

Hard disk drives - A miracle of technology

Workstations, laptops, personal computers and security recorders all contain a hard disk drive. Today it's a self-evident fact, that no one thinks twice about. Take a closer look however, and one appreciates that hard disk drives are a tremendous miracle of technology, accomplishing incredible things.



A hard disk drive is generally defined as a non-volatile storage device that stores digitally encoded data on rapidly rotating platters with magnetic surfaces. It saves information by targeted magnetisation of midget parts on the surface of the disk. Therefore the drive uses a small electro-magnet assembly, referred to as a head.

The head floats above the surface on an air cushion generated by the air friction of the rotating disk. Nowadays the space between the head and the disk constitutes approximately 12 nanometres. Compare this with a single human hair that measures 50.000 nm! It stands to reason that the air between the head and the hard disk drive must exclude all pollution to avoid possible damages.

The power and accuracy of a hard disk drive can be compared with a plane flying at 8,000,000kmh at a height of 0.8 mm above grassland, simultaneously counting every single blade of grass. The plane would miscalculate less than one blade of grass during a flight lasting for 1,250 flights around the earth. An impressive performance!

Durability of hard disks

Hard disk drive manufacturers typically use the "mean time to failure" or MTF to indicate the operational reliability of their products. This is the average period until a failure occurs.

When a hard disk drive manufacturer indicates that the MTF is 1,000,000 hours (116 years), this doesn't mean that a hard disk drive will first fail after 1,000,000 hours in use. Rather it means that when 1,000 hard disk drives begin simultaneously and the first failure occurs after 1,000 hours, the resulting MTF is 1,000,000 hours.

In other words:

$$1,000 \text{ HDD} \times 1,000 \text{ hours of operation} = 1,000,000 \text{ hours MTF}$$

Hard disks that are used for this calculation have not reached the end of their product lives yet (generally 5 years), are operated within the ideal temperature range (max. 40 °C) and have not been damaged.

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Important parameters for the product life of a hard disk drive are the number of hours of operation as well as the number of read and write accesses. A hard disk drive that is operated in 24/7 mode (24 hours a day and 7 days a week) and which is permanently accessed, has a considerably higher wear and tear than a hard disk drive with fewer hours of operation and only occasional accesses.

Hard disk drives in use for security

Hard disk drives in digital video recorders, used in modern video surveillance, can be compared with "top athletes". A hard disk drive in a standard PC is probably operating 8 hours a day, 200 working days a year and its capacity utilisation only amounts to 3%. Security applications have a capacity utilisation of 99,9%*, information is stored on the hard disk drive 24 hours a day and 365 days a year.

[*permanent recording, no image comparison]

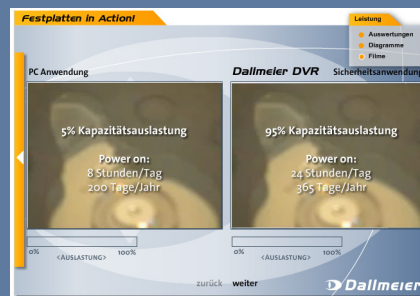
Even IT-servers have only an average capacity utilisation of 65%. Nevertheless every operator is aware of the fact that a server has to run in an appropriate environment, i.e. in an air conditioned, dust-free room. In this respect, DVRs often get neglected. There are scenarios, for instance, where a recorder is stashed in a closet or operated on an unstable surface.

In spite of constant load and sometimes suboptimal environment conditions, hard disk drives in security applications have a MTTF of 200,000 hours! Thomas Reisinger, Technical Director at Dallmeier: "Dallmeier calculated this value empirically. All hard disk drives that have been installed in our products and were used worldwide provided the data for this calculation."

This doesn't alter the fact that hard disk drives are and remain the main failure reason for digital recording systems. However the statement "there is a problem with the hard disk drive" is qualified immediately, when the above thoughts are considered. To demonstrate it with a descriptive comparison: the probability of an engine failure of a formula 1 racing car is understandably higher than the probability of an engine failure of a car that is always standing in the garage.

Good to know!

On the Dallmeier web site you will find all the information you need about hard disks – including their functionality, capacity utilisations in different areas of use or recommendations for a qualified environment - in a vivid Flash animation. And the best about it: You can download this flash animation and forward it to customers and end users.



www.dallmeier-electronic.com

Ideal conditions for hard disk drives at Dallmeier

Dallmeier does everything possible to extend the product life of the hard disk drives. Only hard disk drives tested and approved by Dallmeier are used in the recorders.

Even if the hard disk drive doesn't derive from the own manufacture, Dallmeier strictly ensures that all quality standards of the CCTV/IP- manufacturer are fulfilled.

This means, of course, that all hard disks are handled with the utmost care throughout the production process.

Elaborate ventilation systems and extensive system messages (temperature monitoring) make sure that the hard disk drives are operated in an ideal environment and that the user is immediately informed about possible malfunction. In case a hard disk drive has to be replaced, the disks are located in removable drawers for ease of access and to reduce the downtime of the system to a minimum.

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Examples for optimal and „less optimal“ transport and environmental conditions



Recommendations on how to create a qualified environment

Hard disk drives used in security applications must perform to their optimum. To ensure this, some preconditions have to be fulfilled. As already implied, the failure probability can be reduced significantly through creating ideal environmental conditions.

Next to the operating temperature, shocks and vibrations are another main reason for hard disk drive failures. As described before, the head floats during operation above the surface and is only bared from hitting the surface by an extremely thin air cushion.

If the hard disk drive is moved during operating, or is exposed to shocks, minimal particles can peel away and disperse around the whole data media. Improper transport can also cause damage to the hard disk drive.

Therefore:

- Only transport the device in its original packing
- Protect the device against shocks
- Protect the devices in operation against being hit
- Do not move the devices in operation
- Locate in a vibration-free environment
- Consider the installation position of the device

Further possible reasons for a shortened product life of a hard disk drive:

- Power failures
- Damage through electrostatic influences
- Magnetic fields
- Corrosion caused by too high humidity
- High temperature changes (condensing humidity)
- Air pollution

Thomas Reisinger again: "There is another aspect that can extend the product life of hard disk drives significantly: intelligent recording through motion detection. Often the recorder is recording something that isn't required. Recording only when there really is a movement in the picture, abates the wear of the hard disk drive. A reduction of more than 50% is common!"

Long life for the hard disk drive

Of course there are hard disk drive failures. However despite the constant strain on hard disk drives used in security applications, the failure probability is extremely low. Dallmeier's strict manufacturing standards help enormously. Provided that some basic conditions concerning environment and operation of the video recorders are regarded, the product life of hard disk drives can be increased enormously.