

DATA RECOVERY / HARD DISK TECHNICAL NOTES

Title: Apparent problems with Fluid Dynamic Bearing (FBD) technology in hard drive spindle motors

Notes: The motor assembly on many modern hard disk drives contains a fluid bearing. Fluid bearings are commonly used by many hard drive manufacturers and have advantages over their older ball bearing counterpart drives is so much as

- (1) They provide superior shock resistance and,
- (2) They run much quieter.

We have found that when a hard disk drive with a motor assembly of this type is powered up from cold, the fluid contained in the bearing takes time to reach it's optimum performance viscosity. During this 'warm up' period, the hard drive platters are subject to vertical vibration, causing multiple read / write errors, and ultimately leading towards the failure of the hard drive.

We believe that this vertical vibration is a contributing factor to why some modern hard disks develop firmware and other service area related faults.



Above: Disassembly of the spindle motor from a seized hard drive. The parts are (left to right): starter motor, fluid bearing, rotor

Vertical vibration is most evident on the outermost disk area, where the head needs to reach the maximum vertical travel distance to comply with platter oscillations (and at higher speed).

The hard disk's service track is also located in this region. The service track is read when the disk starts up and usually (when the disk is idling), the heads will return to this position too. Working conditions such as these accelerate head suspension wear, causing sectors to seem unreadable.

As the G-list is updated, the firmware will gradually become corrupted, repaired, and finally lost.

The read / write heads may also begin to produce an audible steady ringing noise. In this case the parking cantilever sub-assembly will be subject to axial play too, and additionally -

- 1) When the heads are next parked the cantilever will be bent
- 2) When the drive next starts up the heads will move sending the bent cantilever to track 0 and onward, whilst continuously scraping the disk surface.

Once this has happened, the disk becomes a good candidate for advanced data recovery.

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