

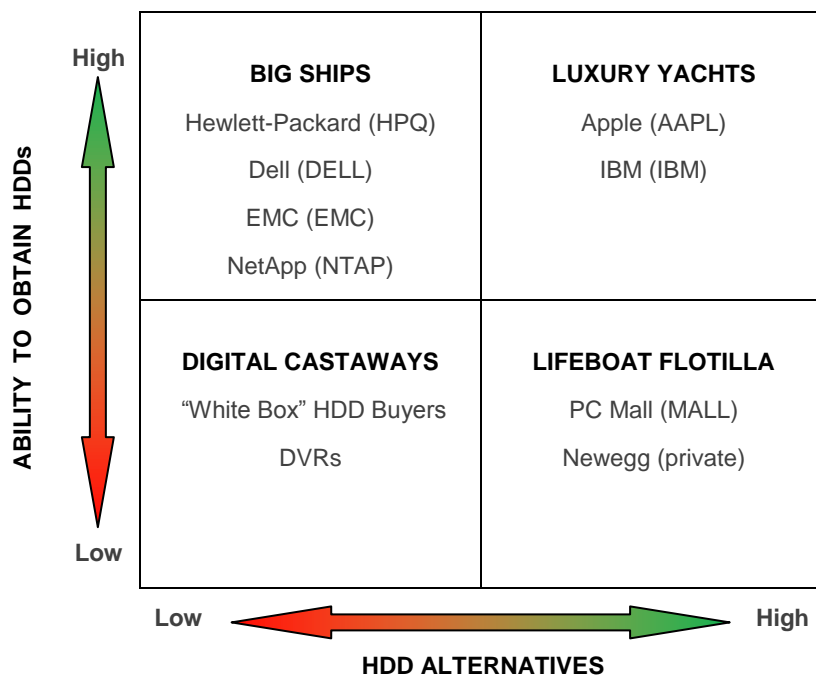
NET: DISCERN hosted an investor event with five storage industry veterans this week, including three that have served on the board of the hard drive industry association and a storage systems expert. A lively discussion of the impact of the tragic flooding in Thailand included consensus on some issues... and emphatic disagreement on others. The insights gleaned from our industry panel did not alter our non-consensus views that:

- It could be a year or more before hard disk drive (HDD) prices and availability return to normal, with repercussions through much of the tech sector, and
- HDD shortages could be a tipping point, acting as a catalyst for enterprises to improve storage management and discover the quantum leap forward in LTO tape technology that poses a risk for HDD-based storage systems¹ such as those supplied by **EMC, NTAP, HPQ, DELL** and **IBM**. (HPQ and IBM also supply LTO tape storage systems.)

DISCERN's Dec. 14th (Wed.) conference call will cover our findings in more detail.

HDD BUYER IMPACT

- The impact of shortages and high prices on HDD buyers should depend upon their ability to get more than their "fair share" of HDDs and the availability of HDD alternatives (see figure).
- The deeper and more severe the HDD shortage, in our view, the greater the likelihood of a tipping point with long-term effects—e.g., tape stages a resurgence in Tier 3 enterprise storage or lower priority buyers of HDDs with a high dependency on HDDs are crippled / fail.



Source: DISCERN

¹ Discussed in several recent reports: "Hard Disk Storage—Caught in the Middle" (Aug. 31, 2011), "A Risk for Disk: Social Networking, The Cloud & Streaming Video" (published on September 19, 2011), "The Risk for Disk: Company Implications" (Sept. 27, 2011) and "The Risk for Disk: The Facebook Effect" (Sept. 30, 2011).

LESSONS LEARNED...AND NOT

Lessons learned:

- Have material multiple sources for each component.
- Geographically diversify production; yours and your supply chains'.
- There is a meaningful downside risk to running lean inventories.

Time will tell:

- True win-win relationships with suppliers.

Lessons not learned:

- Prepare to fight the next battle, not the last one.

