Hard Drive Reliability Update: September 2014

September 23, 2014 by Brian Beach (https://www.backblaze.com/blog/author/brianb/)

(https://www.backblaze.com/blog/wp-content/uploads/2014/09/blog-drive-study.jpg)

For the most recent hard drive reliability (https://www.backblaze.com/blog/backblaze-hard-drive-stats-q1-2020/) statistics, as well as the raw hard drive test data, visit Hard Drive Data and Stats (https://www.backblaze.com/b2/hard-drive-test-data.html).

At Backblaze we now have 34,881 drives and store over 100 petabytes (https://www.backblaze.com/blog/400-petabytes-cloud-storage/) of data. We continually track how our disk drives are doing, which ones are reliable, and which ones need to be replaced.

I did a blog post back in January, called "What Hard Drive Should I Buy?" (https://www.backblaze.com/blog/what-hard-drive-should-i-buy/) It covered the

(https://www.backblaze.com/blog/what-hard-drive-should-i-buy/) it covered the reliability of each of the drive models that we use. This month, I'm updating those numbers and sharing some surprising new findings.

Reliability of Hard Drive Brands

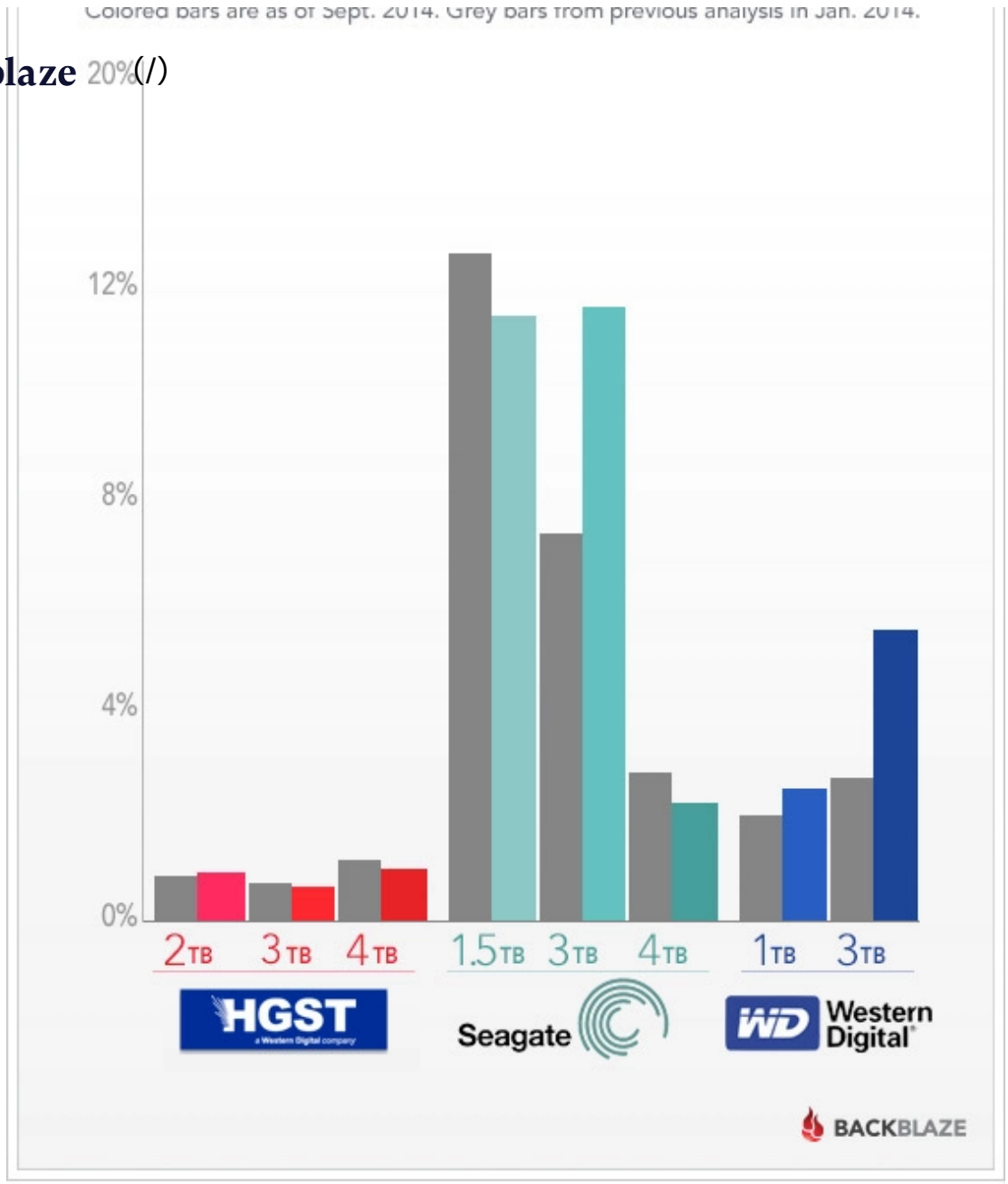
Losing a disk drive at Backblaze is not a big deal. Every file we back up is replicated across multiple drives in the data center. When a drive fails, it is promptly replaced, and its data is restored. Even so, we still try to avoid failing drives, because replacing them costs money.

