Slim-type Optical Disc Drive

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Key Words : ODD(), Disc Warping(), Single Rotating disk(), Shroud(), LDV Measurement()

Abstract

In this paper, we investigated the disc warping in high-speed slim-type optical disc drive. Recently, the information storage devices are increasing track density and higher rotation speed to enhance their recording capacity and their data transfer rate. Generally, ODD used in the Lap-top Computer has small inner space. So, the flow instability of inner space is rapidly increased as its higher rotation speed. An extreme case, the flow instability causes the malfunction of readout at pick-up of drives. The experiments and numerical analysis were carried out for several cases, the result shows the influence of airflow to the disc warping.

1. 가

(CD-RW, DVD) 가

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Desk-Top PC

Note-Book PC

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(Tilting / Focusing Error),

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Contact

Cavity 가

, FLUENT

360 °

2.

2.1.2

Cavity

Cavity - 360 °

FLUENT

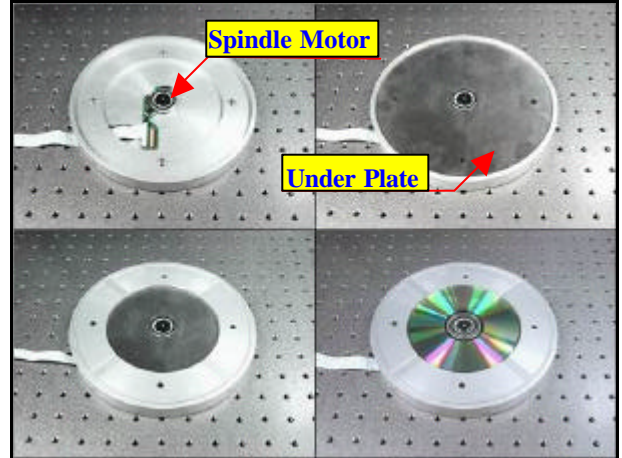


Fig. 2 Photograph of 360 ° Shroud

2.1

Cavity

Figure 2 360 °

2.1.1

Figure 1

, Under Plate

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가

2.2

2.2.1

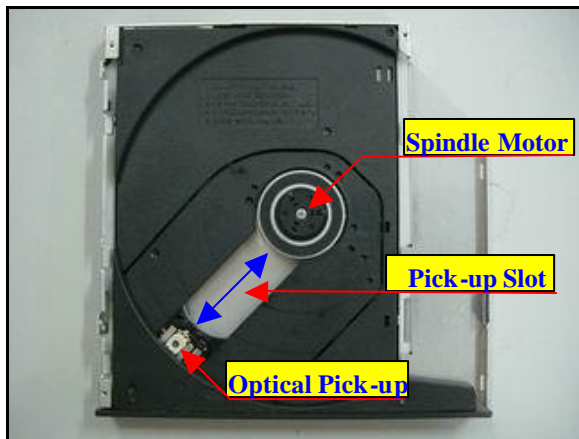


Fig. 1 Photograph of Slim-type ODD

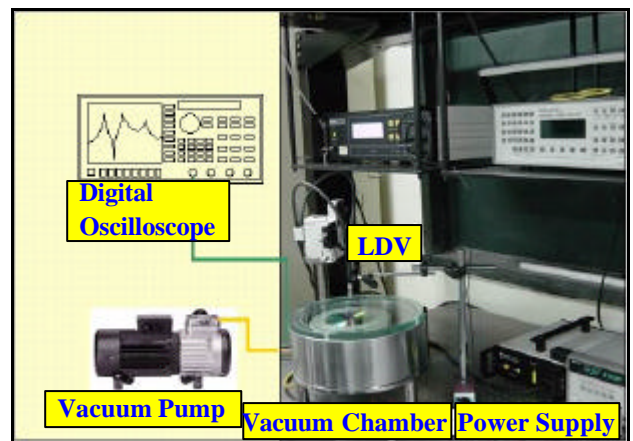


Fig. 3 Photograph of experimental setup(disc warping)

Figure 3 360°

LDV

2.2.2

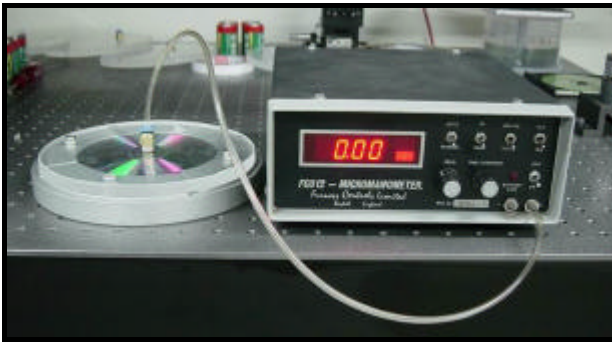


Fig. 4 Photograph of experimental setup(pressure)

Figure 4 가

360° 가

Table 2

Table 1 Micro Manometer Spec.

Accuracy	± 1% Digit
Response	Variable damping: 20ms~10sec
Range	- 195.9 ~ +195.9 Pascal (10%) - 1959.6 ~ +1959.6 Pascal (100%)

3.

