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Hard drives prefer a stable and consistent operation at temperatures ideally no higher than 40°C.

Boosting Hard Drive Lifespan

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Modern enterprise hard drives are highly reliable and may generally be used beyond their warranty period without any issues and no significant increase in failure rates. However, this is dependent on the drives being well-maintained and operated under optimal conditions. If not, the likelihood of failure rises considerably. But what constitutes optimal operating conditions, and what should companies be mindful of if they wish to maximise the lifespan of their hard drives?

Firstly, hard drives require a stable and consistent operation, as they contain moving parts that can be damaged by movements or shocks. Systems equipped with hard drives are therefore best housed securely in a rack. Tower-format devices, which cannot be accommodated in a rack, should be placed in a location where they are not at risk of being accidentally knocked or kicked, and certainly not on a desk, where the tabletop can act as a sounding board, transmitting any vibrations directly to the devices.

Furthermore, the hard drives must be securely fastened within the device. Merely placing them inside the casing can lead to minor movements of the drive due to the rapidly spinning disks inside, which may cause

damage. Particularly in more affordable systems, manufacturers often use plastic clamps or bays that allow for some 'give' in the hard drives or are themselves not completely secure within the casing. In such cases, it is advisable to properly secure the hard drives and bays, for example, with small rubber pieces or use additional screws, if possible.

High Temperatures Shorten Lifespan

Enterprise hard drives are designed to operate at temperatures between 5°C and 60°C. However, this only means that they will function correctly within this range – at higher temperatures, the electronic and mechanical components, such as the spindle bearings, wear out more quickly. Operating at the upper end of the specified range is not ideal either, as it can lead to a higher probability of failure.

The Mean Time To Failure (MTTF) listed in the datasheets refers to an average operating temperature of no more than 40°C. For most enterprise hard drives, this is 2.5 million hours, corresponding to an Annualised Failure Rate (AFR) of 0.35%. This means that out of 1,000 drives, three to four are expected to fail over the course of a year. At temperatures above 40°C, the failure rate increases – typically by about 30% for every 5°C rise in temperature. Therefore, continuous operation of hard drives at 55°C can raise the average failure rate (AFR) to 0.76%, leading to the expected failure of seven to eight drives within a year.

Overloading Increases Wear and Tear

Furthermore, usage also affects the lifespan of hard drives, as they are designed for a specific operational duration and workload. In the case of desktop drives, this is typically 16 hours per day and 55 TB per year – these models are unsuitable for network-attached storage (NAS) systems and servers, where they run 24/7 and are subjected to higher workloads. On the other hand, NAS and enterprise hard drives can handle round-the-clock operation and manage 180 TB and 550 TB, respectively. It doesn't matter whether the data is being written or read.

Suppose companies want to maximise the lifespan of their hard drives. In that case, they should ensure not to exceed the specified workloads, protect the drives from shocks and vibrations, and operate them consistently at no more than 40°C on average over their lifetime. Then, using them beyond the warranty period is usually not an issue – however, regular data backup becomes even more important.



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