We carefully track which drives are doing well and which are not, to help us when selecting new drives to buy.

The good news is that the chart today looks a lot like the one from January, and that most of the drives are continuing to perform well. It's nice when things are stable.

The surprising (and bad) news is that Seagate 3TB drives are failing a lot more, with their failure rate jumping from 9% to 15%. The Western Digital 3TB drives have also failed more, with their rate going up from 4% to 7%.

In the chart below, the grey bars are the failure rates up through the end of 2013, and the colored bars are the failure rates including all of the data up through the end of June 2014.



(https://www.backblaze.com/blog/wp-content/uploads/2014/09/blog-fail-drives-manufactureX.jpg)

Share this Image On Your Site

You can see that all the HGST (formerly Hitachi) drives, the Seagate 1.5TB and 4TB, and Western Digital 1TB drives are all continuing to perform as well as they were before. But the Seagate and Western Digital 3TB drives failure rates are up quite a bit.

What is the likely cause of this?

It may be that those drives are less well-suited to the data center environment. Or it could be that getting them by drive farming (https://blog.backblaze.com/2012/10/09/backblaze_drive_farming) and removing them from external USB enclosures caused problems. We'll continue to monitor and report on how these drives perform in the future.

Should we switch to enterprise drives (https://www.backblaze.com/blog/enterprise-drive-reliability/)?

Assuming we continue to see a failure rate of 15% on these drives, would it make sense to switch to "enterprise" drives instead?

There are two answers to this question:

1. Today on Amazon, a Seagate 3TB "enterprise" drive costs $235 (https://www.amazon.com/SEAGATE-Constellation-ST3000NM0033-SATA3SATA-Enterprise/dp/B00FW3M6EI/) while a Seagate 3TB "desktop" drive costs $102 (https://www.amazon.com/Seagate-Desktop-3-5-Inch-Internal-ST3000DM001/dp/B005T3GRLY). Most of the drives we get have a three year warranty, making failures a non-issue from a cost perspective for that period. However, even if there were no warranty, a 15% annual failure rate on the consumer "desktop" drive and a 0% failure rate on the "enterprise" drive, the breakeven would be 10 years, which is longer than we expect to even run the drives for.
2. The assumption that "enterprise" drives would work better than "consumer" drives has not been true in our tests. I analyzed both of these types of drives in our system and found (http://blog.backblaze.com/2013/12/04/enterprise-drive-reliability/) that their failure rates in our environment were very similar—with the "consumer" drives actually being slightly *more* reliable.

Detailed Reliability of Hard Drive (https://www.backblaze.com/blog/life-and-

times-of-a-backblaze-hard-drive/) Models

This table shows the detailed breakdown of how many of which drives we have, how old they are on average, and what the failure rate is. It includes all drive models of which we have at least 200. A couple of models are new to Backblaze and show a failure rate of “n/a” because there isn’t enough data yet for reliable numbers.