TIPPING POINTS

Will the flood be a tipping point for permanent change? We left the dinner more confident about some potential changes than others, as follows:

Highly Likely	<ul style="list-style-type: none"> • The Seagate-Samsung deal closes—Seagate (STX) quickly shifts mix to Samsung's (KOSE: A005930) unique 500 GB per platter 2.5" HDD and replaces other Samsung products with its own. • Western Digital (WDC) eventually regains lost market share—HDD buyers will continue going out of their way to insure they have multiple strong vendors. • The HDD supply chain diversifies—Geographic mix shifts to other locations in Asia and with less concentration among component suppliers. China, Singapore, Vietnam and the Philippines all have drawbacks, so Thailand should remain important to the HDD industry.
Likely	<ul style="list-style-type: none"> • Toshiba emerges stronger—The European Commission (EC) must sign off on an approved buyer of some WDC assets for the WDC/HGST deal to go through. Toshiba (TSE: 6502) is one of the few plausible potential buyers, putting it in a strong negotiating position. TDK is the next most likely acceptable buyer. • The WDC-Hitachi deal closes—The EC conditions are not a lay-up. One industry veteran has heard HGST senior management no longer views the merger as a good deal due to the flood impact and is seeking a way out. Workers at HGST's Shenzhen, China plant are currently on strike protesting the WDC takeover, which they reportedly fear will affect their interests. • SSD adoption accelerates—Reliability issues remain a barrier to adoption. Distributors are seeing a pickup in SSD orders, though NAND flash prices are not rising. • Cloud adoption accelerates—Cloud storage is a viable option for much of the data now stored on desktop, notebook, external personal, consumer electronics and enterprise business critical (not mission critical) HDDs. Security and latency concerns remain a barrier to adoption. • Inventory levels ultimately rise—After the backlog of pent up HDD demand is worked off, inventories throughout the HDD supply chain should return to the (higher) levels typical prior to the Great Recession.
Perhaps	<ul style="list-style-type: none"> • The strong HDD buyers stay stronger—To retain customers poached from lower tier vendors, Tier 1 PC, server and storage system vendors will need to convince them Tier 1 offerings are worth premium prices. • Tape stages a resurgence—Enterprise IT buyers learn about the huge improvements in tape technology and begin to use tape more appropriately—i.e., much more broadly—migrating some data off of low end disk storage systems. Incumbency is an advantage for HDDs. • Storage system utilization improves—HDD storage system capacity utilization in non-mainframe environments increases from its current level of about 40%.
Unlikely	<ul style="list-style-type: none"> • The HDD industry is generally not expected to change its predatory race-to-the-bottom behavior as long as there are more than two suppliers. We view recent HDD pricing and margin pressure as a cyclical low and expect the cycle to continue.
Highly Unlikely	<ul style="list-style-type: none"> • The HDD industry is not expected to add excess capacity—Excess capacity is expensive, would accelerate a return to normal pricing, and is unlikely to be rewarded with permanent market share gains.

Source: DISCERN

WINNERS AND LOSERS

We expect the duration and nature of HDD shortages to vary widely among different segments of the HDD market, as shown in the following figure. This should play a key role in varying the impact among HDD buyers.

HDD Segment	HDD Market Share (Pre-Flood)	Large Buyers of HDDs	Duration and Nature of HDD Shortages	HDD Alternatives
Mission Critical Enterprise (Performance Oriented)	~60% Seagate ~20% HGST ~20% Toshiba	EMC, IBM, NTAP, HPQ, DELL	Component shortages only. ² Backlog likely worked off during 1Q12.	<ul style="list-style-type: none"> SSDs at the high end
Business Critical Enterprise (Capacity Oriented)	~40% Seagate ~40% Western Dig. ~20% HGST	EMC, NTAP, HPQ, DELL, IBM; also IM, TECD, AVT, ARW, GOOG, Facebook, AMZN, MSFT	Severe loss of production capacity at WDC. A priority segment for HDD vendors, so backlog could be worked off during 2Q12.	<ul style="list-style-type: none"> Tape in many applications Improved storage management
Mobile	~25% Western Dig. ~20% HGST ~20% Toshiba ~20% Seagate 10+% Samsung	HPQ, Lenovo (SEHK: 992), DELL, AAPL, Acer (TSEC: 2353), Toshiba, Asustek (TSEC: 2357), Sony, Samsung, Fujitsu	Low priority segment hit hard by the floods. Expect relatively deep and long shortages. Short-term potential for low-capacity ³ HDDs.	<ul style="list-style-type: none"> SSDs at the high end
Desktop	~40% Western Dig. ~40% Seagate 10+% HGST ~10% Samsung	HPQ, DELL, Lenovo, Apple, Acer; followed by Fujitsu, Asustek, Samsung, Sony, Toshiba; also IM, TECD, AVT, ARW	Low priority segment hit hardest by the floods. Expect among the deepest and longest shortages. Potential for low-capacity HDDs short-term.	<ul style="list-style-type: none"> None
Consumer Electronics	~40% Western Dig. ~35% Seagate	TiVo (TIVO), Direct TV (DTV)	Low priority segment hit hard by the floods. Expect among the deepest and longest shortages. Minimal or no tolerance for low-capacity HDDs.	<ul style="list-style-type: none"> DVDs Streaming video