3.1 360°

3.1.1 360°

24
5600rpm(± 50rpm)

가

Table 2 Experimental conditions

Disc Rotation Speed	Air Pressure	Vacuum Pressure
5600rpm (± 50rpm)	760mmHg	10mmHg

Table2

, Fig.5

h1,

h2,

c

Table 2

h1, h2, c

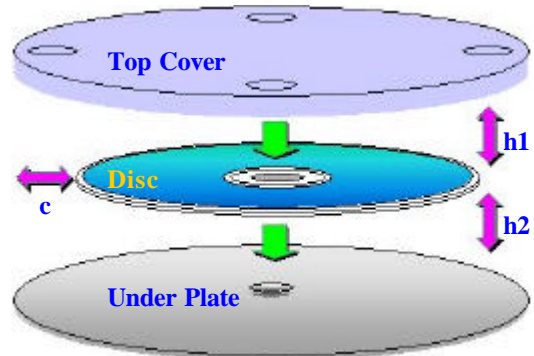


Fig. 5 Schematic diagram of experimental parameters

h1, h2, c 가
(Case1)

(Case2)

h1, h2, c

Case3,4

가

Table 4

Table 3 Experimental of variables

	h1	h2	c	Pressure
Case1	1.5mm	1.8mm	1.0mm	760mmHg
Case2	1.5mm	1.8mm	1.0mm	10mmHg
Case3	1.2mm	1.5mm	1.0mm	10mmHg
Case4	1.5mm	1.8mm	0.8mm	10mmHg

3.1.2 360°

360°

Spec. 5600rpm

Fluent

3.1.3 Stiffness

Flexible

Rigid (S41C)

3.1.4 Fluent

360° 5600rpm

Table 4 Simulation conditions

	AIR
Mesh	20,000 TET
Viscosity	Turbulent Large Eddy
Condition	Steady State
Velocity	5600 rpm
Criterion	0.0001

Mesh TET Turbulent Large Eddy

4.

4.1 360°

4.1.1 360°

Figure 6 Case1

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Case2

Case3,4

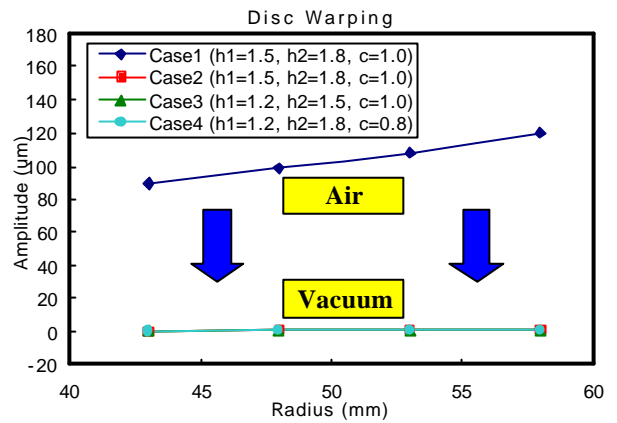


Fig. 6 Disc warping of 360° Shroud at 5600rpm

4.1.2 360°

Figure 7

Case6

h1

Spec.

, c

가

가

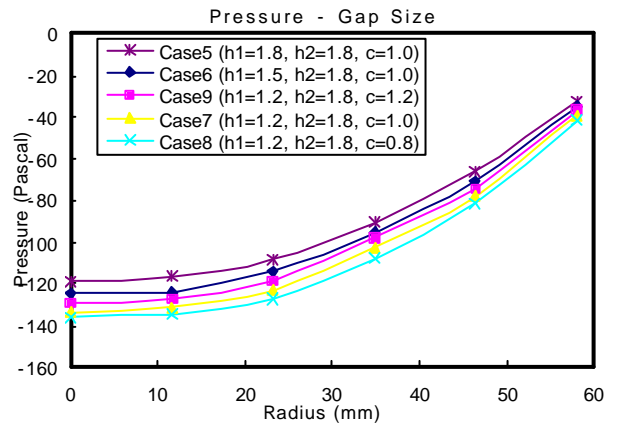


Fig. 7 Pressure of 360° Shroud at 5600rpm

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5.

4.1.3 Stiffness

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가

360°

가

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Fig.8

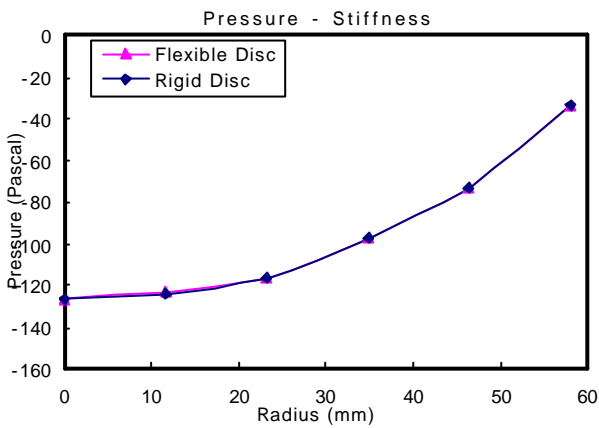


Fig. 8 Pressure of 360° Shroud at 5600rpm

(Fig.10 Lower)

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4.1.4 Fluent

360°

Upper 가 1.5mm

, Lower 가 1.8mm

가

가

Fig.9

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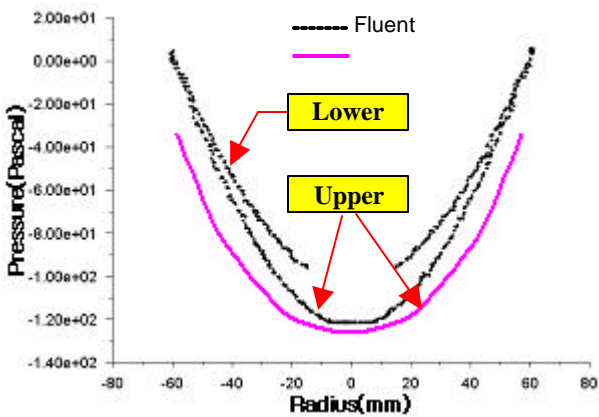


Fig. 9 Comparison of experiment and numerical analysis

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