Number of Hard Drives by Model at Backblaze

(https://www.backblaze.com/blog/best-hard-drive-q4-2014/)

MODEL	SIZE	NUMBER OF DRIVES	AVERAGE AGE IN YEARS	ANNUAL FAILURE RATE
Seagate Desktop HDD.15 (https://www.backblaze.com/blog/best-hard-drive-q4-2014/) (ST4000DM000)	4TB	9619	0.6	3.0%
HGST Deskstar 7K2000 (HGST HDS722020ALA330)	2TB	4706	3.4	1.1%
HGST Deskstar 5K3000 (HGST HDS5C3030ALA630)	3TB	4593	2.1	0.7%
Seagate Barracuda 7200.14 (ST3000DM001) (https://www.backblaze.com/blog/3tb-hard-drive-failure/)	3TB	3846	1.9	15.7%
HGST Megascale 4000.B (HGST HMS5C4040BLE640)	4TB	2884	0.2	n/a
HGST Deskstar 5K4000 (HGST HDS5C4040ALE630 (https://www.backblaze.com/blog-smart-stats-2014-8.html))	4TB	2627	1.2	1.2%
Seagate Barracuda LP (ST31500541AS)	1.5TB	1699	4.3	9.6%
HGST Megascale (https://www.backblaze.com/blog/hard-drive-reliability-q1-2015/)				

4000 (HGST HMS5C4040ALE640 (https://www.backblaze.com/blog-smart-stats-2014-8.html))	4TB	1305	0.1	n/a
HGST Deskstar 7K3000 (HGST HDS723030ALA640)	3TB	1022	2.6	1.4%
Western Digital Red (WDC WD30EFRX)	3TB	776	0.5	8.8%
Western Digital Caviar Green (WDC WD10EADS (https://www.backblaze.com/blog-smart-stats-2014-8.html))	1TB	476	4.6	3.8%
Seagate Barracuda 7200.11 (ST31500341AS)	1.5TB	365	4.3	24.9%
Seagate Barracuda XT (ST33000651AS)	3TB	318	2.2	6.7%

We use two different models of Seagate 3TB drives. The Barracuda 7200.14 is having problems, but the Barracuda XT is doing well with less than half the failure rate.

There is a similar pattern with the Seagate 1.5TB drives. The Barracuda 7200.11 is having problems, but the Barracuda LP is doing well.

Summary

While the failure rate of Seagate and Western Digital 3TB hard drives has started to rise, most of the consumer-grade drives in the Backblaze data center are continuing

rise, most of the consumer-grade drives in the Backblaze data center are continuing to perform well, and are a cost-effective way to provide unlimited online backup (https://www.backblaze.com/) at a good price.

Notes

September 30, 2014: We were nicely asked by the folks at HGST to replace the name Hitachi with the name HGST given that HGST is no longer a Hitachi company. To that end, we have changed Hitachi to HGST in this post and in the graph.

print

About

Brian Beach (https://www.backblaze.com/blog/author/brianb/)

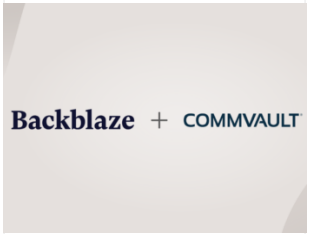
Brian has been writing software for three decades at HP Labs, Silicon Graphics, Netscape, TiVo, and now Backblaze. His passion is building things that make life better, like the TiVo DVR and Backblaze Online Backup.

Recent Posts You Might Find of Interest

'31

The Beginner's Guide to Computer Backup with Backblaze (https://www.backblaze.com/blog/beginner-guide-to-computer-backup/)

Backblaze vs. Dropbox: Backing Up Our Backup Claims (https://www.backblaze.com/blog/backblaze-vs-dropbox-backing-up-our-backup-claims/)



Simplify Data Protection with Backblaze and Commvault (https://www.backblaze.com/blog/simplify-data-protection-with-backblaze-and-commvault/)

Buil Clo Stor App i Minu (http ww.ba aze.cc og/bu a-clo stora app- 30 minut

«  Backblaze Mobile for iOS 8 (https://www.backblaze.com/blog/backblaze-mobile-for-ios-8/)

Scorpion Shows Us Why Access to Backups Is Important  »

(https://www.backblaze.com/blog/scorpion-shows-us-why-access-to-backups-is-important/)

MemphisIsaac
8 years ago

What is meant by "HGST (formerly Hitachi)" needs clarifying. It's my understanding that Hitachi sol superior results in your January reliability post for Hitachi, I thought that was why you were also sh update. However, it shows none. Furthermore, if I'm understanding the above sale correctly, more r HGST results are a hodge-podge of older Hitachi-based drives and newer WD-based ones? So, can Toshiba (which I thought would more truly be "formerly Hitachi" rather than HGST) 3.5 inch drives?

