



Microcontamination Testing Services

Cleanliness Test For Disk Drive Parts

EFFECTS OF CONTAMINATION IN DISK DRIVES



Principal parts of a hard disk drive: One or more circular metal platters, coated on both sides with a very thin layer of a magnetizable material, are mounted on a spindle that rotates them at a constant, high speed. For each surface (the top and the bottom of each platter), the drive has a read/write head. These heads are mounted on a head assembly that moves them in toward the spindle or out toward the edge of the platters.

With higher storage densities the concentration levels of microcontamination that a drive can tolerate have become very low. The ultimate effect on the drive is failure. The majority of these contaminants will normally fall into the following categories: Ionics, Particulates, Organics and Gases

Ionic Contamination-The major contribution of ionic contamination with the presence of moisture in the disk drive is corrosion of the pole material in the head and the media. The sources of ionic contamination are varied from the drive manufacturing process. Some sources of ionic contaminants: latex gloves, finger cots, cotton Q-tips, foam swabs, particulates, packaging materials, vapor or aerosols and the presence of humans in the manufacturing environment. Media, at times, has been found to contain sulfates primarily on the carbon layer. Additional sources of ionic contamination are from ionic surfactants that may contain sulfates or phosphates that may still remain on the parts. Almost all latex gloves contain chloride and some ESD gloves have sulfate. The Q-tips and swabs contain chloride. Particulates may contain chloride, sulfate and others. These contaminants are normally transferred to the drive components by contact handling during assembly or from air borne particulates. In the case of Q-tips/swabs which are normally used with isopropyl alcohol there is enough water present in the alcohol to transfer the ionic contaminate to the part from the cotton or foam swab. The end effect of ionic contamination is corrosion of the pole tip and the media that yields a failed drive. In the case of the phosphate containing surfactants the glass deposition on the head can be etched away exposing the poles.

Particulates- Particulates are separated into two groups, **aerosols** and **solid particulates**.

Aerosols- Mists from oils, condensed volatiles from other organic materials in time may deposit on the media surface causing stiction failure.

Solid Particulates- Solid particulates may be from **organic, inorganic, metallic or magnetic materials**. Examples of solid organic and inorganic particulates: powder from gloves, finger cots, make-up and human debris. Particulate residues embedded in media or sliders from lapping slurries used in processing are potential sources of HDI failure. Metallic particulates from stainless steel components and magnetic particulates when present will cause drive failure. Particulates that become free within the drive may cause the head to crash or fly erratically and lead to a drive failure.

Organics- Organics may be classified into **volatile and nonvolatile**

Volatile- Volatile components from gaskets or adhesives or other sources which outgas may condense upon the media surface causing problems such as stiction, head smear, or corrosive attack of pole tip surfaces.

Non Volatile Residues (NVR)- Compounds which may be NVR sources can come from uncured adhesive components, mold release agents (polydimethyl-siloxanes), plasticizers (DOP), oils from motors and bearings, and monomers from tray materials. Almost all of the examples can form a film on the media and cause a stiction problem resulting in drive failure.

Kindly call us if you have further enquiry (Biological & Chemical Technology Division)

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