



Solid State Hybrid Drives

The Key to a Huge “SSD” Market

John Moon
Seagate Technology

What is the Future of Storage?

Hard Disc Drives



Solid State Drives



Solid State Hybrid Drives



The Answer is:

All Three

Hard Disc Drive



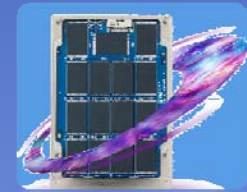
When you need the maximum storage capacity at the lowest cost.

Solid State Hybrid



When fast performance is needed on affordable storage with a large capacity.

Solid State Drive



When high performance is number one. Cost and capacity are distant seconds.

A continuum of products:

The ratio of Solid State to Rotating Storage will vary depending on the application.

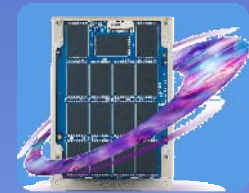
Hard Disc Drive



Solid State Hybrid



Solid State Drive



Rotating Storage

Solid State Storage

“...looking out five years, I wouldn't be shocked if 80% of our portfolio is hybrid.”

Steve Luczo

Chairman, President and CEO

Seagate Technology

July 2010

Solid State Hybrid Today – Momentus XT

- Launched in May of 2010
- 2.5” SATA 3Gb/s Notebook Drive
- Up to 500GByte Storage Capacity
- Uses 4GBytes of onboard SLC flash memory for enhanced performance

Solid State Hybrid Today – Momentus XT

2007

Seagate Launches
Momentus PSD
Industry's 1st Hybrid HDD

2010

Seagate Launches
Momentus XT
2nd Gen Hybrid



Focused on being
everything to everyone

Focused on performance
via end-user experience

160, 120 GB
256MB Flash
5400 RPM

500, 320, 250 GB
4GB SLC Flash
7200 RPM

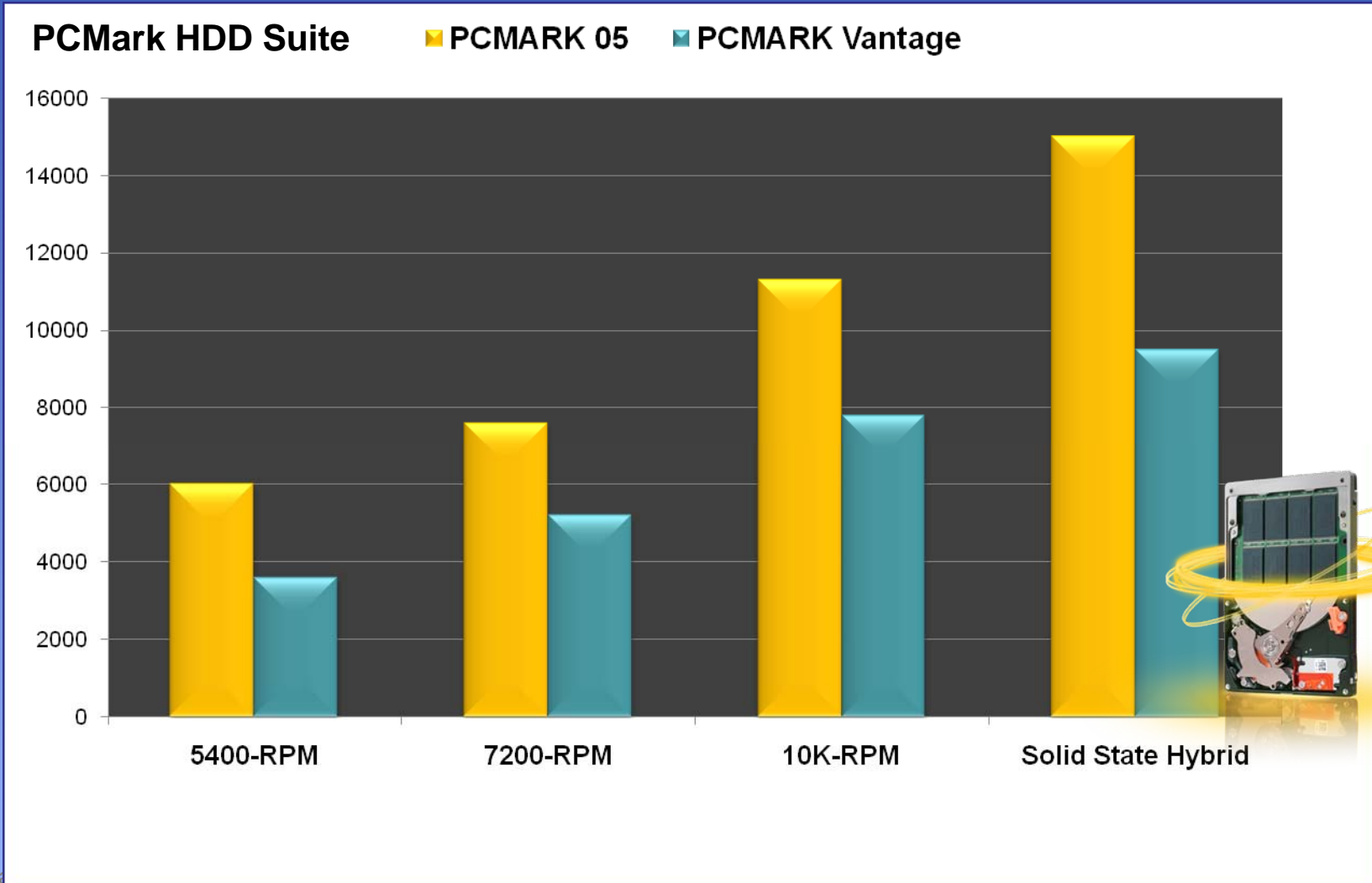
MS Ready Drive:
Boot, App-launch, Battery, Reli