Source: DISCERN, IDC, Bloomberg and company reports

While cloud storage is an HDD alternative for all but the mission critical segment, cloud data is stored on HDDs or tape...and much of it on HDDs. An environment where HDD supplies are constrained limits cloud storage as an alternative to HDDs, so it has not been included in this figure.

² For this HDD segment, the flooding primarily impacted the supply of components such as motors, base plates and gaskets and not HDD production.

³ Due to the nature of the component shortages, WDC can increase its HDD unit shipments by shipping low capacity desktop and notebook HDDs with fewer components; in some cases this should be a more attractive option for lower-tier HDD customers than no HDDs at all.

Near-term

- **Seagate (STX)** gains share at rich margins and strengthens its balance sheet. We expect it to enjoy abnormal pricing and margins for a year or more and hear it is locking in volume commitments from buyers for extended periods (anywhere from one to three years, depending on the industry contact, and likely about 18 months).
- **Western Digital** loses share and invests about \$500M in capital equipment. Other unusual charges it may face include; a \$250M breakup fee if the HGST deal doesn't close, a \$525M arbitration award to STX, and the costs of recovering from the flooding. A rapid recovery of full production capacity hinges on successfully accelerating a technology transition (areal density) that is challenging under the best of circumstances and could depress yields for months. Without that transition, HDD unit shipments should be limited by slider availability. Low-capacity, low component HDDs could increase unit shipments but in our view would have severely depressed margins; this strategy is likely to be pursued merely to satisfy demand from lower-tier customers. Abnormally high pricing should mitigate the financial impact. Insurance will likely cover some, but not all, of the extraordinary costs.
- Capital equipment provider **Veeco (VECO)** is already getting orders.
- Capital equipment provider **Xyratex (XRTX)** is expected to see an increase in orders and it is believed its HDD related business is highly profitable. **WDC** accounts for about half of Xyratex's Storage Infrastructure (SI) revenue, which was 21% of total revenue in 2010 and is expected to be 10% of total revenue in 2011.
- Capital equipment provider **Intevac (IVAC)** counts HGST among its customers but not Western Digital; its outlook should be influenced by whether or not the WDC/HGST deal goes through and, if so, subsequent manufacturing decisions.
- Component providers with high exposure to WDC, such as **Hutchinson Technology (HTCH)** and **Marvell (MRVL)**, are expected to experience demand drops in 4Q11 and into 1Q12, then above-normal demand as the HDD backlog is worked down through most of CY12 and potentially into CY13. HTCH could be negatively affected if HDDs ship with lower component (slider) counts.
- Similarly, component providers with high HDD-related exposure (PCs, servers, storage systems, some consumer electronics)—e.g., **DRAM makers, contract manufacturers, microprocessor makers and potentially semi fabs**—will likely experience demand drops in 4Q11 and into 1Q12, then somewhat above-normal demand as the HDD backlog is worked down through much of CY12 and potentially into CY13. We hear that the total BoM (bill of materials) for PCs is currently little-changed, with higher HDD prices offset by lower prices for other components. We think OEMs and ODMs will likely see HDD prices rise in 1Q12.
- **The strong get stronger**—Large HDD buyers such as **HPQ, DELL, AAPL, IBM, Lenovo, EMC and NTAP** should take share from lower tier competitors in the short term. Some weaker competitors are likely to fail.