50 1 • Reply • Share ›

Ryan → MemphisIsaac
8 years ago

Perhaps I can help clear this up. I used to work for HGST during the WD transition. HGS strong footing in the enterprise level SAS and consumer SATA products (and still very m customers knew us as "HGST". So, the decision was made to keep the HGST acronym n a Western Digital Company". Customers still know they are dealing with HGST, the same Toshiba and we do still develop consumer SATA products, although, the enterprise stuff IBM Deskstar products and were some of the most reliable drive on the market.

We operated very much like our own HDD company after the merge. We actually never c company was HR and the benefits, which sometimes didn't align, haha. While the compa and HGST brands. Just think of it as a name tweak, and nothing more.

11 0 • Reply • Share ›

dosmastr → Ryan
7 years ago

Care to comment on the 75GXP drives?

0 0 • Reply • Share ›

Cockie Sunburn → MemphisIsaac 8 years ago edited

I was wondering the same thing, based on reports of people claiming "Toshiba took ove

Two things. Wikipedia states "To address the requirements of regulatory agencies, in M drives for the

This probabl produces 3,5

5

CBuntrock → Cockie Sunburn

This topic also really confused me. So as far as I understand you correctly, th
a few factories have been given to Toshiba? Because some articles say the 3
Research and Knowledge etc. for me. Important factor! Beside this, I still buy

0 0 • Reply • Share ›

fUjiMaNia

8 years ago

@Backblaze : Thank you for sharing this information. No regular end-user or even manufacturers w

8 0 • Reply • Share ›

Shaun Forsyth

8 years ago

Love the information guys but this is a little tantamount to scaremongering, without other informat
suspect the average life of a Seagate 3TB drive (that gets over the initial 3-4 weeks failure zone) to

I urge you to provide some more detail from the S.M.A.R.T data (as averages)

- Start/Stop Count
- Spin Retry Count
- Power Cycle Count
- Power-On Hours

This will at least allow us to compare the data centre style use to home user use of the drives.

Would also be good to see why and how you decide a drive has failed, do you use S.M.A.R.T to pre

Either way, I enjoy the posts and please keep them coming.

13 3 • Reply • Share ›

k_man → Shaun Forsyth

8 years ago

Scaremongering? Don't you think that is a little harsh. These are comparative results like
But there is not need to be alarmed about these numbers. Well, unless you work for Sea
In my case I haven't used Seagate (I use Hitachi instead) for years because I had been s

23 1 • Reply • Share ›

Shaun Forsyth → k_man 8 years ago edited

A little harsh maybe, but not everyone is as well informed or understand how

I do have a, hmmm.... dreaded, seagate 2TB drive in my personal desktop co

for average users these drives should have no issues. I would hate for people subjected to.

On the other hand, I read these great posts because I too have servers in data So its a great source of knowledge for me, but I shouldn't always use myself

3 0 • Reply • Share ›

Nick Corcodilos → Shaun Forsyth 8 years ago

Yah, well, my Seagate ST2000DM001 2TB drive just bricked after risk another one? When Seagate used to have 3 and 5 year warran any more.

19 0 • Reply • Share ›

Sgt Pinback → Nick Corcodilos 8 years ago

I have a few of the same model, ST2000DM001 - my first one died were seagate - and looking at my dead pile of 5 drives over the las

3 0 • Reply • Share ›

Nick Corcodilos → Sgt Pinback 8 years ago edited

Well, I decided to give Seagate one more try. Replaced the dead M with them. While WD seems to fare better, I think drives are now s have to backup your backup drives.