System Performance:
10K or SSD like

Vista Required
Bolt-on Hybrid Architecture

OS Independent
True Hybrid Architecture

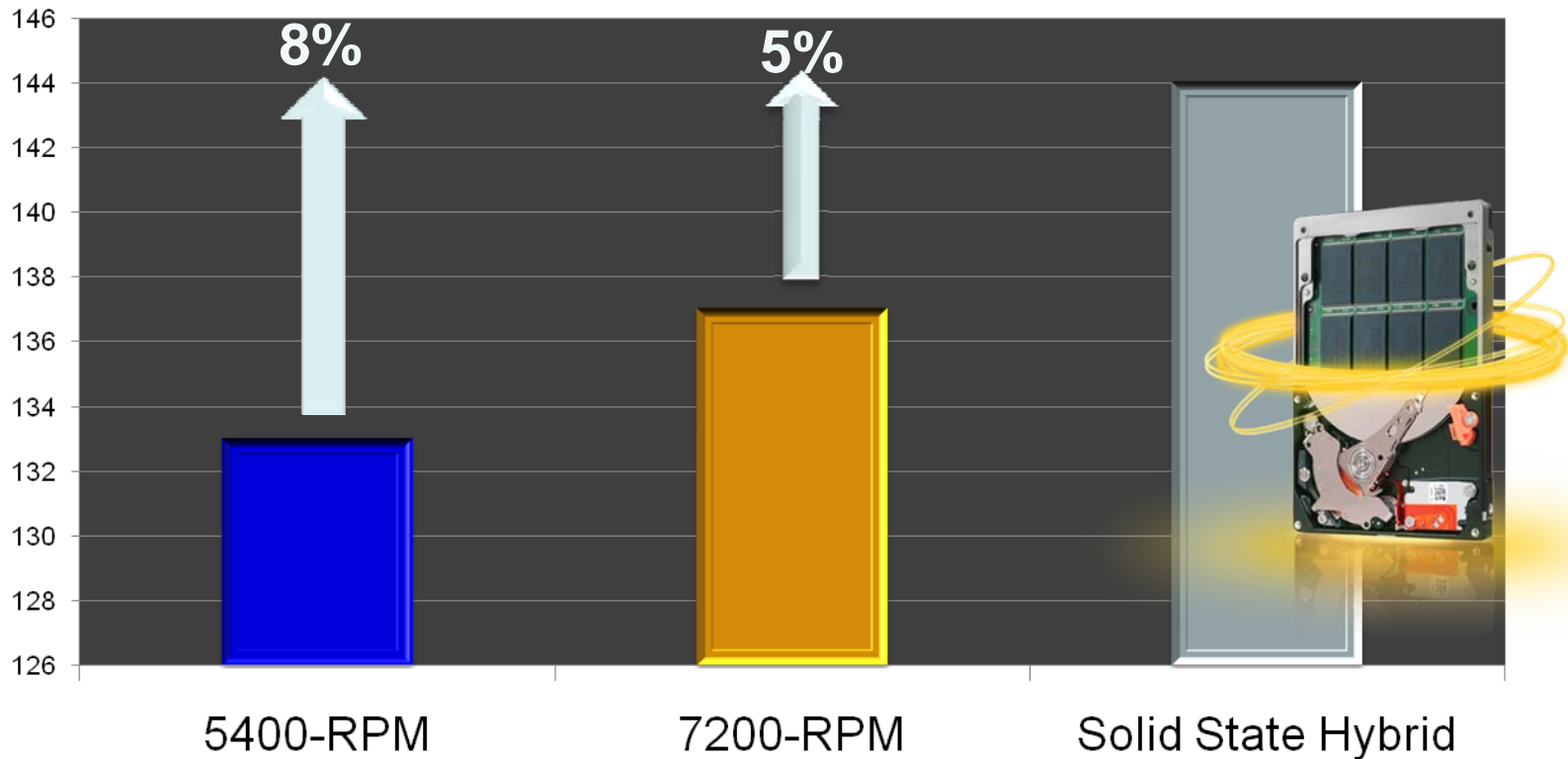
Solid State Hybrid Today – Momentum XT



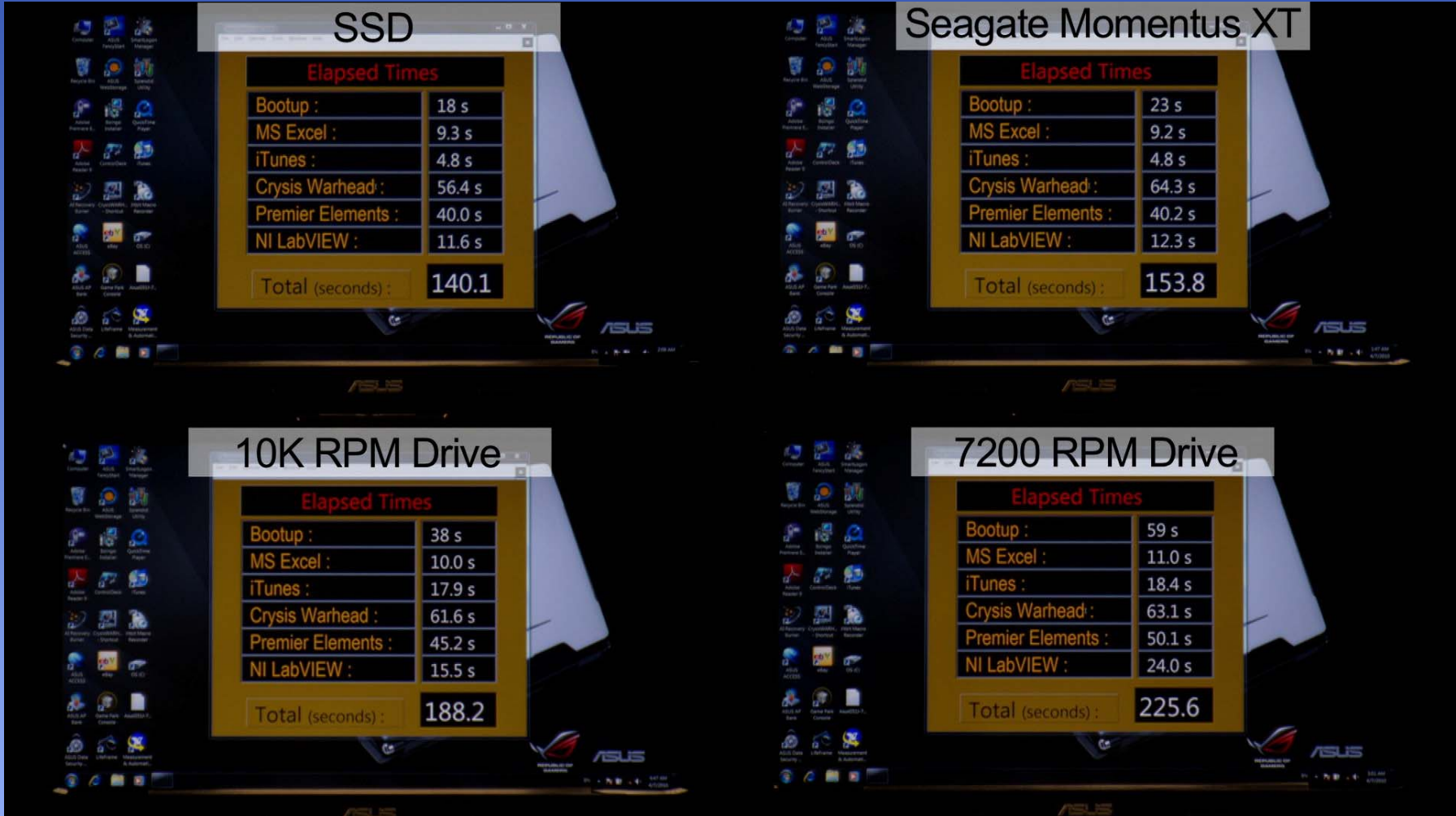
Solid State Hybrid Today – Momentus XT

Users can feel the impact of each point of SysMark 07

Sysmark 07 Scores
2.5-inch Notebook Client Storage (500GB)



Solid State Hybrid Today – Momentus XT





Momentum XT Market Reception

Tremendous reception – feedback favorable worldwide!

- Reviewers:
 - Too many “best of’s” to list