Long-term

- Potential long-term beneficiaries of improved storage system utilization in non-mainframe environments include **IBM's** Tivoli software and related services and **Symantec's (SYMC)** Veritas software.
- Potential long-term beneficiaries of a resurgence of tape storage include tape system vendors **Quantum (QTM)**, **Spectra Logic** (private), **IBM**, **Hewlett-Packard** and **Oracle (ORCL)** and tape media vendors **TDK (TSE: 6762)**, **FujiFilm (TSE: 4901)**, **Sony (TSE: 6758)**, **EMTEC (ETEC)**, **Maxell** (private) and **Imation (IMN)**. About 40% of non-mainframe enterprise data currently stored on HDD systems is well-suited to (much) lower-cost tape, according to storage consultant Fred Moore, and tape's sweet spot is the largest and fastest growing tier of data (Tier 3).
- **Western Digital** could have the most modern, capable production facilities in the industry after it recovers. On a less positive note, it is well known there are few potential asset buyers that could satisfy the EC's criteria for approving the HGST deal. Such buyers are likely to drive a hard deal, demanding not only IP but also operational facilities (which are temporarily in short supply at WDC).

NO CHANGE TO OUR HDD UNIT SHIPMENT EXPECTATIONS

The evening's discussion did not materially change our view of the recovery of HDD production, which is:

- **4Q11 HDD shipments** will be 110M to 130M units, likely 115M to 120M including 20M to 25M units from HDD vendor inventory. Production is likely to be 90M to 100M units.

- **1Q12 HDD shipments** will likely be 140M to 165M units, somewhat biased towards the low end of that range. Key variables include Western Digital's slider recovery (in house and from TDK) and Toshiba's recovery.
- **HDD production shortfalls versus demand** are estimated to be about 80M⁴ units in 4Q11 and another 20M to 25M in 1Q12. Together this is about 15% of T12M demand. We think storage capacity (e.g., TB) shipments could be nearer to 20% below unconstrained demand for 4Q11-3Q12.
- **HDD supplies constrained at least until 4Q12...** and potentially into CY13.⁵
- **Full production capacity** is not expected to be restored until Mar-12 at the earliest and potentially not until mid-2012. Western Digital is highly respected for its agility and ability to execute; this—and a lack of execution hiccups—are necessary for full production restoration by Mar-12, in our view.

CONFERENCE CALL

At 11:00 a.m. on Wednesday, Dec. 14th DISCERN will host a conference call to cover findings from our Storage Insights dinner in more detail. Please [contact your DISCERN sales rep](#) for dial-in details.

INDUSTRY PANEL

The panel of industry veterans that shared their expertise at DISCERN's Storage Insights dinner were:

- [Dirk Thomas](#), former president of Hitachi Global Storage Technologies and a China based DISCERN Advisor;
- [Fred Moore](#), storage consultant with deep systems expertise. President of Horison Information Strategies and former SVP of Strategic Planning at StorageTek;
- [Mike Russak](#), EVP and GM of Intevac Hard Disk Equipment Products, former president and CTO of Komag⁶ and former CTO and VP of R&D for HMT Technology⁷;
- [Gary Davis](#), a Kuala Lumpur based consultant to the data storage industry and board member of the International Disk Equipment Manufacturer's Association (IDEMA); and
- [Tom Coughlin](#), a consultant, author and storage industry association leader with expertise in slider (head) and media technology. Tom is also chairman of the annual Flash Memory Summit.

⁴ Shipment forecasts of 110M to 130M units include an estimated 20M to 25M units shipped from HDD vendors Finished Goods Inventory.

⁵ For more on our non-consensus view that it could take a year or more for pent up HDD demand to be filled and inventory to be replenished throughout the supply chain—as well as the repercussions for much of the technology industry—please see “HDDs and Technology—Thailand Impact Worse Than Expected” (published November 14, 2011), “HDD Shortage—Fast Recovery Points to 1+ Year of Pain” (November 17, 2011), “Seagate Moves to Lock in Multi-Year Purchase Commitments” (also November 17, 2011), “TECD: Will Thailand Flooding Sink Guidance?” (November 18, 2011) and “HPQ Supply Chain Exposure: Uneven Impact” (November 22, 2011).

⁶ Komag, a supplier of media for hard disk drives, was acquired by Western Digital (WDC) in 2007.

⁷ HMT, a supplier of media for hard disk drives, was acquired by Komag in 2000.

ANALYST CERTIFICATION

I, Cindy Shaw, CFA, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed in this research report.

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