UPDATE 10/15: The Seagate is still going. No problems. Probably

2 0 • Reply • Share ›

Pete Lorenzo → Nick Corcodilos 7 years ago

I disagree. Some technologies are continuing to drop in price, but the best deal I can find is actually $30 more than it was back then

1 0 • Reply • Share ›

MA

Mike Adams → Shaun Forsyth 8 years ago

I would replace that Seagate immediately. I had a contract job anc at all the date codes and they seemed to die in the 2 to 3 year spa

10 0 • Reply • Share ›

MA

Matthew Austin → Shaun Forsyth 8 years ago

I manage an IT help desk at a small college and let me tell you I'm brought in to our help desk dead and just yesterday I decided to e increasing steadily and throwing SMART errors in StableBit DriveS

So that anecdotal evidence, COMBINED with Backblaze noticing tl

12 1 • Reply • Share ›

S

SLS → Matthew Austin 8 years ago

I have had this reallocated sector issue with most our 1TB and 2T eventually all will do this, its just a matter of time. Management di

1 0 • Reply • Share ›

phonebanshee → Matthew Austin 8 years ago

I ran into this article because I just had a ST3000DM001 die on m

0 0 • Reply • Share ›

JA

Jim Anderson → Shaun Forsyth 8 years ago

I'm with the rest of them when it comes to Seagate drives. In the l warranty to 1 year from 5years you knew it was bound to happen.

7 0 • Reply • Share ›

TR

Tipografia Romania libera → Shaun Forsyth 8 years ago

Make a full backup pronto.

5 0 • Reply • Share ›

PN

Peter Novák → Shaun Forsyth 8 years ago

I have been using Seagate Barracuda drives for 10 years and until my first 1,5TB drive died out almost instantly and without warning

The third drive is faring moderately, I might say, because it has wo probably is capacity for another 2000 available, there is already th drive itself (SMART), they are instead being exposed as BAD to OS sectors. So I'm looking for immediate repacement. And frankly, I d

Another 3TB Seagate has died unexpectedy after mere 1 year, anc

Need to say, these drives have been almost always ON, that is not nothing for most of day, and some 150GB read and write on daily

On the other hand, the older models (80, 120, 300GB) fared much

I see two typical patterns of failure.

1, Drive begins dropping from SATA bus. In this scenario, backup i difficult, and in a few days the drive will definitely die out. I assum

3 0 • Reply • Share ›

Keirnoth → Peter Novák 8 years ago

I'll back this person's post about the 500 GB Seagate. Anecdotal e strong. I had to resort to using it as a boot drive because the low

strong. I had to resort to using it as a boot drive because the low t

Got the Seagate 3TB mentioned in this post from a 2013 Amazon
OS just freezes and files read VERY slowly from the drive. Drive las
dying after 1 year. Got the infamous 1.5TB 7200.11 awhile back ar
properly).

3 0 • Reply • Share ›

Bernald Solano → Keirnoth 8 years ago
The 7200.9 series are good, actually really good actually, when I s

3 0 • Reply • Share ›

Peter Novák → Peter Novák 8 years ago
Correction: The still operational 1,5 TB has passed only 2,8 years

1 0 • Reply • Share ›

Lieane → Shaun Forsyth 6 years ago
Segate 2TB drive now starting to fail .... just into it's 2nd year after

0 0 • Reply • Share ›

Brandon Edwards → Shaun Forsyth 8 years ago
got 2x seagate 2.5" 500gb external paperweights myself. They we

0 0 • Reply • Share ›

Marcus Franulovich → Shaun Forsyth 8 years ago
It isn't scaremongering. Home user here with 8 Seagate 3tb drives in a home NAS enviro
like this. The drives are rubbish. I wish this article had been out when I bought them.. co

3 0 • Reply • Share ›

Metaxis → Shaun Forsyth
8 years ago
You should read the seminal google paper on disk failure trends:

http://static.googleusercon...

It shows that SMART only had relevant non-zero counters for 56% of failed drives, thus

However, for drives that had non-zero SMART parameters relevant to predicting failure (
(one). That's a huge deal. The research finds that if any of those parameters are non-zer

Other surprising results from the paper are that, after infancy, utilization rate is not stror
failure rate compared to cool or very high temps.

Though drive models and characteristics have changed plenty since 2007, many of thes

3 1 • Reply • Share ›

Edward Iskra → Metaxis 8 years ago

The paper is from 2007, but their data was from 2005 and 2006, and reflects year-old technology! The findings are more dated than you think.