“My computer starts up 10 times faster.”



“Gaming Load: 46% faster than a 7200RPM desktop drive.”



“The real-world performance of this drive is way quicker than the numbers (benchmarks) imply.”



“Mac OS X boot times were cut in half.

Just imagine launching Word or Excel in three or four seconds – it’s shockingly fast.”

“Costs just a fraction of the price of an SSD that has just one-fourth of its storage space.”



- Are we talking about “hybrid” drives or SSDs?
- Yes.
- Solid State Hybrid Concept
 - ***A small SSD.***
 - A large capacity disc drive attached.
 - All packaged in a HDD form factor.
 - Intelligent algorithms to decide what to “cache” in the SSD and what to “store” on the HDD.

Solid State Hybrid – The Future



Porche 918 Spyder

- 500hp V8
- 2x electric motors = 218hp extra
- 0-62 mph in 3.2 sec
- Top speed 198 mph
- 78 mpg (up to)
- 4 operating modes from full battery to ultimate performance



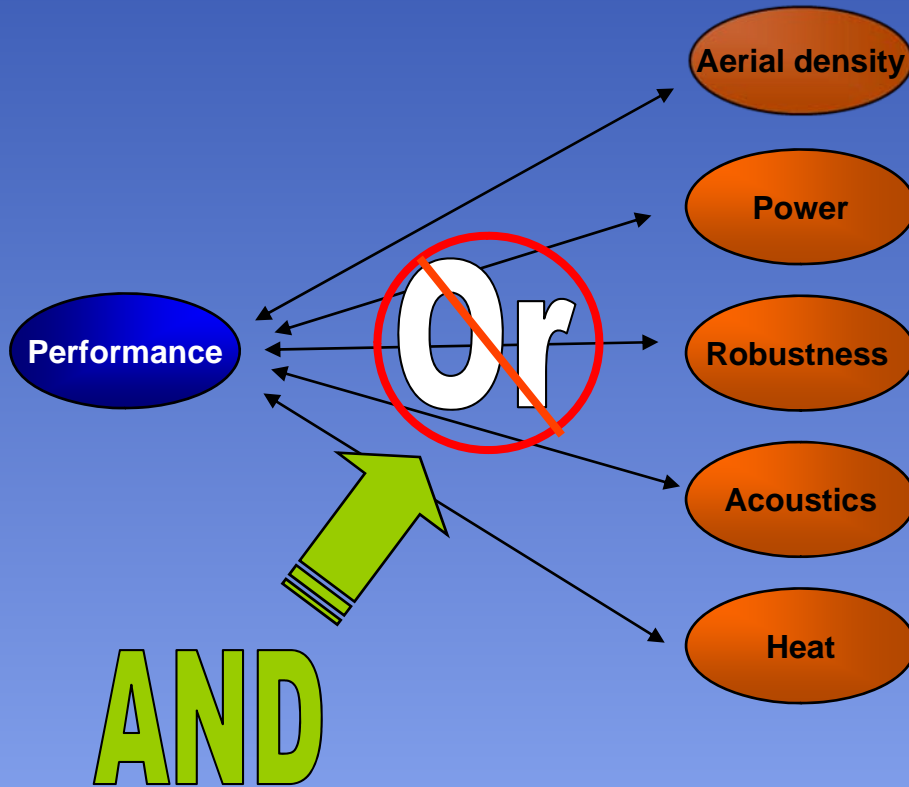
Toyota Prius

- 98 hp inline 4 cyl
- 80hp electric motor
- 0-60 in 9.8 sec
- Top speed 112 mph
- 50 mpg (combined)

Momentum XT: "More 918 Spyder than Prius"

- Anand Shimpi, AnandTech.com

An End to the Pesky Trade-offs.



Disc Drive Design has had to make trade-offs between performance and other important parameters.

Flash provides the answer!

Flash cache enables optimized parameters without sacrificing performance.

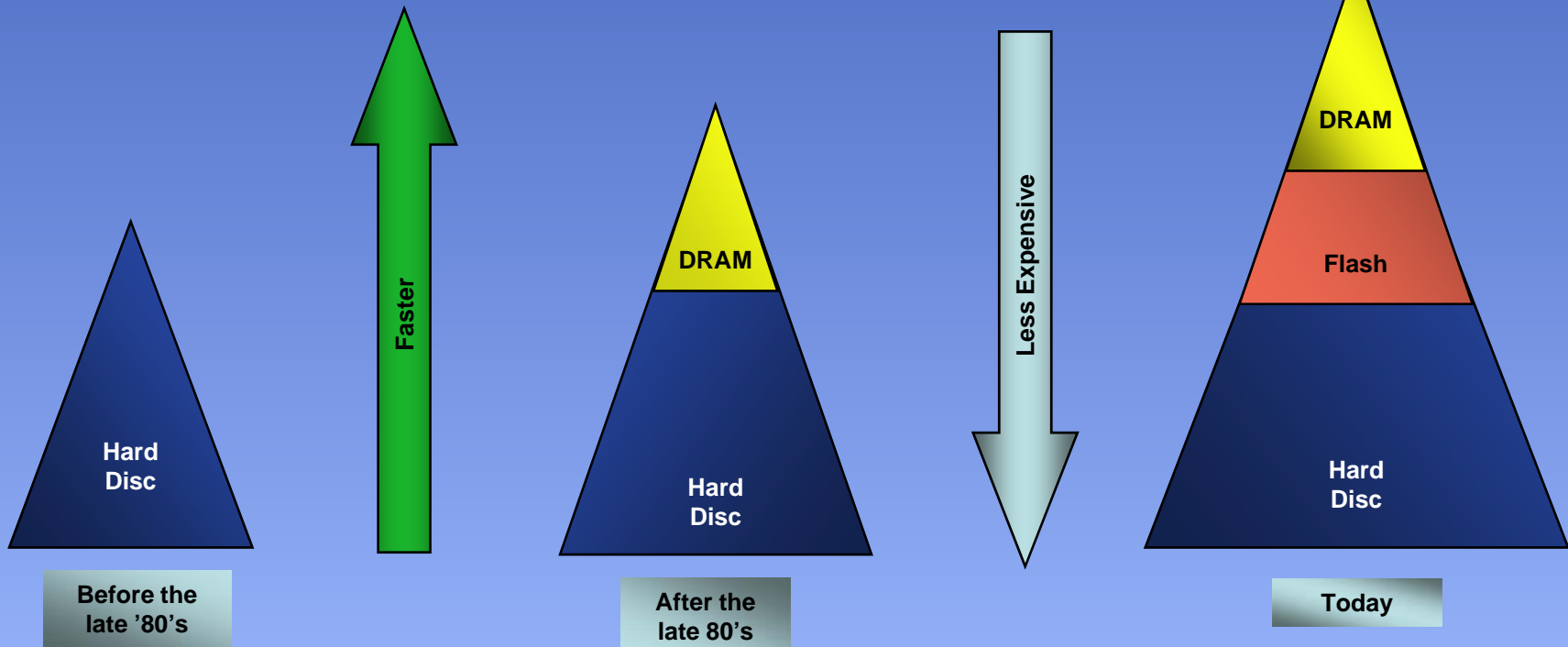
This makes for happy engineers and happy end-users.



History Repeating Itself

The addition of Flash Memory as a cache in Disc Drives parallels the days when Disc Drives started using DRAM as cache.