"The disks are a combination of serial and parallel ATA consumer-grade hard study were put into production in or after 2001. The population contains seve models. The data used for this study were collected between December 200

2 1 • Reply • Share ›

MaryReilly → Shaun Forsyth

7 years ago

Not scaremongering. I have 20 Seagate 3TB drives and in 2 years, 5 have failed complet remaining drives for HGST drives. The added expense is worth the reduced headache ar

1 0 • Reply • Share ›

Haravikk → Shaun Forsyth

8 years ago

I'm not sure about scare-mongering; you're right that it can't easily be used to make com trundling around on the internet now and then or playing a few games.

That said, I've lost faith in Seagate entirely; I had a few Barracuda drives in one of my old them, no sign of faults in S.M.A.R.T.), but newer drives have been abysmal (two lasted ju

1 0 • Reply • Share ›

TR

Tipografia Romania libera → Shaun Forsyth 8 years ago

1. What formula did you use to get this 10 years average lifespan?
2. The problem is: I don't use average hard disks, I use a particular one. And one externa life. I constantly and consistently check SMART data just to make sure I will not have su

1 0 • Reply • Share ›

Shaun Forsyth → Tipografia Romania libera 8 years ago

Average Life of the Seagate 3TB (ST33000651AS) according the graph above is 2.2, in backblaze that would be (24*365)*2.2=19272 power on hours, home user desktop as mentioned in my post I would expect to have an on time on average per day of around 5 hours, (I know as a technical person, my machine is on all the time, but its sleeping, I use it around 2.5 to 6 hours a day on average). so 19272 / 5 = 3854.4 days, then 3854.4 / 365 = 10.56 years. Which is not bad, since in my first post it was a guess based on when I used to collect and service thousands of computers from business which went defunct.

I am going to take
away that you believe the smart data is not a good indicator of a drives imminent failure. However this is not what I was looking for. I was

looking for averages from the smart data to indicate failure.

1 0 • Reply • Share ›

TR **Tipografia Romania libera** → Shaun Forsyth 8 years ago

No way, the failure rate of a mechanical drive is not linear after the

4 0 • Reply • Share ›

Lenin ✓ communist → Shaun Forsyth 6 years ago

It is my personal theory that drives fail due to spin-up and spin-do

I only have anecdotal evidence of that but it's pretty strong anecdo fail on me),.

0 0 • Reply • Share ›

dosmastr → Shaun Forsyth

7 years ago

Are these drives ever doing more than an initial Start?
if its a cloud cluster the drives probably never stop, power cycle or have to spin retry. Po

0 0 • Reply • Share ›

Dilbert → Shaun Forsyth

8 years ago

The "Average Age" column in their table is the average age of these disks at the time of higher for those drives.

So, you have a *single* Seagate in your PC which is working fine, and you conclude that average user?

BackBlaze has *hundreds* of these drives working perfectly fine. With 15.7% failure rate

0 0 • Reply • Share ›

Snuffo Laughagus → Shaun Forsyth 8 years ago

I would have to disagree from personal experience from the past 5 years, Shaun.

Among other that I don't remember, I have owned drives by IBM (1994), Quantum (1994) (2002), Toshiba (2006), Seagate (2010), WD (2010), Iomega EGO (2011) Samsung (201

Out of all the drives mentioned in this list, the only that has failed in normal use and forr eventually stopped spinning). And I was able to retrieve all the data on it after freezing tl service. The 1996 Toshiba died in a similar manner after the laptop fell during an attemp

The 1998 Seagate with its fluid bearing, a revolutionary concept at the time, super silent

The 1996 Quantum "Fireball" died after a major power surge actually FRIED the motherb everything in the area, computers, fax machines, TVs, microwave ovens...)

The Samsung drives I use for a backup show zero issues after 3 years used as backup c
WD Elements I am tesing now. However, one of the Samsungs failed after 2 weeks, dew

The 2010 WD external fell on the floor a couple of times (OK, it's carpeted and it fell only

The Iomega EGO fell several times on a carpeted floor from my desk as well - no issues,

0 0 • Reply • Share ›

PR **Peter Rajdl** → Shaun Forsyth
8 years ago
Last year I sold a FreeNas server with 5x Seagate 3tb drives. Within 3 months one drive
same drives also suffered a failure.