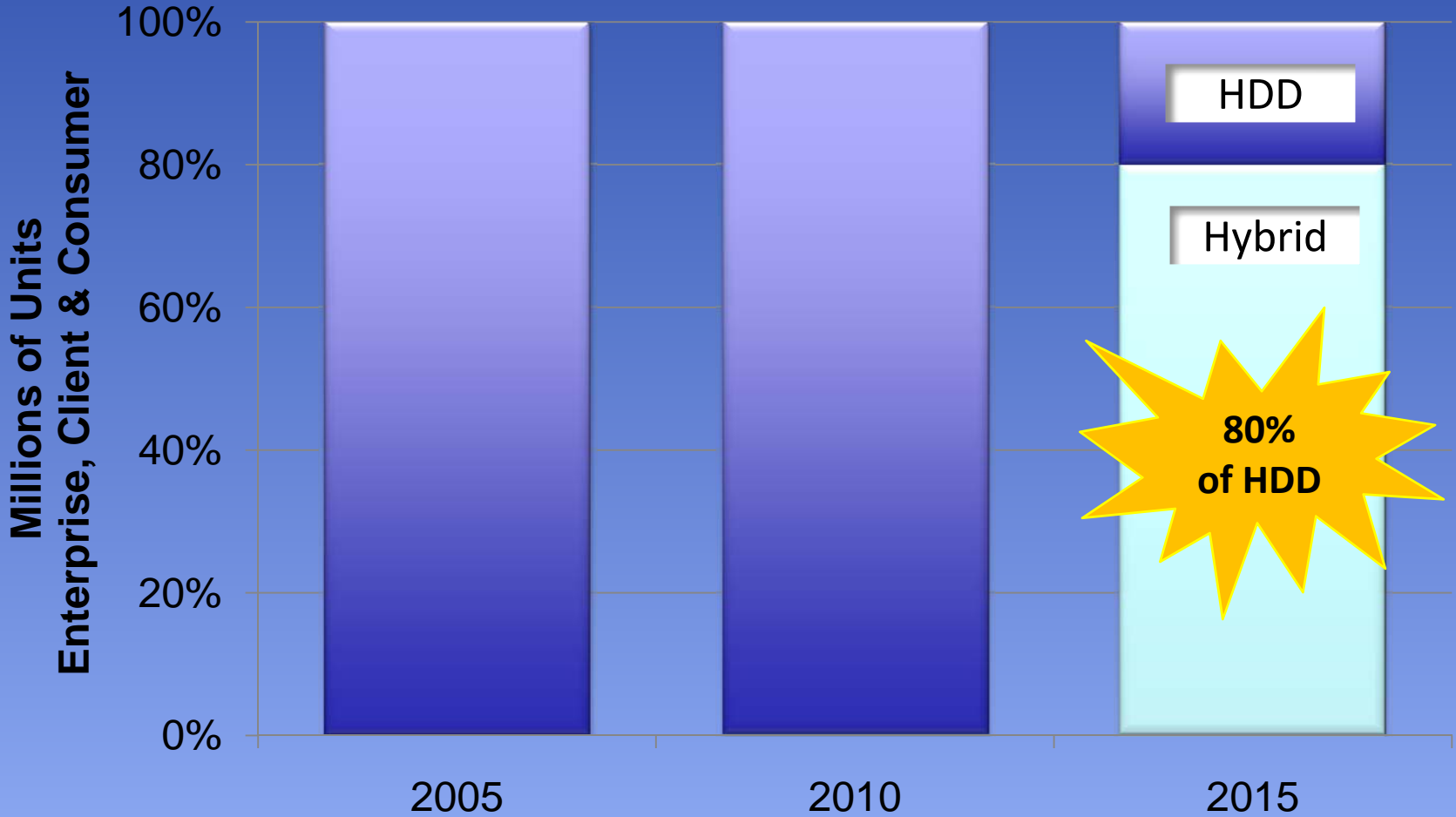
Flash Memory provides another tier of caching. Speeds faster than disc, but not as fast as DRAM. Less expensive than DRAM, but not as cost effective as disc.



Solid State Hybrid – A Very Useful Market

The Solid State Hybrid drives a “Specialty” NAND Market

- Lower density/legacy technologies
- Predictable demand model
- High Volume



Source: Seagate Market Research, August 2010



Thank You!