0 0 • Reply • Share ›

David Wujcik → Peter Rajdl 8 years ago
That's what you get for putting a SQL server on terrible spinning media...

0 0 • Reply • Share ›

AC **Alex Chen**
8 years ago
Do you change default drive parameters in any way? For example, I know WD green drives have 5 s

5 0 • Reply • Share ›

Haravikk → Alex Chen
8 years ago
In a data centre use-case I don't think a WD Green would ever get a chance to sleep, kinc
They're really not suited to drive array usage.

0 0 • Reply • Share ›

AC **Alex Chen** → Haravikk 8 years ago
The web is full of stories of WD greens dying within weeks of server use, unti

0 0 • Reply • Share ›

Matt Buford → Haravikk 8 years ago
Well, I'm doing home NAS use and not DC, but...

From what I understand, the WD head parking issue was limited to specific m
with red drives having issues with too much head parking too.

I've had 9 WD10EADS 1TB green drives (the same ones in this Backblaze rep
settings, and I have not had any issues. It seems that at least this model of g
47,800 power on hours, 23 start-stop-count, 23 load cycle count, and 21 pow

somehow I parked the heads twice (outside of power cycles) in 5.5 years.

Back when I bought them, 10 watts active was the norm for drives and these slower (less wear and tear) and used less power (which also means less hea with these drives. If I were ready to upgrade, I would probably go with greens winning combination for my needs.

Back in 2009, WD red didn't exist. There was their normal line of drives at 10 very similar to green ("intellipower" RPM) and have almost identical power us

If I were in the market to upgrade, I'd have to do some more research to be su

0 0 • Reply • Share ›

Haravikk ➚ Matt Buford 8 years ago

Hmm, strange, I have two WD Green 1.5tb drives and a single 1tb 10,000 times a day, indicating a delay of about 5-8 seconds, it's pr bought years apart. I've also seen WD Greens taken from media c that's largely idle with bursts of streaming.

Clearly not all WD Greens are created equal, so for that reason I d with less power consumption than the greens. I guess I just assur keeping them running would be sub-optimal.

That said, I'd still swear by the Reds for noise level; mine are almo even with a heap of them in a single system. I just wish I could aff

0 0 • Reply • Share ›

Matt Buford ➚ Haravikk 8 years ago

Because it was never a problem for me I never bothered checking,

drivespace idle3-tools-0.9.1 # ./idle3ctl -g /dev/sdb
Idle3 timer set to 80 (0x50)

According to what I've read, that translates to 8 seconds. I wonde seconds is a long time for no IO at all. In my case, I have the OS b not streaming a video. A quick check of my disks using "vmstat -d that, in all the years I've used these disks, I never had any 8 secon was installed before any server type apps were set up, or doing m

Anyway, I guess for me, cost matters (especially when buying 5-1 probably still lean toward starting with green drives for no other re or give in and go with red. Of course, if reds happened to be the sa

0 0 • Reply • Share ›

herr_akkar → Haravikk 8 years ago

That means that in a home use scenario where the drive is not in active use a

I have had multiple Greens die on me when left running for a few months.

0 0 • Reply • Share ›

Haravikk → herr_akkar 8 years ago edited

I was under the impression that greens are intended for infrequen
WD Greens has changed a lot, so I'm not 100% sure anymore, all I
horrific S.M.A.R.T. values) that they aren't great for continual usag

WD Reds meanwhile (again, in my experience) are intended for co

0 0 • Reply • Share ›

Xam

8 years ago

And what about WD40EZRX? Any data about the 4TB versione of WD Green?

4 0 • Reply • Share ›

Bill McKenzie

8 years ago

If you are looking for the Hitachi HGST 2TB drive above #HGST HDS722020ALA330 don't waste yo
as NEW.

3 0 • Reply • Share ›

Anthony Ally → Bill McKenzie

7 years ago

Where do you buy new hgst drives that are truly new?

0 0 • Reply • Share ›

Load more co

BackblazeA Publicly Traded Company (BLZE (https://ir.backblaze.com/?_ga=2.41661474.1437973618.1652720486-1530664084.1637004113))